

# Farmland Requirements for Ontario's Growing Population to 2036

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for the

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Guelph, Ontario

Revised February 14, 2012

# Executive Summary

The primary aim of this report is to provide a quantitative estimate of the area of Ontario farmland that would be needed to feed the province's population now and in the next quarter century, to 2036. An estimate of the land requirements for self-sufficiency in food will allow planners, policy-analysts and other decision-makers to have a concrete base for work surrounding the protection of agricultural land from conversion to other uses. A basic premise of this work is that decision-making for the protection of farmland should be part of wider food policy, especially concerning the goal of food security for the population.

Part A of this report provides context and background to the state of agriculture, population and urban growth in Ontario. This includes data concerning agricultural land use, balance of trade, population projections and jurisdictional information of relevance to farmland protection. Part B describes a method to estimate the amount of land needed to provide an ideal diet for Ontario's population in 2009 and for three population scenarios projected for 2036 by Statistics Canada. This method joins both production capability and consumption through the use of agricultural census data and the recommendations for a complete and nutritious diet contained in Eating Well with Canada's Food Guide, the federal policy on food and nutrition. The analysis draws food production and consumption trends together with the area of farmland in use and population growth projections to illustrate various future food self-sufficiency scenarios for Ontario.

This report estimates that Ontario required some 3,770,059 hectares of farmland to feed its 2009 population of 13,210,700, which translates to 0.29 hectares per person. This assumes that all residents adhered to the national nutrition guidelines of Canada's Food Guide and the

province was completely self-sufficient. In that year, Ontario had some 4,264,865 hectares in agricultural production related to food, 494,806 of which were surplus to requirements for self-sufficiency.

The report's findings, however, indicate that although Ontario had the ability to be self-sufficient in 2009, the province is nearing its capacity for self-sufficiency in food production. By 2036 Statistics Canada projects a population of between 16,135,900 and 19,440,000 for Ontario, which would require between 5,482,567 and 6,605,215 hectares respectively, to meet the population's food requirements. Assuming no change in current farm production and food system structures, this represents a total land deficit of 1,217,705 hectares in the low growth scenario to a high of 2,340,353 hectares in the high growth scenario. These figures do not take into account food wastage, which could be as much as 40% of production.

At the same time, the amount of farmland in the province is declining. A comparison of the 4,264,865 hectares in food-related production in 2009 and the 4,410,000 hectares in food-related production in 2006 (a decline of 145,135 hectares), signals a declining farmland base and therefore a declining capability for self-sufficiency in Ontario.

In summary, the self-sufficiency ratio of Ontario is declining, which suggests that the risk for food security in Ontario is also growing. Coupled with ongoing population growth and the declining farmland base, the deficits reported here can be expected to increase into the future unless significant changes are made in supporting the agriculture and agri-food sectors and protecting Ontario's agricultural land base.

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# Acronyms and Glossary

AAFC - Agriculture and Agri-Food Canada

CAP - Common Agricultural Policy (of the EU)

CAR - Census Agricultural Region

CCS - Census Consolidated Subdivision

CD - Census Division

CMA - Census Metropolitan Area

EU - European Union

GTA - Greater Toronto Area

Ha - Hectare, i.e. 2.47 acres

MOE - Ministry of the Environment of Ontario)

NAFTA - North American Free Trade Agreement

OMAFRA - Ontario Ministry of Agriculture, Food and Rural Affairs

OMEI - Ontario Ministry of Energy and Infrastructure

OMMAH - Ontario Ministry of Municipal Affairs and Housing

PPS - Provincial Policy Statement

USDA - United States Department of Agriculture

WTO - World Trade Organization

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**Alternative farming**— loosely, any farming system that is not main-stream, conventional, production farming (see production farming below)

**Balance of trade** – the monetary difference between the value of goods and services imported to those exported from a specified area. When the balance of trade is negative, a trade deficit is said to exist.

**Census farm**—a farm as defined by the Census of Agriculture, Statistics Canada, being: an agricultural operation that 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); or other agricultural products (Christmas trees, greenhouse or nursery products, mushrooms, sod, honey, maple syrup products).

**Conservation Authorities** -in Ontario, locally-governed quasi-governmental bodies of mainly appointed officials which play a large role in watershed management and local planning.

**Food security** - exists when all people, at all times, have physical and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life

**Import substitution** - the replacement of imported goods with equivalent ones that are produced within the specified area

**Production agriculture** - term often used in Ontario to describe conventional commercial agriculture

**Self-sufficiency**- the ability of a specified area to provide for its own needs; in this case food

**Self-sufficiency ratio** - the ratio of food consumed within a specified area compared to the amount produced

**Supply management** - refers to Canada's marketing and production system which controls the amount of production of, especially, poultry, eggs and chicken to the domestic market's needs. Import tariffs are in place to prevent foreign access to these domestic markets.

**Trade deficit** – see balance of trade above

## Introduction

Of a total land area of 907.6 thousand square kilometres in Ontario, about 8.7%, or 78.9 thousand square kilometres are of high capability land for farming. This means Classes 1, 2 and 3 (Category A) of the Canada Land Inventory. Of this area, about 28% or 22.1 thousand square kilometres are the highest Class 1 soils, with no limitations for cropping. This is the largest amount of Class 1 soils of any province.<sup>1</sup> In 2006 Ontario had 57,211 census farms, the most of any province, occupying some 53.8 thousand square kilometres.<sup>2</sup> This is the largest number of census farms of any province.<sup>3</sup> Ontario farms sold almost \$11 billion worth of agricultural products in 2009, second only to Alberta.<sup>4</sup>

Taken alone, these statistics leave no doubt that the province is a major agricultural producer. However, the economic and social dynamics of the farm sector are generally less positive. Farm numbers continue a long decline, the farm population following suit. Farm operators are aging and succession to the next generation is often not guaranteed. Both entry to and exit from the farming occupation are difficult. Many markets are volatile and corporate interests upstream and downstream of the farm undermine its autonomy. Perhaps most troubling, the costs of production are rising faster than incomes from sales,<sup>5</sup> which puts financial viability in jeopardy. As important as they are, these socio-economic problems in Ontario farming are not

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<sup>1</sup>Canada, 2010: "Soil Capability for Agriculture" (map table), *The National Atlas of Canada*, 5<sup>th</sup> edition, Energy, Mines and Resources Canada

<sup>2</sup> Canada, 2010: Table 4.3-1 *Land use – Total area of farms, census years 2006 and 2001*, Statistics Canada

<sup>3</sup>Canada, 2010: *Table 29: Number of farms and farm area* (for 2001 and 2006), Statistics Canada

<sup>4</sup>Canada, 2010: *Agriculture value added account, by province* (for 2009), Statistics Canada

<sup>5</sup> Statistics Canada, 2009: *The financial picture of farms in Canada* Highlights and Analysis of the 2006 Census of Agriculture

the subject of this report. This work is focussed solely on questions surrounding the adequacy of Ontario's agricultural land base to feed its people. The basic question addressed here is how much farmland Ontario needs to feed the population now and for the next quarter century.

Owing to its natural resource endowment as well as its economic and settlement history, most agricultural production occurs within southern Ontario, which is also the most densely-populated region of Canada.<sup>6</sup> With 13,069,200 people in 2009, Ontario has the largest population of any province and this is increasing at a rate of 1.0% per year.<sup>7</sup> Some 132,900 residents were added between 2008 and 2009 alone.<sup>8</sup> Most of this population increase occurs in the southern part of the province, which is also where the best farmland is found. This land has historically been lost to agriculture through conversion to urban or other uses, a trend that has long-raised concern within the province. As a result, various planning instruments and statutes are in place to attempt to curb wasteful urban sprawl, conserve natural environments and limit the loss of agricultural land. Their success is variable and generally difficult to assess.

Although Ontario's agricultural land base is reasonably generous, a large amount is devoted to pasture or commodities such as hay, soy beans and grain corn or to sod and nursery products.<sup>9</sup> Much of this production is destined for animal fodder, industrial uses or other non-food uses. A considerable amount of Ontario's production is exported beyond the province (Figure 1).

While these realities may not be problematic as such, Ontario experiences a growing

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<sup>6</sup>Canada, 2010: "Population Density, 2006" *The Atlas of Canada*, Natural Resources Canada

<sup>7</sup>Canada, 2010: *Population by year, by province and territory* (for 2009), Statistics Canada

<sup>8</sup>Canada, 2010: *Population by year, by province and territory* (number and percentage change), Statistics Canada

<sup>9</sup>Ontario, 2010: *Statistical Summary of Ontario Agriculture*, Economic Development Policy Branch, Statistics Unit, Ontario Ministry of Agriculture, Food and Rural Affairs (OMAFRA), January 10

international trade deficit in a number of food products, especially fruit and vegetables, many of which could actually be grown in Ontario.<sup>10</sup>

**Figure 1: Ontario Agri-Food Trade; 2000-2009**(source: after OMAFRA, 2010, Ontario Agri-Food Trade)

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Ontario Agri-Food Trade (billions of dollars)										
Year	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
<b>Exports</b>	6.79	7.92	8.41	8.39	8.69	8.55	8.60	8.73	9.35	8.85
<b>Imports</b>	10.58	11.66	12.51	12.32	12.23	12.64	13.46	14.99	16.45	16.87
<b>Balance</b>	-3.79	-3.74	-3.41	-3.20	-3.54	-4.09	-4.86	-6.26	-7.10	-8.02

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The trade deficit directly indicates a decline in Ontario’s self-sufficiency ratio. This is the ratio of the food consumed within the province to the amount produced. This report uses the term self-sufficiency to represent the ability of Ontario to feed itself.

When an increasing trade deficit is added to ongoing population growth and conversion of farmland, not only is the self-sufficiency ratio affected, we may properly suspect that the province’s food security itself is at risk. The United Nation’s *Rome Declaration on World Food Security* made at the *World Food Summit* of 1996 contains a now well-accepted definition of food security:

Food security exists when all people, at all times, have physical and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life.<sup>11</sup>

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<sup>10</sup>Ontario, 2010: *Ontario Agri-food Trade by Commodity Group, 2009, January through December (Cdn \$’000)* Ontario Ministry of Agriculture, Food and Rural Affairs (OMAFRA), April 15

Canada contributed to the UN's *World Food Summit* proceedings and endorses its findings.<sup>12</sup> A variation of the same definition was recently used in the federal government's *Canadian Community Health Survey* of 2007-2008:

Food security is commonly understood to exist in a household when all people, at all times, have access to sufficient, safe and nutritious food for an active and healthy life. Conversely, food insecurity occurs when food quality and/or quantity are compromised, typically associated with limited financial resources.<sup>13</sup>

There is no mention of local or regional production in either of these definitions and so according to them declining food self-sufficiency does not translate directly to food insecurity. The role of trade in agricultural products seems to be that. Indeed, advocates of free trade, comparative advantage and competition have strongly criticized the very idea that countries should strive towards self-sufficiency in food. They see self-sufficiency itself as a threat to food security<sup>14</sup> in times of crop failure, for example. Trade is seen as the mechanism that enables food security.

Rich countries may simply import food to fill demand. Ultimately, however, the world's growing population must live upon a finite land base and resource endowment and be self-sufficient at a global level. The global arable land resource is now fully farmed in many regions, including much of Ontario. Expansion of farming onto forested areas, wetlands or fragile and

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<sup>11</sup>United Nations Food and Agriculture Organization, 2010: *Rome Declaration on World Food Security*, World Food Summit, 13-17 November, 1996, Rome, Italy

<sup>12</sup>Canada, 1998: *Canada's Action Plan for Food Security* (1998): In Response to the World Food Summit Plan of Action

<sup>13</sup>Canada, 2010: "Household Food Insecurity" *Canadian Community Health Survey, 2007-2008*, Statistics Canada

<sup>14</sup>e.g. Paul Conway, a senior vice-president of Cargill, as reported by Blas, Javier, 2009: "Food Self Sufficiency is a Nonsense" *Financial Times*

marginal lands is not environmentally desirable. Global food security is, then, directly related to self-sufficiency at the global scale. In a finite world whose population continues to increase, there is no jurisdiction which can afford to neglect its global responsibility to the twin goals of food security and protection of farmland from conversion to other uses.

In a penetrating 1998 critique of British and European Union (EU) policy, David Barling and colleagues considered Britain's food security against the country's declining self-sufficiency in its own agricultural production. They note that British government policy interprets food security in terms of access to and affordability of food rather than local self-sufficiency.<sup>15</sup> In contrast, Barling and colleagues link food security directly with an increased self-sufficiency ratio. This represents a change in British policy environments from the 1970s when local self-sufficiency was prominent in the contemporary discourse. An example of this was a white paper titled *Food from our Own Resources* issued in 1975 and representing a British policy environment which firmly endorsed increasing the self-sufficiency ratio.<sup>16</sup> A pamphlet published by a well-known ecologist pointedly asked (and attempted to answer) the basic question asked in its title: *Can Britain Feed Itself?*<sup>17</sup>

This concern occurred in the years following the UK's accession to the European Union (EU) and reflects the country's adjustment to economic integration and free trade with the other members. The EU's Common Agricultural Policy (CAP) directs much of the policies surrounding production and trade of agricultural products as well as the agri-environment and

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<sup>15</sup>Barling, David, Rosalind Sharpe and Tim Lang, 2008: *Rethinking Britain's Food Security: a Research Report for the Soil Association*, Centre for Food Policy, City University London, November

<sup>16</sup>*Food From our own Resources*, Command Paper No. 6062, 1975, Government of the United Kingdom

<sup>17</sup>Mellanby, Kenneth, 1975: *Can Britain Feed Itself?* London: Merlin

support to farmers. England's former Ministry of Agriculture, Fishing and Food (MAFF) which was production-oriented is now the Department of Environment, Food and Rural Affairs (DEFRA). Its current mandate is now broad and integrates rural community health and the environment with its traditional concern for agricultural production and fisheries,<sup>18</sup> generally in conformity with the current CAP and production *per se* is no longer of prime concern.

The present report agrees with Barling and colleagues and assumes a direct relation between self-sufficiency and regional or provincial food security. In this case, the recent decline in food self-sufficiency in Ontario revealed by its growing trade deficit holds not just health and social implications for Ontario's population, but represents a risk to food security itself. In 2007-2008, 8.2 % of Ontario's households were found to be already food insecure, a higher rate than the national average of 7.7%.<sup>19</sup>

The combination of population growth, food-insecurity, conversion of farmland to other uses and growing trade deficit in food warrants a rigorous examination of the province's food self-sufficiency, which is the aim of this work. *Part A: Ontario Farming in Context* provides a description of Ontario's farmland resource, the jurisdictional framework for agriculture and the socio-economic variables that influence farmland change. *Part B: Estimating Ontario's Farmland Needs* provides a rigorously-derived estimate of how much farmland is required for Ontario to be self-sufficient in food now and for the next quarter century. Finally, *Part 3: Conclusions* discusses the findings and suggestions for further work.

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<sup>18</sup>Department of Food, Environment and Rural Affairs, 2010: Government of the UK website

<sup>19</sup>Canada: 2010: "Household Food Insecurity" *Canadian Community Health Survey, 2007-2008*, Statistics Canada, Chart 4: Percentage of households with food insecurity, by province/territory, Canada, 2007-2008

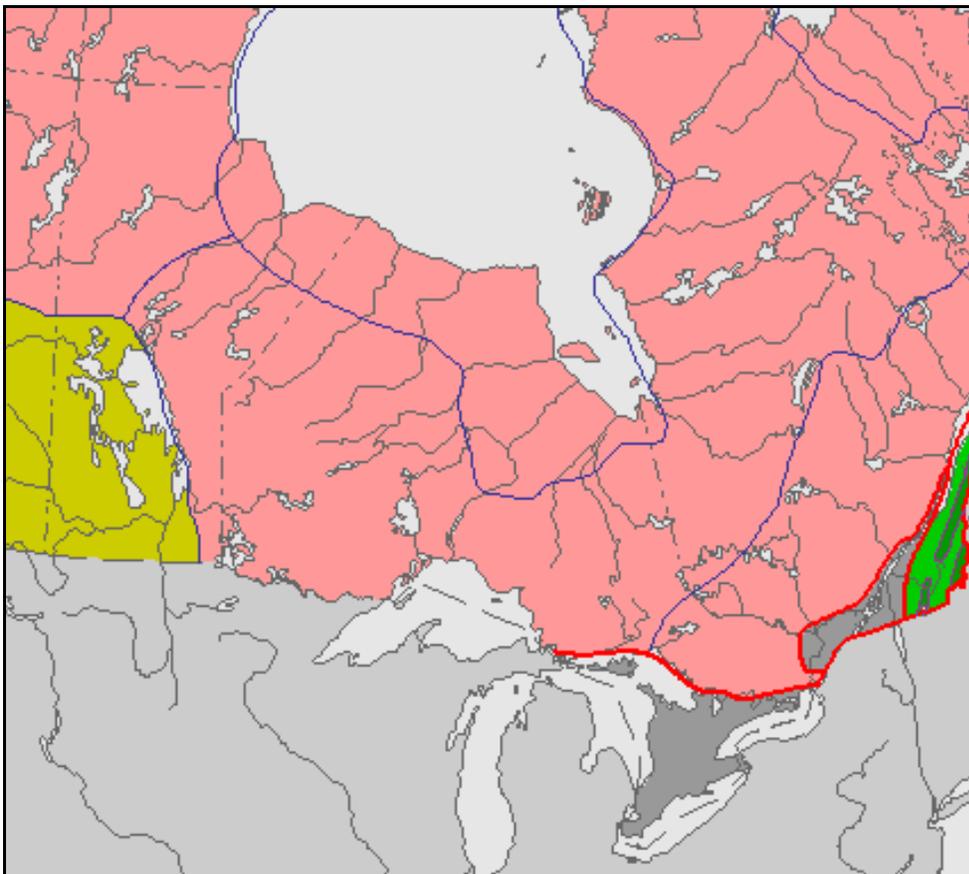
## Part A: Ontario Farming in Context

### A.1 The Farmland Resource and Socio-Economic Background

#### A.1.1 The Resource Endowment

Ontario's agricultural resource is roughly divided between its two major physiographic regions: the southern Great Lakes-St. Lawrence Lowlands (in grey) and the Precambrian Shield (in pink) of northern Ontario (Figure 2).

**Figure 2: Physiographic Regions of Ontario**(source: *Atlas of Canada*, 2010)



The soils of the Great Lakes-St. Lawrence Lowlands are mainly luvisolic and fertile while the northern soils of the Precambrian Shield are mainly spodosols of low fertility. The Lowlands are generally flat to gently rolling, and often show evidence of glaciation in the form of moraines, drumlins, till plains or ancient deltas. These sandy and stony areas are of lower agricultural capability. The Niagara Escarpment, an older geological feature of resistant limestone dissects the western Lowlands, running from Niagara Falls through the Bruce Peninsula. An outlier of the Canadian Shield called the Frontenac Axis crosses the St. Lawrence River east of Kingston and makes a natural boundary between southern and eastern Ontario.

The Lowlands' continental climate is tempered by the Great Lakes and is characterized by warm, often humid, summers and quite cold winters. The annual precipitation varies between 600 to 1000 millimetres and is fairly evenly distributed throughout the year. There are, however, occasional dry spells during the summer. The growing season in southern Ontario varies between 200 and 260 days.<sup>20</sup> Southern Ontario has several important microclimates, for example in the Niagara Peninsula, Prince Edward County, north shore of Lake Erie and the south shore of Georgian Bay. These allow the production of specialities such as tender fruit, grapes, nut bearing trees and apples.

Much of northern Ontario is underlain by the Precambrian Shield whose thin, acidic soils are mainly unfit for farming. There are, however, several important fertile areas in northern Ontario which support a considerable production of livestock, grains and forage crops, vegetables and berries. These are found mainly within the clay belts near Lake Timiskaming and the Thunder Bay-Rainy River areas. The climate of Northern Ontario is markedly continental, with

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<sup>20</sup>*Canadian Oxford World Atlas*, 1998, 4<sup>th</sup> ed. Toronto: Oxford University Press

very cold winters but with warm summers. Varying between 180 and 100 days<sup>21</sup>, the growing season is short compared to southern Ontario.

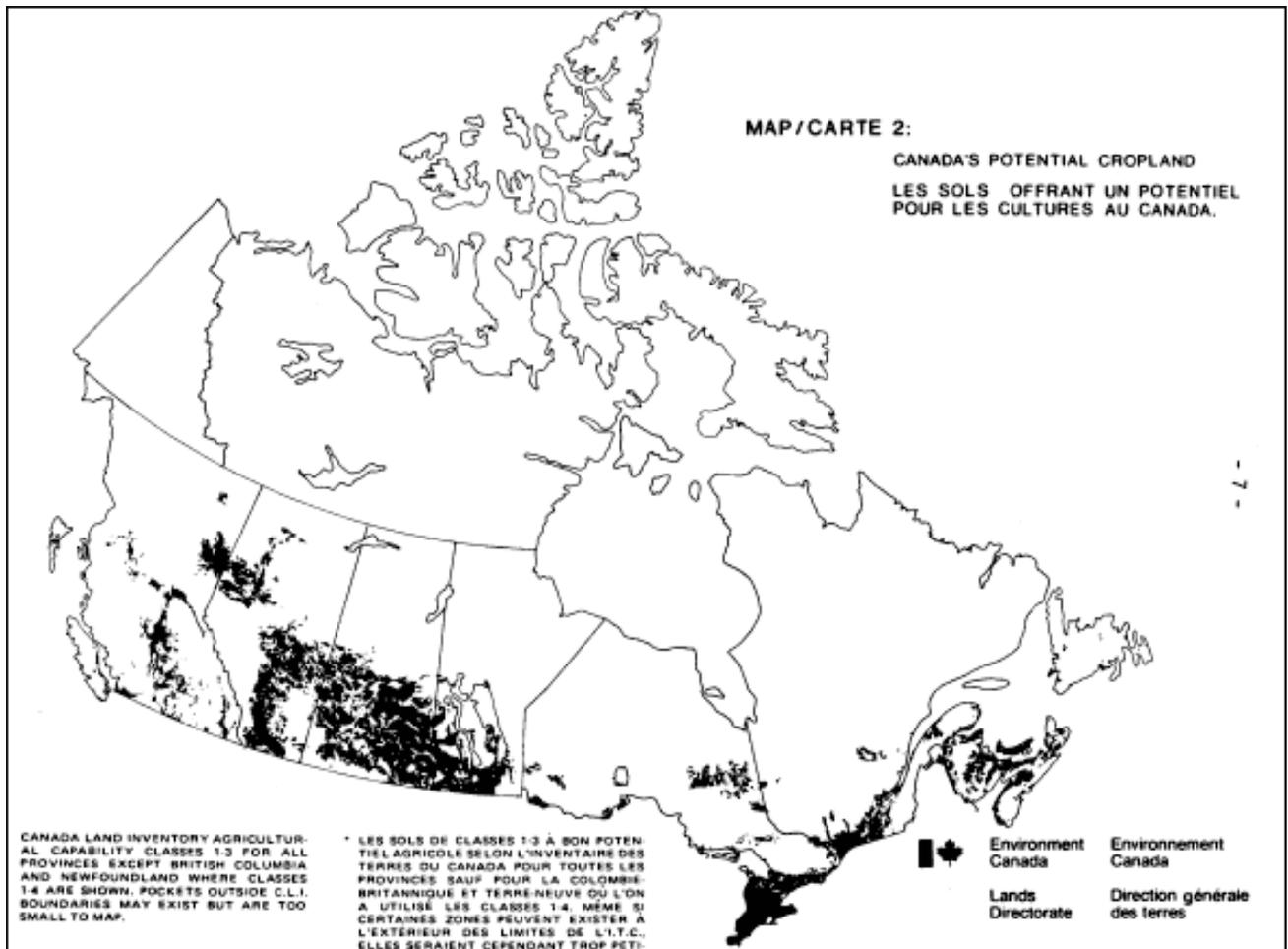
During the 1950s the Canada Land Inventory (CLI) mapped and classified the entire country for its agricultural potential, forest potential and other attributes. According to the CLI, the soils of southern Ontario are mainly Classes 1 to 3, that is, of high capability for agriculture. Except for the scattered zones of agriculture in northern Ontario, the land has no capability for arable agriculture.

The CLI capability for agriculture is a key attribute used in Ontario to designate agricultural zones for municipal Official Plans and Zoning Bylaws. The Ontario Ministry of Agriculture, Food and Rural Affairs (OMAFRA) provides access to detailed and large-scale CLI soilmaps for planning purposes based on the old counties of the province. As well, the federal ministries of Natural Resources Canada and Agriculture and Agri-Food Canada (AAFC) also provide them free in digital form for use in creating maps and geographic information systems from its GeoGratis data files. Figure 3 shows the potential cropland of Canada. Clearly visible are the scattered pockets of northern Ontario's farmland and the homogeneous spread of potential cropland in southern Ontario.

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<sup>21</sup> *ibid.*

**Figure 3: Canada's Potential Cropland** (source: Canada Land Inventory, Natural Resources Canada)



### A.1.2 Agricultural dynamics

While there is a long history of concern about the conservation, stewardship and environmental management of Ontario's soil and water for farming, concern about food self-sufficiency has never been notable. Perhaps this is because there was no long era of subsistent peasant farming in early Ontario. Rather, from the time of its first survey and settlement in the late 18<sup>th</sup> century, agriculture was meant to be commercial and export-oriented. If it occurred at

all, subsistence agriculture was a short-lived phenomenon of the first settlers, to be replaced by cash cropping as soon as possible. As a protected British colony, what became Ontario was an important supplier of wheat and a few other staple products to Great Britain. From 1854 to 1866 reciprocity (free trade) in certain commodities occurred between the United States and Canada. A lively trade in livestock and animal products ensued.<sup>22</sup> Then as now, public policy was formulated to support and encourage farmers and to train and provide extension services to them. Public spending today funds education and research to advance crop and animal science and best farm management practices. Support programs and policies are now in place to optimize commercial production and this has always been for export as much as for local consumption. Commercial production and trade has always been intrinsic to Ontario's agricultural system.

The number of Ontario farm operations, as well as the farm population, peaked well before the mid-twentieth century and both have steadily fallen since then.<sup>23</sup> But this does not mean that the amount of land being farmed has declined significantly. The recent pattern has generally followed other North American regions in decreasing numbers of farms, increasing farm size and the retreat of traditional, smaller family operations in favour of fewer and larger ones.<sup>24</sup>

The legacy of commercial "production agriculture" is deeply entrenched in Ontario. Although small-scale and alternative farming does exist, Ontario farming remains

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<sup>22</sup>See, e.g.: Jones, Robert Leslie, 1946: *History of Agriculture in Ontario 1613-1880* Toronto: University of Toronto Press; McCallum, John, 1980: *Unequal Beginnings: Agriculture and Economic Development in Quebec and Ontario until 1870* Toronto: University of Toronto Press; and McCalla, Douglas, 1993: *Planting the Province: the Economic History of Upper Canada 1784-1870* Toronto: University of Toronto Press

<sup>23</sup> Canada: 2009: *The Financial Picture of Farms in Canada* (analysis based on the 2006 census) Statistics Canada

<sup>24</sup>*ibid.*

overwhelmingly production-oriented, specialized, intensive, industrial and highly capitalized in land, machinery and other inputs. There is a corresponding dependency on the upstream and downstream suppliers of equipment, energy, seed, fertilizer and other chemical inputs. Owing to its high capability soils, temperate climate and a number of favourable microclimates, production is extremely diverse in Ontario, and tends to be highly specialized on any single farm.

Nationally and provincially-mandated marketing boards for many commodities are now in place, some of which play a strong role in pricing, especially in the sectors of milk, eggs and poultry. All agricultural sectors continue to receive direction as well as assistance through federal and provincial policy and programs. Farm organizations and producer organizations are well-represented on marketing boards, as they are on municipal planning committees and quasi-governmental organizations such as Ontario's Conservation Authorities. These quasi-governmental agencies are very important in watershed management within southern Ontario.

### A.1.3 Urban dynamics

Almost immediately after being surveyed and opened for settlement, industrialization and town-building occurred rapidly throughout the farming landscapes in southern Ontario.<sup>25</sup> Urban expansion, industry and accompanying job opportunities continue today, attracting many migrants from other provinces and immigrants from other countries. Because of an almost ubiquitous expanse of good soil, urban development in southern Ontario inevitably occurs at the expense of the surrounding high capability farmland. Generations of rural planners, academics,

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<sup>25</sup> Spelt, Jacob, 1983: *Urban Development in South-Central Ontario* Ottawa: Carleton University Press

non-governmental organizations and concerned citizens have lamented the ongoing conversion and loss of farmland.

In contrast, urbanization is slow within the few and scattered agricultural landscapes of northern Ontario. The clay belts of the Algoma District and in the Thunder Bay-Fort Frances region were opened to agricultural settlement much later than southern Ontario in a region which has never been strongly urbanized. Urban areas in northern Ontario are comparatively small and most experience continual out-migration rather than growth. As a result, conversion of farmland to non-agricultural uses has not been a prominent concern in northern Ontario. Here, the economically volatile sectors of forestry and mining are important activities. Railroad and road networks have always been important to the region's economic well-being, not least for their local employment opportunities.

## A.2 Policy Environments and Regulatory Frameworks

### A.2.1 Federal and International

Like the environment, in Canada agriculture is constitutionally a shared federal/provincial/territorial responsibility. The federal ministry responsible for agriculture and some other rural affairs is Agriculture and Agri-Food Canada (AAFC), which has a very broad mandate. The following is a summary of the minister's responsibilities:

The Minister of Agriculture and Agri-Food is responsible for all matters relating to agriculture. This includes supporting agricultural productivity and trade, stabilizing farm incomes, encouraging research and development, and being responsible for the inspection and regulation of animals and plant-life forms. The Minister has been assigned responsibility for coordinating rural development and enhancing the quality of rural life.<sup>26</sup>

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<sup>26</sup>Canada: 2010: Agriculture and Agri-Food Canada website

AAFC's five-year *Growing Forward* policy framework was formulated in 2008 in collaboration with the provinces and territories. Its programs and policies supersede the *Agricultural Policy Framework* (APF) of 2002. The three general objectives of *Growing Forward* are:

- Focusing on building a competitive and innovative sector
- Ensuring the sector contributes to society's priorities
- Being proactive in managing risks.<sup>27</sup>

*Growing Forward* is explicit in its aim of supporting industry-led marketing strategies to brand Canadian products and improve access to domestic and global markets and to work towards improving market access. Canada is unusual among trading nations in its national system of supply management of milk, poultry, eggs and tobacco. Supply management tightly regulates the volume of production, its sale and the prices of these important products through the provincial allocation of quota whose units must be purchased by producers in a competitive market. This system matches production with actual regional demand. Tariffs protect these supply-managed sectors from foreign competition. Supply management further protects farmers from market volatility through guaranteed markets and prices. It also provides a certain force for regionalization of products and their processing. Farmers in these sectors generally approve of the system, indeed they helped create it. But Canada's supply management is considered to be an unfair trade barrier by the United States and some other trading partners. It is under discussion at the current (but stalled) Doha round of World Trade Organization (WTO) negotiations.

As a trading nation within a global economy, Canada is a member of the WTO.

According to its website:

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<sup>27</sup>*Ibid.*

The World Trade Organization (WTO) is the only global international organization dealing with the rules of trade between nations. At its heart are the WTO agreements, negotiated and signed by the bulk of the world's trading nations and ratified in their parliaments. The goal is to help producers of goods and services, exporters, and importers conduct their business.<sup>28</sup>

The Doha Development Agenda is the name of the current round of negotiations of the WTO. This round began in 2002 but has been stalled since 2008, mainly because of disputes over agricultural trade. Smaller producing countries, in particular, have long levelled criticism against what they believe are unfair trade practices by developed producing countries, notably the European Union, the United States and Japan.

Canada is also signatory to a number of bi-lateral and multi-lateral trading agreements. Chief among them is the North American Free Trade Agreement (NAFTA) between the United States, Canada and Mexico. By definition, trade agreements are designed to open trade between markets rather than promote trade barriers and protectionism. All of these agreements influence trade, markets and conditions of production in Ontario.

Trade agreements and other forms of economic liberalization and integration are characteristic of the process of globalization. Globalization is often said to undermine the sovereignty of any single country in that it curtails its absolute ability to make decisions affecting events within its borders. In other words, it places limits on national sovereignty. Because trade agreements limit the ability of states, society and business to act independently of an international order, a counter-movement to a globalizing food system has arisen in reaction. The “food sovereignty” movement now gains momentum, a concept apparently originated by *La Via*

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<sup>28</sup>World Trade Organization, 2010 website

*Campesina*, an international peasant organization. As recently put by one of its bodies, food sovereignty is:

...the people's democratic control of the food system, the right of all people to healthy, culturally appropriate food produced through ecologically sound and sustainable methods, and their right to define their own food and agriculture systems...<sup>29</sup>

The call for food sovereignty is now heard in many quarters and is thoroughly enmeshed with concepts of social justice, food security, local food systems and self-sufficiency.

The federal ministry Health Canada also has a stake in food-related matters, especially concerning food safety, nutrition and diet. Its most recent version of *Eating Well with Canada's Food Guide* is the culmination of many years of research, trial and revision. This national nutrition policy is comprehensive and culturally neutral, although sensitive to Canada's aboriginal population. Its simplified typology of food categories lends itself to direct comparison with agricultural production and is central to the methodology of this report.

## A.2.2 Provincial

While agriculture is a shared jurisdiction, constitutionally the land resource and municipal affairs are entirely provincial jurisdictions. Ontario alone creates all enabling statutes, regulation and policy concerning municipalities and land use planning within them including the use, sale or conversion of farmland. The province does, however, delegate or decentralize authority to the municipalities to carry out local planning and decision-making and so the provincial and municipal levels are closely connected

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<sup>29</sup>La Via Campesina, 2010: *Statement from the People's Movement Assembly on Food Sovereignty*, July 9 website

Farming itself in Ontario is the domain of the Ontario Ministry of Agriculture, Food and Rural Affairs (OMAFRA), which oversees many provincial programs of support and information, such as for agricultural land use regulation. Current policy places a strong emphasis on food safety issues and is “...committed to ensuring and promoting a healthy, safe, and successful food sector.”<sup>30</sup> The Ontario Ministry of Health and Long-Term Care is concerned with food safety issues as well. Ontario’s Ministry of the Environment (MOE) also has responsibility for some agri-environmental regulations surrounding land use decision-making and farm practices, many of which pertain to human health and safety.

OMAFRA gives tacit support to the idea of self-sufficiency and local food through its *Savour Ontario* program and the *Foodland Ontario* program that preceded it. *Savour Ontario* promotes a wide variety of home-grown products among Ontario consumers, going beyond the mainly fruit and vegetables that were promoted by *Foodland Ontario*. Despite Ontario’s recognition of a growing trade imbalance in food, these programs operate without any overt sense of economic nationalism or protectionism. There are no apparent international or domestic trade barriers in Ontario’s policies. Nor are there any obvious policies directed towards self-sufficiency, food security, food sovereignty or import substitution. Evaluating the promotion of Ontario-grown product through these programs as a form of increasing self-sufficiency is difficult.

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<sup>30</sup>Ontario Ministry of Agriculture, Food and Rural Affairs, 2010 website

### A.2.3 Municipal

Although considerable routine activity and decision-making have been delegated, decentralized or downloaded from the province to Ontario's municipal administrations, their precise rights and responsibilities are entirely regulated by provincial statutes such as the Municipal Act and Planning Act. By the latter, municipalities must create an Official Plan and a Zoning By-Law which identifies, classifies and plans for all land within their borders, including built-up, rural and agricultural zones. Both the Official Plan and the Zoning By-Law are reviewed and amended periodically. Municipal residents and other interests may request exceptions or variances to the Zoning By-Law and decisions on these are made on an ongoing basis. Such decision-making is normally left to the municipal council and its committees, but appeal is possible to the OMB or (rarely) to the courts. Except for planning and programs handled directly by the Ontario Government, it is generally within this municipal sphere of activity and decision-making that farmland protection occurs.

Some municipalities are more pro-active than others in promoting food security, the local food movement or the protection of their farmland from conversion. Some public health units, such as Wellington and Guelph's and Waterloo Region's, have recognized the connection between food security, nutrition and the availability of local food and have launched various initiatives to encourage local producers and consumption of their products. The Toronto Food Policy Council is very influential in keeping the issues of food security and the protection of farmland clearly in public view and on the local political agenda throughout the GTA.

#### A.2.4 The Third Sector

A number of third sector actors, sometimes referred to as civil society, are important at the municipal or local level. The website of OMAFRA provides a list of 305 provincial organizations with an interest in agricultural affairs, food or rural affairs.<sup>31</sup> Agri-businesses and the farm lobby, mainly made up of input manufacturers, processors, farm organizations and commodity groups, are highly influential in the construction of policy and regulation in Ontario concerning food and agriculture. Ontario's three accredited general farm organizations are important stakeholders in local planning processes. These are the Ontario Federation of Agriculture, the Christian Farmers Federation of Ontario and the National Farmers Union. The non-accredited francophone farm organization *l'Union des cultivateurs franco-ontariens* is influential in the east and north of the province. Each of these groups has its own stance on the question of farmland conversion, although all of them are in favour of some sort of regulation to control it.

The Friends of the Greenbelt and the Greater Toronto Area Agricultural Action Committee are other third sector groups aligned with farm organizations which advocate for the retention of farmland and farming in the GTA. Consumer organizations, practitioners and activists within the local food movement and a myriad of other organizations, including the sponsor of this research, the Ontario Farmland Trust, operate within broad networks of influence, action and advocacy to protect farmland in some manner.

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<sup>31</sup>Ontario Ministry of Food, Agriculture and Rural Affairs, 2010: *The List*, website

## A.3 Tracking Change in Ontario's Farmland

### A.3.1 Change in Farmland

Information on the extent and use of farmland throughout Canada is collected by the Census of Agriculture every five years. It is tabulated for different geographical scales, ranging from an entire province, through Census Agricultural Regions (CAR), Census Divisions (CD), to Census Consolidated Subdivisions (CCS). Figure 4 shows the major land uses and their areas of Ontario's farms in 2006.

#### **Figure 4: Land Use on Ontario Farms; 2006**

(sources: based on Statistics Canada Census of Agriculture, 2006; Land Use table and Greenhouse Products table)

Land Use	Number of Farms Reporting	Area in ha	Percent of Total Area
<b>Total Area of Farms</b>	<b>57,211</b>	<b>5,386,453</b>	<b>100.0</b>
Land in Crops (excluding Christmas trees)	50,169	3,660,941	68.0
Summerfallow	1,098	3,711	0.1
Tame or Seeded Pasture	16,482	303,400	5.6
Natural land for Pasture	19,313	450,281	8.4
Greenhouse Vegetables	654	649	0.01
Mushroom growing area	85	32	<0.01
All other land (including Christmas tree area, woodlands and wetlands)	48,342	959,935	17.8

From Figure 4 we see that 68% of Ontario's farmland is in crops, by far the largest land use on farms. Tame or seeded pasture takes in 5.6 % and natural land for pasture composes

8.4%. The amount of land in summerfallow is 0.1%, while the land taken up by greenhouse vegetables and mushrooms is less than 0.1%. Some 17.8 % of Ontario's farmland is taken up by other land uses, including Christmas trees, woodlands and wetlands. The area reported for each land use category does not equal the total land area. The difference is likely accounted for by buildings, non-food crops, greenhouses and other farm infrastructure. If we combine the land use categories of cropland, summerfallow, the two pasture categories, greenhouse vegetables and mushrooms, some 4,419,014 hectares, or 82.0% of Ontario's farmland is devoted to productive uses which potentially enter either the animal or human food chain. Figure 5 summarizes recent change in farmland area in Ontario's CARs and their CDs.

**Figure 5: Change in Ontario Farmland and Census Farms; 2001-2006** (source: after Statistics Canada, 2006 Census of Agriculture, Farm Data and Farm Operator Data, Cat. No. 95-629-XWE)

Region	Farms reporting 2006	Area in hectares 2006	Farms reporting 2001	Area in hectares 2001	5-year change in farms	% change in farms	5-year change in area	% change in area
<b>Ontario</b>	<b>57,211</b>	<b>5,386,453</b>	<b>59,728</b>	<b>5,466,233</b>	<b>-2,517</b>	<b>-4.2%</b>	<b>-79,780</b>	<b>-1.5%</b>
<b>Southern Ontario CAR</b>	<b>18,665</b>	<b>1,592,343</b>	<b>19,631</b>	<b>1,612,725</b>	<b>-966</b>	<b>-4.9%</b>	<b>-20,382</b>	<b>-1.3%</b>
Hamilton CD	975	53,906	1,026	56,202	-51	-5.0%	-2,296	-4.1%
Niagara CD	2,236	93,777	2,266	94,218	-30	-1.3%	-441	-0.5%
Haldimand-Norfolk CD	2,415	203,435	2,602	208,453	-187	-7.2%	-5,018	-2.4%
Brant CD	818	67,727	817	64,221	1	0.1%	3,506	5.5%
Oxford CD	1,990	168,339	2,104	180,270	-114	-5.4%	-11,931	-6.6%
Elgin CD	1,489	159,282	1,608	154,908	-119	-7.4%	4,374	2.8%
Chatham-Kent CD	2,196	224,102	2,352	223,549	-156	-6.6%	553	0.2%
Essex CD	1,740	133,456	1,789	135,214	-49	-2.7%	-1,758	-1.3%
Lambton CD	2,281	238,525	2,427	244,655	-146	-6.0%	-6,130	-2.5%
Middlesex	2,525	249,795	2,640	251,035	-115	-4.4%	-1,240	-0.5%
<b>Western Ontario CAR</b>	<b>18,498</b>	<b>1,627,992</b>	<b>19,191</b>	<b>1,643,423</b>	<b>-693</b>	<b>-3.6%</b>	<b>-15,431</b>	<b>-0.9%</b>

Peel CD	483	38,562	522	42,263	-39	-7.5%	-3,701	-8.8%
Dufferin CD	893	77,136	898	78,170	-5	-0.6%	-1,034	-1.3%
Wellington CD	2,588	196,621	2,616	190,764	-28	-1.1%	5,857	3.1%
Waterloo CD	1,444	91,614	1,444	91,378	0	0.0%	236	0.3%
Halton CD	566	35,976	619	39,966	-53	-8.6%	-3,990	-10.0%
Perth CD	2,438	201,599	2,570	203,527	-132	-5.1%	-1,928	-0.9%
Huron CD	2,738	292,803	2,880	290,996	-142	-4.9%	1,807	0.6%
Bruce CD	2,259	248,135	2,345	247,449	-86	-3.7%	686	0.3%
Grey CD	2,687	229,543	2,834	240,028	-147	-5.2%	-10,485	-4.4%
Simcoe CD	2,402	216,002	2,463	218,882	-61	-2.5%	-2,880	-1.3%
<b>Central Ontario CAR</b>	<b>8,705</b>	<b>778,936</b>	<b>8,938</b>	<b>798,487</b>	<b>-233</b>	<b>-2.6%</b>	<b>-19,551</b>	<b>-2.4%</b>
Hastings CD	1,146	121,886	1,190	123,861	-44	-3.7%	-1,975	-1.6%
Prince Edward CD	520	58,926	535	57,960	-15	-2.8%	966	1.7%
Northumberland CD	1,031	97,594	1,104	102,655	-73	-6.6%	-5,061	-4.9%
Peterborough CD	1,192	100,940	1,202	104,669	-10	-0.8%	-3,729	-3.6%
Kawartha Lakes CD	1,537	144,451	1,516	145,966	21	1.4%	-1,515	-1.0%
Durham CD	1,686	132,212	1,709	133,662	-23	-1.3%	-1,450	-1.1%
York CD	972	67,613	1,020	71,210	-48	-4.7%	-3,597	-5.1%
Muskoka CD	199	15,685	201	14,075	-2	-1.0%	1,610	11.4%
Haliburton CD	84	6,195	69	5,656	15	21.7%	539	9.5%
Parry Sound CD	338	33,434	392	38,773	-54	-13.8%	-5,339	-13.8%
<b>Eastern Ontario CAR</b>	<b>8,864</b>	<b>973,568</b>	<b>9,333</b>	<b>1,002,046</b>	<b>-469</b>	<b>-5.0%</b>	<b>-28,478</b>	<b>-2.8%</b>
Stormont, Dundas and Glengarry CD	1,811	200,153	1,939	200,926	-128	-6.6%	-773	-0.4%
Prescott and Russell CD	1,052	119,980	1,148	120,347	-96	-8.4%	-367	-0.3%
Ottawa CD	1,267	114,674	1,318	120,452	-51	-3.9%	-5,778	-4.8%
Leeds and Grenville CD	1,303	132,753	1,348	136,237	-45	-3.3%	-3,484	-2.6%
Lanark CD	874	94,120	910	97,923	-36	-4.0%	-3,803	-3.9%
Frontenac CD	672	79,775	699	83,180	-27	-3.9%	-3,405	-4.1%
Lennox and Addington CD	617	75,205	629	79,902	-12	-1.9%	-4,697	-5.9%
Renfrew CD	1,268	156,909	1,342	163,079	-74	-5.5%	-6,170	-3.8%
<b>Northern</b>					<b>-156</b>		<b>4,061</b>	<b>1.0%</b>

<b>Ontario CAR</b>	<b>2,479</b>	<b>413,613</b>	<b>2,635</b>	<b>409,552</b>		<b>-5.9%</b>		
Nipissing CD	272	33,891	284	33,658	-12	-4.2%	233	0.7%
Manitoulin CD	258	72,092	284	70,222	-26	-9.2%	1,870	2.7%
Sudbury CD	143	20,558	168	23,728	-25	-14.9%	-3,170	-13.4%
Greater Sudbury CD	160	9,264	159	10,285	1	0.6%	-1,021	-9.9%
Timiskaming CD	471	83,284	532	86,941	-61	-11.5%	-3,657	-4.2%
Cochrane CD	184	30,447	204	31,109	-20	-9.8%	-662	-2.1%
Algoma CD	335	38,775	337	38,091	-2	-0.6%	684	1.8%
Thunder Bay CD	252	25,030	238	24,031	14	5.9%	999	4.2%
Rainy River CD	312	85,642	326	76,113	-14	-4.3%	9,529	12.5%
Kenora CD	92	14,631	103	15,375	-11	-10.7%	-744	-4.8%

In the five years between 2001 and 2006 some 2,517 census farms and 79,780 hectares of farmland dropped out of the census. This was about 1.5% of the province's total farm area. Most of the net decline occurred in the southern part of Ontario. Specifically, the Eastern Ontario CAR declined by 28,478 hectares and 469 farms; the Southern Ontario CAR declined by 20,382 hectares and 966 farms; the Central Ontario CAR declined by 19,551 hectares and 233 farms; and the Western Ontario CAR declined by 15,431 hectares and 693 farms.

Although the pattern in southern Ontario is one of overall decline in the amount of farmland and census farms, a number of CDs within its CARs showed gains in farmland: Brant, Elgin, Chatham-Kent, Wellington, Waterloo, Huron, Bruce, Prince Edward, Muskoka and Haliburton. These increases in farmland, however, were not necessarily due to an increase in number of farms, but rather to the consolidation and growth of existing farms.

A net increase of 4,061 hectares occurred in the Northern Ontario CAR. This was in the CDs of: Rainy River, Manitoulin, Thunder Bay, Algoma and Nipissing. But as in southern

Ontario, farm consolidation is evident in northern Ontario, there being a net decline of 156 farms for the entire CAR.

The changes in farmland revealed in each Ontario CD do not necessarily mean that the land has undergone conversion to other uses, only that it is no longer part of an operating census farm as defined by Statistics Canada. The fate of this land is important to know and understand and is the subject of ongoing analysis at the federal level.<sup>32</sup> Some of the farmland disappearing from the census may be simply idle and reverting to natural growth or removed from farming for conservation or reforestation purposes. In other cases, it may have been sold for other rural land uses or for development. It is difficult to track and record the multitude of sales transactions and land use changes for an entire province and yet this is what would be required to know and understand the dynamics of loss of farmland and its conversion to other uses.

Since 2001, *Ontario's Municipal Performance Measurement Program*, produced annually by the Ministry of Municipal Affairs and Housing (MMAH), has collected data from each municipality on a range of topics, including land use planning. Two of the land use planning topics relating to the protection of agricultural land are: the percentage of new residential units located within settlement areas and the percentage of land designated for agricultural purposes which was not re-designated for other uses during the reporting year. These measures indicate how compact new development tends to be within the province's municipalities. The most recent information available on these two categories is from 2007. In that year 92% of new residential units in Ontario were located within settlement areas in the 249

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<sup>32</sup>Hoffman, Nancy, Giuseppe Filoso and Mike Schofield, 2005: "The Loss of Dependable Agricultural Land in Canada" *Rural and Small Town Canada Analysis Bulletin*, Vol. 6, No. 1 Catalogue no. 21-006-XIE Statistics Canada

municipalities reporting.<sup>33</sup> The smaller, lower-tier municipalities tended to be the ones which did not locate all of their new residential units within their settlement areas. In the same year, for the 187 municipalities reporting, most report that 100% of their land designated for agricultural purposes was not re-designated for other uses. This is a measure of the preservation of land zoned for agricultural uses. One single-tier municipality of less than 10,000 reported that 77 hectares of farmland were re-designated.

Since January 1, 2000, a total of 1,539 hectares of land that were originally designated for agricultural purposes have been re-designated for other purposes. The vast majority of this occurred in southern Ontario within upper-tier regional municipalities.<sup>34</sup> The data thus verify the conventional wisdom that the integrity of the land zoned for agriculture is more at risk of conversion within southern Ontario and within the larger municipalities.

While the information from *Ontario's Municipal Performance Measurement Program* is helpful in understanding the tendency or possibility for land conversion, it is still not an absolute measure of loss of farmland through land conversion. Various investigators have attempted to measure this. Watkins and colleagues, in a 2003 publication of the Centre for Land and Water Stewardship of the University of Guelph, examined the general problem of loss of farmland. They concluded that urban sprawl and farm lot severances were the two most important drivers

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<sup>33</sup> Ontario, (no date): "Location of New Residential Development: Effectiveness: Percentage of new residential units located within settlement areas" *Municipal Performance Measurement Program Summary of 2006 and 2007 Results* Ministry of Municipal Affairs and Housing

<sup>34</sup> Ontario, (no date) "Preservation of Agricultural Land: Effectiveness: Percentage of land designated for agricultural purposes which was not re-designated for other uses during the reporting year" ; "Number of hectares of land originally designated for agricultural purposes which was re-designated for other uses during the reporting year" and "Number of hectares of land originally designated for agricultural purposes which was re-designated for other uses since January 2, 2000" *Municipal Performance Measurement Program Summary of 2006 and 2007 Results* Ministry of Municipal Affairs and Housing website, 2010

of conversion of farmland.<sup>35</sup> There are critics of this group, however. A 2007 policy brief prepared by Labbé and colleagues responded critically to a 2004 study by the same Centre for Land and Water Stewardship, pointing to problems of definition and choice of time periods in statistical reporting of farmland change.<sup>36</sup>

In 2005 Hoffman and colleagues updated a 2001 study by Hoffman,<sup>37</sup> which examined the trends in agricultural and non-agricultural land use across Canada between 1951 and 2001.<sup>38</sup> With an emphasis on the effects of urban development, they analyzed trends in cultivated land, the availability of good farm land and urban land uses. They found that in 2001, 11% of Ontario's Class 1 soils were already occupied by urban land. This compared to about 5% in 1971, an evident loss to urbanization of the best farmland. These authors point out that this measure does not take into account the fact that specialty cropland such as in the Niagara fruit belt can be particularly vulnerable to urbanization. Nor does the simple measurement of loss include the negative influence on farming that may extend far beyond the physical boundaries of urban areas.

### A.3.2 Parameterization

If it could be ensured that the information was continuous, accurate and comparable, the aggregated data from the Census of Agriculture and the *Ontario Municipal Performance*

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<sup>35</sup>Watkins, Melissa, Stewart Hilts and Emily Brockie, 2003: *Protecting Southern Ontario's Farmland: Challenges and Opportunities* Centre for Land and Water Stewardship, University of Guelph, Guelph Ontario, Farmland Preservation Research Project Discussion Paper Series

<sup>36</sup>Labbé, Adèle, B. James Deaton, Alfons Weersink and Glen Fox, 2007: "Examining Farmland Loss in Ontario" *Agricultural Policy Research Networks*, Farm Level Policy Brief

<sup>37</sup> Hofmann, Nancy. (2001) "Urban Consumption of Agricultural Land" *Rural and Small Town Canada Analysis Bulletin* Vol. 3, No. 2 Ottawa: Statistics Canada, Catalogue no. 21-006-XIE)

<sup>38</sup> Hoffman, Nancy, Giuseppe Filoso and Mike Schofield, 2005: "The loss of dependable agricultural land in Canada" *Rural and Small Town Canada Analysis Bulletin* vol. 6, No. 1 Ottawa: Statistics Canada, Catalogue no. 21-006-XIE

*Measurement Program* could be used to track longitudinal changes in land designated for farming, the area of land in different types of production and the area of census farms. There is no guarantee of continuity, however. Even the census definition of “farm” has changed frequently and a universal definition of “farmland” remains elusive. Tracking farmland trends are important for planning purposes and policy-making but they do not, in themselves, answer the basic question posed by this report, which is to estimate how much land is required to feed the population of Ontario. The methodology of this report, then, does not rely on detailed analysis of trends of farmland conversion or re-designation *per se*.

## A.4 Tracking Ontario’s Population Change

### A.4.1 Population Change to 2036

The population of Ontario in 2009 was estimated by Statistics Canada to be 13,069,200. The vast majority of the population lives in cities and towns in the southern part of the province. With more than two million residents alone, Toronto is, by far, the largest city. In 2006 there were 5,113,149 people within its Census Metropolitan Area (CMA).<sup>39</sup> The other Ontario CMAs are: Ottawa (846,802), Hamilton (692,911), London (457,720), Kitchener (451,235) and Windsor (323,342). Each of these CMAs is in southern Ontario and they, along with smaller urban areas, exert development pressure on the surrounding rural land.

While somewhat below the national average growth rate and considerably less than the growth rates in Alberta and British Columbia, Ontario has the largest absolute annual increase in population numbers of any province. This is because of its larger initial population base. While

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<sup>39</sup>City of Toronto, 2010 website

growing continually for many years, it remains difficult to predict Ontario's future population increase with certainty. This is because the basic parameters driving population growth are not themselves constant.

The change in size of any population depends essentially on just two parameters: its rate of natural increase (births minus deaths) and rate of net migration (in-migration minus out-migration). Many things can intervene to influence these two parameters to make prediction of absolute numbers difficult. Based on actual trends and applying different assumptions about fertility, mortality and immigration, Statistics Canada has made projections of the population size from 2009 to 2036 to produce low, medium and high growth rate scenarios.<sup>40</sup> The table in Figure 6 is adapted from the national table to show the projections for the three growth rate scenarios for Canada and Ontario from 2009 to 2036.

**Figure 6: Federal Population Projections to 2036; Three Scenarios**(source: Table 1 Observed (2009) and projected (2036) population according to three scenarios, Canada, provinces and territories, Statistics Canada, 2010

	<b>2009</b>	<b>Three Scenarios for 2036</b>		
		<b>Low-growth</b>	<b>Medium-growth</b>	<b>High-growth</b>
Canada	33,739,900	40,142,400	43,821,700	47,686,000
Ontario	13,069,200	16,135,900	17,746,800	19,440,000

Ontario's Ministry of Finance also makes periodic projections of the province's future population (Figure 7).<sup>41</sup> These projections are available in detail for each census division, including detailed projections of demographic characteristics.

<sup>40</sup>Canada, 2010: "Population projections: Canada, the provinces and territories" *The Daily*, Wednesday, May 26, Statistics Canada website

<sup>41</sup>Ontario, 2010: *Ontario Population Projections Update 2009-2036* Ministry of Finance website

**Figure 7: Ontario Ministry of Finance Population Projections to 2036; Three Scenarios**  
(source: Ontario Ministry of Finance, 2010)

	<b>2009</b>	<b>Three Scenarios to July 1 2036</b>		
		<b>Low Growth</b>	<b>Reference</b>	<b>High Growth</b>
Ontario	13.1 million	15.6 million	17.8 million	20.2 million

Like Statistics Canada, Ontario creates three growth scenarios: low, reference and high. Ontario considers the reference rate to be the most likely scenario. Although Ontario also bases its projections on the census, the results are somewhat different from those of Statistics Canada. Ontario’s methods take into account interprovincial migration, which possibly accounts for the differences. The trends and relative numbers are basically the same, however.<sup>42</sup>This report uses the three federal scenarios derived by Statistics Canada in Figure 6, not the provincial scenarios of Figure 5.

According to Statistics Canada, the population of the entire country is expected to increase in the coming years. It will age rapidly until 2031, after which the rate of aging will slow. The rate of immigration is expected to remain high and the ethnic diversity of Canada will likely continue to increase over the next two decades, especially within certain metropolitan areas such as Toronto. This ethnic diversity will be among both foreign-born and Canadian-born population.<sup>43</sup>Since the immigrant segment of the population tends to be younger than the Canadian-born segment, it will likely contribute proportionally more to the future growth of the population through natural increase because of higher fertility rates.

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<sup>42</sup>Canada, 2010: based on *Table 1 Observed (2009) and projected (2036) population according to three scenarios, Canada, provinces and territories* Statistics Canada

<sup>43</sup>Canada, 2010, “Study: Projections of the diversity of the Canadian population” *The Daily*, Tuesday, March 9, Statistics Canada

For Ontario alone, Statistics Canada expects the province to exceed the national growth rate in all three growth scenarios. Nevertheless, Ontario's rate of growth is projected to slow gradually over the next quarter century. Net migration will account for 68% of the growth, with natural increase accounting for the remaining 32%. Thus we assume the influence of immigration and interprovincial migration to be very strong and both of these will depend heavily on future economic conditions, not just in Ontario, but throughout Canada and beyond.

Figure 8 describes Ontario's and Canada's immigrant population in 2006.

**Figure 8: Ontario's and Canada's Immigrant Population in 2006, with Places of Birth**  
(source: based on: Immigrant population by place of birth, by province and territory, Statistics Canada, 2006 Census of Population. Last modified 2007-12-11)

	<b>Canada</b>	<b>Ontario</b>
<b>Total - Place of birth</b>	<b>6,186,950</b>	<b>3,398,725</b>
United States	250,535	106,405
Central and South America	381,165	216,640
Caribbean and Bermuda	317,765	211,380
Europe	2,278,345	1,307,885
United Kingdom	579,625	321,650
Other Northern and Western Europe	489,540	209,610
Eastern Europe	511,095	304,495
Southern Europe	698,080	472,130
Africa	374,565	164,795
Asia and the Middle East	2,525,160	1,376,595
West Central Asia and the Middle East	370,515	213,980
Eastern Asia	874,370	417,985
Southeast Asia	560,995	270,710
Southern Asia	719,275	473,915
Oceania and other countries	59,410	15,025

Ethnicity is related to immigration and this is a factor in projecting future population size. With over half of Canada's immigrant population, Ontario is very ethnically diverse. The largest source regions for immigrants to Ontario are Asia and the Middle East, followed closely by Europe. Many new immigrants to Ontario tend to concentrate within Toronto and its metropolitan region.

By 2036 the number of seniors is expected to more than double to 23.4% of the population. The Greater Toronto Area is projected to be the fastest growing region and will account for 51% of the provincial total by 2036. The province's other regions are expected to grow more slowly, while rural areas in the east, southwest and northern regions of Ontario will gradually decline in numbers.<sup>44</sup>

The rural farm and non-farm population trends are pertinent to the context of the present work since most agricultural production will continue to occur within rural areas and by rural populations. Figure 9 shows recent trends within Ontario's farm population and non-farm rural population, with definitions.

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<sup>44</sup>Ontario, 2010: *Ontario Population Projections Update 2009-2036* Ministry of Finance

**Figure 9: Ontario Farm Population and Total Population, by Rural and Urban Population; 2001 and 2006**(source: Statistics Canada,2008)

<b>Ontario</b>	<b>2001</b>	<b>2006</b>	<b>% change</b>
<b>Total number of farms</b>	<b>59,728</b>	<b>57,211</b>	<b>-4.2</b>
<b>Total farm population<sup>1</sup></b>	<b>186,410</b>	<b>178,575</b>	<b>-4.2</b>
Rural farm population	181,230	171,410	-5.4
Urban <sup>2</sup> farm population	5,180	7,165	38.3
<b>Total population</b>	<b>11,410,046</b>	<b>12,160,282</b>	<b>6.6</b>
Rural population	1,747,499	1,809,206	3.5
Urban population	9,662,547	10,351,076	7.1
		<b>%</b>	
Farm population as a % of total population	1.6	1.5	...
Rural farm population as a % of total rural population	10.4	9.5	...
Rural population as a % of total population	15.3	14.9	...
<p>1. Refers to all persons who are members of a farm operator's household, living on a farm in a rural or urban area.                  2. Refers to areas with minimum population concentrations of 1,000 and a population density of at least 400 per square kilometre, based on the current census population count. All territory outside urban areas is considered rural. Taken together, urban and rural areas cover all of Canada.  <b>Sources:</b> Statistics Canada, Census of Agriculture and Census of Population.                  Last modified: 2008-11-12.</p>			

We see from Figure 9 that although the rural population of Ontario is increasing, the farm population itself is decreasing in both absolute numbers and as a proportion of the rest of the population. In 2006 1,809,206 people, or 14.9% of the total population, lived in census rural areas. The farm population numbered 178,575, which was 1.5% of the total population or 9.5% of the rural population. Following a long decline as a share of total population, the farm population now forms a small minority even within rural areas. How this decline will affect the province's agricultural production is a matter of conjecture and debate.

#### A.4.2 Parameterization:

The ethnic diversity of Ontario likely exerts a strong cultural influence on dietary choices. This probably contributes to a strong demand for specific imported foods which would have an influence on the balance of trade in food products. It is difficult, however, to either quantify or generalize the influence of ethnicity on agricultural production from existing census data. In any case, except for its probable influence on the balance of trade, cultural preference in food is not important to the methodology used in the present work. The methodology developed below relies on basic commodities and unprocessed food types rather than processed foods or culinary examples. It predicts the amount of farmland that will be needed to feed the residents of Ontario an ideal diet from actual crops grown. To drive a detailed application of this model, reliable information for the following parameters is required and is readily available:

- Population size (and its factors of growth) for three growth scenarios
- Age categories
- Gender

The need for population size is self-evident. The age categories and gender are needed to calculate typical dietary requirements of the population and these vary enormously throughout an individual's lifetime and according to gender.

## Part B: Estimating Ontario's Farmland Needs to 2036

### B.1 Review of Approaches

There are a number of ways to estimate the amount of farmland needed to feed a population. The question itself is not straightforward, rather is freighted with ideological

considerations. We have seen that Barling and colleagues<sup>45</sup> conclude that national policies on food security are aligned with socio-economic value systems. Essentially, these either accept reliance on trade or reliance on self-sufficiency. Nations depending on trade may feel justified in reducing priority of farmland protection but must accept the risks of volatile international commodity markets. For a nation to promote and achieve self-sufficiency, protection of farmland within national borders is an obvious necessity. This requires political will and social acceptance of planning or other instruments which essentially disable a free market in land.

The fundamental dichotomy of values is evident throughout the world today. Food security, as defined by the United Nations, is central to its Millennium Development Goals, yet is not broadly linked with national self-sufficiency. This may be because of the UN's promotion of development through international trade. Food security through self-sufficiency is, however, high on the agenda of many developing countries, especially in Africa, and especially since the international food crisis of 2008. It is no coincidence that the food sovereignty movement is also prominent in the developing world. It is difficult to reconcile this basic dichotomy of economic values. We will simply assert that the protection of farmland is necessary not only to promote self-sufficiency but also to promote food security, in Ontario as elsewhere.

A number of developed trading nations share an interest in increasing their food self-sufficiency. For example, Japan has long had a low rate of food self-sufficiency compared to other developed countries. Using a calorie-based method of calculation, Japan's current rate is 41% while rates for Britain and Italy are between 60% and 70%. In comparison, the United States and France are over 100%, indicating that they are net exporters of food. In 2000 a news agency

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<sup>45</sup>*op. cit.* Barling et al., 1998

reported on Japan's efforts to increase its self-sufficiency rate or percentage of food supplied by national agriculture. The report provides insight into Japan's interpretation of food security that pins it firmly to self-sufficiency:

... a country should endeavour to ensure the minimum necessary supply of food in case of poor harvests at home or abroad caused by such factors as abnormal weather conditions, or in case of an unexpected situation, such as a state of war.<sup>46</sup>

As part of a wider agricultural program, Japan recently announced a new commitment to increase self-sufficiency to 50% over the next ten years.<sup>47</sup> Russia has also recently declared an interest in advancing its agricultural sector and obtaining a higher level of self-sufficiency.<sup>48</sup>

This may be contrasted with the United States Department of Agriculture (USDA). It is greatly concerned with the environmental conservation of farmland through numerous programs and also supports the protection of land from conversion.<sup>49</sup> It also contributes to a number of domestic food aid programs, but the USDA does not explicitly link food security to loss of farmland. The language of self-sufficiency is used in the sense of the personal attributes of individuals or particular communities, not applied to the entire population. Still, American third-sector voices are heard which do reflect a concern with self-sufficiency, by the American Farmland Trust, for example.<sup>50</sup>

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<sup>46</sup> Japan Information Network, 2000: *Food Self-Sufficiency: Government Targets Rate of 45% by Fiscal 2010*, edited by Japan Echo Inc. , June 5

<sup>47</sup> "Addressing food self-sufficiency" (editorial), *The Japan Times Online*, April 19, 2010

<sup>48</sup> Lacombe, Clément, 2010: "La Russie veut assurer son autosuffisance alimentaire, mais à surtout des rêves de grande puissance agricole" *Le Monde*, March 6

<sup>49</sup> e.g. the United States Department of Agriculture, 2010: *Final Benefit-Cost Analysis for the Farmland Ranch Lands Protection Program (FRPP)* Natural Resources Conservation Service, May 19

The distancing of developed economies from the question of national agricultural self-sufficiency is well-illustrated in the evolution of the Common Agricultural Policy (CAP) of the European Union (EU). Following the devastation of the Second World War, the CAP was established by the original Common Market members to protect farmers and maintain food security following the hardships of war and reconstruction. The result was spectacular over-production, massive subsidies, and highly distorted markets,<sup>51</sup> all of which were roundly criticised by other producing countries. The CAP now retreats from its former emphasis on production primarily for food security and self-sufficiency. Instead, fair international trading in food and upholding of consumer choice for its members is promoted.<sup>52</sup>

Following the *World Food Summit* of 1996 Canada outlined policy, programs and action to work towards food security both within the country and internationally.<sup>53</sup> Today, while some regions or population segments are targeted for intervention by different agencies, there appears to be no single comprehensive food policy for all of Canada. The opposition Liberal Party of Canada has responded with a wide-ranging, five-part suggestion for a *National Food Policy*, covering issues on: low-income children's access to healthy foods, support for food security in Africa, buy local initiatives in Canada and expansion of market access abroad for farmers, among others.<sup>54</sup> It has no explicit discussion of self-sufficiency at the national level.

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<sup>51</sup> See e.g. Gardner, Brian, 1996: *European Agriculture: Policies, production and trade* London, UK: Routledge

<sup>52</sup> See e.g. Swinbank, Alan, 2005: "The Evolving CAP, Pressures for Reform, and Implications for Trade Policy" paper prepared for the Australian Agricultural and Resource Economics Society's pre-conference workshop: *Trade Policy Reform and Agriculture: Prospects, Strategies, Implications* Coffs harbor, New South Wales, February, 2005

<sup>53</sup> Canada, 1998: *Canada's Action Plan for Food Security (1998): in response to the World Food Summit Plan for Action* Government of Canada

<sup>54</sup> Liberal Party of Canada, 2010; website

There *is* interest in self-sufficiency at the provincial level, however. For example, Nova Scotia's Office of Health Promotion hopes to increase local food production for the purposes of better and more affordable nutrition,<sup>55</sup> language which is close to the concept of food security. Ontario's *Savour Ontario* and *Foodland Ontario* programs will have the effect of increasing self-sufficiency at the same time as they foster rural development and farm economies.

A few Canadian studies have examined self-sufficiency in food production and estimated the land base necessary to achieve it. Van Bers and Robinson demonstrated in 1993 that Canada could be largely self-sufficient in many food products even under a lower intensity, sustainable system of agriculture (where "sustainable" was equivalent to "organic" production). Their methodology relied on a knowledge of different yields for different intensities of production,<sup>56</sup> something they admitted was difficult to obtain. In 2009, Desjardins and colleagues estimated the quantity of vegetables, fruits, legumes and grains needed to satisfy the nutritional needs of the growing population of Ontario's Waterloo Region to the year 2026 and whether this could be produced through local agriculture.<sup>57</sup> Their methodology used *Canada's Food Guide* in relating production to consumption.

British Columbia (BC) has a limited amount of good agricultural land but protects it from conversion through its provincial Agricultural Land Reserve. It is one province which has

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<sup>55</sup>Nova Scotia, 2005: *Healthy Eating Nova Scotia* The Healthy Eating Action Group of the Nova Scotia Alliance for Healthy Eating and Physical Activity, in partnership with the Office of Health Promotion

<sup>56</sup>Van Bers, Caroline and John B. Robinson, 1993: "Farming in 2031: A Scenario of Sustainable Agriculture in Canada" *Journal of Sustainable Agriculture*, 4(1): 41-64

<sup>57</sup>Desjardins, Ellen, Rod MacRae and Theresa Schumilas, 2009: "Linking future population food requirements for health with local production in Waterloo Region, Canada" *Agriculture and Human Values*, 10 March, DOI 10.1007/s10460-009-9204-y

examined its current and future level of food self-sufficiency, or self-reliance as it is termed in its reports.<sup>58</sup><sup>59</sup> Using actual production and consumption figures from 2001, the BC Ministry of Agriculture and Lands found that 48% of all food consumed in the province was grown there. It also found that BC farmers produce just 56% of the food that *could* feasibly be grown in the province. Further, when comparing actual availability to the amounts recommended by *Canada's Food Guide to Healthy Eating*, BC's food self-reliance dropped to 34%. This is because the province exports production even while importing large amounts of fruit and vegetables. The BC study concluded that to produce a healthy diet for the projected 2025 population, using existing production technology, farmland, which would mainly be irrigated, would have to increase by 49% over 2005 levels. Even to maintain the 2006 level of self-reliance, BC would have to increase production by 30% over 2001 levels.

A 2007 American study by Peters and colleagues<sup>60</sup> uses the US *Food Guide Pyramid*, known crop yields and farmland areas to compare the land requirements in New York State for different diets, depending on the amount of meat and other animal products eaten. This study also calculated the carrying capacity of New York State's farmlands. The work offers a rigorous and feasible approach to predict how much land is required to feed an entire population. Working on the assumption that all food was grown within the state and applying a correction factor to account for waste occurring along the food chain, the study finds that the average annual land requirements in New York State per person ranged from 0.18 hectares for a meatless diet to 0.86

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<sup>58</sup>British Columbia, 2006: *B.C.'s Food Self-Reliance: Can B.C.'s Farmers Feed Our Growing Population?* B.C. Ministry of Agriculture and Lands

<sup>59</sup> Somerton, Pat, 2008: *Food Self-Reliance* Legislative Library of British Columbia

<sup>60</sup>Peters, Christian J., Jennifer L. Wilkins and Gary W. Fick, 2007: "Testing a complete-diet model for estimating the land resource requirements of food consumption and agricultural carrying capacity: The New York State example" *Renewable Agriculture and Food Systems*, 22(2): 145-153

hectares for a diet that included meat. The authors suggest that other jurisdictions within the Great Lakes region could expect a similar outcome. In this case, making the same assumption of self-sufficiency, it is a simple matter to calculate the current and future needs for farmland based on Statistics Canada's projections from Figure 6 and the area of productive farmland calculated in Figure 4 above. These farmland requirements are displayed in Figure 10.

**Figure 10: Ontario's Current and Future Farmland Requirements using Peters *et al.*'s 2007 Estimates (corrected for wastage) and Canada's Population Projections**

Available Productive farmland 4,419,014 ha	Ontario Farmland Required (ha)			
	2009	2036		
Population	13,069,200	Low-growth: 16,135,900	Medium-growth: 17,746,800	High-growth: 19,440,000
Non-meat diet (.18 ha/person)	2,352,456	2,904,462	3,194,424	3,499,200
Diet with meat (.86 ha/person)	11,239,512	13,715,515	15,084,780	16,524,000

From Figures 4 and 5 we know that in 2006 the total area of farms in Ontario was 5,386,453 hectares but the total area of land for producing food or animal feed was just 4,419,014 hectares. Assuming no change in this land base, according to Peters and colleagues' figures, Ontario had more than enough farmland in 2006 to feed the population, *if the entire population had been vegan or vegetarian*. Such a population would require 2,352,456 hectares and a land surplus would obtain for all three of Statistics Canada's growth scenarios to 2036. In contrast, again based on Peters and colleagues estimates, if the entire 2009 population included

meat in its diet the farmland requirements would have fallen short of the available farmland. Such a population required 11,239,512 hectares in 2009. The deficit grows proportionally for the three growth scenarios for 2036. Dietary preferences regarding meat potentially play a large role in estimating future farmland requirements. A model to estimate Ontario's specific farmland requirements is developed in the next section, in part inspired by some of the methods of Peters and colleagues 2007 New York study.

## B.2 Modelling Food Self-Sufficiency using *Canada's Food Guide*

There appear to be two basic approaches to estimating the farmland needs for any given population: from the perspective of production or from the perspective of consumption. This work joins both the production and consumption approaches using common and comparable units of measurement. The methodology developed here is similar to the planning approach known as backcasting. Backcasting begins by postulating an ideal or desired outcome and then considers what must happen or be in place to achieve it. The desired outcome for the purpose of this study is that the entire population be food-secure and that all adhere to federal nutrition guidelines regarding food groups and serving quantities.

In order to achieve this ideal goal we calculate the number of recommended servings of food required to feed Ontario's current and projected populations and then estimate the land required to grow it based on contemporary yields and production figures. The land estimate is based on empirical amounts of food produced on Ontario farms in 2009, converted to the food servings recommended for each food group in the federal nutritional guidelines.

Current Canadian nutrition policy is contained in *Eating Well with Canada's Food Guide* (hereafter *Canada's Food Guide*), which lays out the basic nutritional guidelines for a varied and

healthy diet for males and females of different age categories. It is very similar in concept to the American *Food Guide Pyramid*. Developed after many years of research and experience, the current edition of *Canada's Food Guide* offers a flexible, easy to understand and comprehensive guide for any user, whether vegan, vegetarian or otherwise, and takes into account cultural food preferences. It divides nutrition into four basic food groups and provides the recommended daily number of servings for each. Also given are the serving volumes or weights from each food group for different ages and genders. The food groups and range of daily servings, depending on age and gender, are:

- Vegetables and fruits: 4-10 servings
- Grain Products: 3-8 servings
- Milk and Alternatives: 2-4 servings
- Meat and Alternatives: 1-3 servings<sup>61</sup>

Although not classed as a food group as such, *Canada's Food Guide* includes guidance for fats or oils in the diet (35-45 ml per day per person). When not given in *Canada's Food Guide*, we converted food servings into weight using Pennington's comprehensive and venerable American nutrition guide.<sup>62</sup> Food servings were then calculated for the entire population and compared to the crop and the following production categories estimated and reported for each year by OMAFRA. These are generally reported by weight or volume:

- Horticultural crops: vegetables and fruits, honey and maple syrup
- Field crops: cereals, soybeans, other beans, fodder corn and hay
- Dairy: fluid milk, cream, butter, cheese, cottage cheese and skim milk powder
- Red meat
- Poultry
- Eggs

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<sup>61</sup>*Eating Well with Canada's Food Guide*, 2010, Government of Canada

<sup>62</sup>Pennington, Jean A.T., 1998: *Bowes and Church's Food Values of Portions Commonly Used* 17th edition, Philadelphia: Lippincott-Raven Publishers

The production amounts of aquaculture and other fresh water commercial fisheries in Ontario are available for 2008.<sup>63</sup> The production is not insignificant but has been excluded from this study even though fish is included in *Canada's Food Guide* as an alternative to meat. This is because open water fisheries have little bearing on farmland. A case could be made to include fish “farmed” in some inland aquaculture facilities, but for consistency’s sake, this is also excluded from this study. The Oil and Fats categories of *Canada's Food Guide* and Ontario’s reported production of dairy fats are also set aside for this study because the data are not comparable.

In order to produce a manageable operational model, the following simplifying assumptions have been made in order to relate Ontario’s farmland area and production to self-sufficient consumption:

- Self-sufficiency in food
- A consuming population that is food-secure and adheres to the ideal diets recommended by *Canada's Food Guide*
- Production levels and yields remaining constant to 2036
- The amount of available farmland estimated for 2009 remaining constant to 2036.

Given these assumptions, the following relationship can be established:

*The amount of farmland needed to feed Ontario's population is equal to: total food production, expressed as number of servings, divided by the total number of servings required by the population for each food group according to Canada's Food Guide, divided by the baseline yield of each food group grown.*

This relationship is then applied to the current population estimate and the federal population projections made by Statistics Canada for Ontario from Figure 6. Estimated production weights and areas of land devoted to each crop type are available yearly

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<sup>63</sup>Ministry of Natural Resources (Ontario), 2010: website

from OMAFRA and every five years from the federal Census of Agriculture. OMAFRA's 2009 yearly summaries have been used here. The weights and volumes reported for each crop type were grouped approximately into the same categories as *Canada's Food Guide* food groups and converted to numbers of equivalent servings as recommended in the guide. These figures are given in detail in Appendix 1.

One unknown but very important factor in all these calculations is the amount of food that disappears from the food value chain due to wastage. A discussion of losses due to wastage will be found following the analysis, based on American estimates published in 1997 by Kantor and colleagues<sup>64</sup> and 2010 Canadian estimates by Gooch and colleagues.<sup>65</sup>

The approach developed here sees population change as the major driving factor in predicting the amount of production and hence the area of farmland required to feed the population over time. Census population data are not readily available for the same gender and age cohorts as those used by *Canada's Food Guide*, although the census cohorts are roughly analogous and are used here. The data were aggregated for different age and gender groups to match the census breakdowns as closely as possible.

Because of the simplicity and universality of the food groups used in *Canada's Food Guide* and also in the agricultural production data, there is no particular advantage in breaking down population into ethnic or other demographic categories. Population size, by gender and age, is sufficient. The next section compiles the statistics for the above model from the sources mentioned above.

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<sup>64</sup>Kantor, Linda Scott, Kathryn Lipton, Alden Manchester and Victor Oliveira, 1997: "Estimating and Addressing America's Food Losses" *Food Review* United States Department of Agriculture

<sup>65</sup>Gooch, Martin, Abdel Felfel and Nicole Marenick, 2010: *Food Waste in Canada* report of the Value Chain Management Centre of the George Morris Centre, Guelph, Ontario

### B.3 Joining Ontario's Production to its Requirements

Using the food/land relationship discussed above, the 2009 age and gender cohorts and population growth projections of Statistics Canada were aggregated to match as closely as possible the age and gender groups of *Canada's Food Guide*. By converting all production figures to common units of weight the ideal food requirements of the population now and for

**Figure 11: Ontario Food Production in *Canada's Food Guide Servings*; 2009 and Three Scenarios to 2036**(Summary of Appendices 1 and 2)

Food Group	Millions of Servings				
	2009 Production	Requirements to meet <i>Canada's Food Guide</i>			
		2009	2036 Statistics Canada Growth Scenarios		
			Low	Medium	High
Vegetables and Fruit	17,375	34,339	38,898	42,781	46,863
Cereal Products *	72,160	30,384	34,772	38,244	41,893
Dairy Products (for Milk & Alternatives)	9,281	14,370	18,860	20,742	22,721
Meats & Alternatives**	14,971	9,301	11,198	12,316	13,491
* does not include grain corn or soybeans ** does not include fish					

2036 can be compared. Figure 11 is a summary of Appendices 1 and 2 showing Ontario's 2009 agricultural production by food group, converted and expressed as number of food servings. Also

shown are the number of servings required by the population in 2009 and for the three projected population growth scenarios of Statistics Canada for 2036.

Figure 11 shows that Ontario's 2009 production of Vegetables and Fruits, converted to servings, falls far short of the number of servings recommended by *Canada's Food Guide*. Some 34,339 million servings were required, but only 17,375 million were produced in 2009. The deficit rises proportionally with the three growth scenarios to the year 2036.

Likewise, the production of dairy products (including fluid milk and cheese) currently falls short of the population's ideal requirements for Milk and Alternatives. Some 9,281 million servings were produced in 2009 but the population ideally needed 14,370 million servings. The deficit again increases in proportion to the population for the three growth scenarios.

In contrast, Ontario's 2009 production of grain products, even omitting grain corn and soybeans, was 72,160 million servings, which is more than adequate to satisfy the population's recommended need for 34,384 million servings. The current level of production of grain products would remain more than adequate to provide for the 2036 population in all three growth scenarios.

In regard to the production of Meats and Alternatives, the 2009 production of 14,971 million servings was also considerably more than the province's ideal need for 9,031 million servings. At the present level of production, the surplus of Meat and Alternatives declines proportionally and comes close to the requirements of the population under the highest growth scenario of 13,491 million servings per year.

Figure 11 includes eggs as a meat alternative but omits fish, for the reasons given above. It also omits Ontario's very large production of grain corn and soybeans. These likely contribute to the Cereal Products group (e.g. as corn meal/flour or breakfast cereal for example), to the Milk

and Alternatives group (e.g. as soy beverages), to the Meat and Alternative group (e.g. as tofu, veggie-burgers and other simulated meats), and to Oils and Fats (e.g. as corn/soy oil, margarine) and as sweeteners (e.g. as corn syrup). However, much of Ontario's corn and soybean production is actually destined for animal feed, for industrial non-food products or for methanol and bio-fuel production. How much of Ontario's production of grain corn and soybeans makes it way to the human food chain was not investigated for this study. Clearly, however, there would be ample production to supply a more than adequate number of servings of grain corn and soybeans for any of the future growth scenarios, should they enter the human food chain. Hay, fodder corn and pasture production for animals are not listed in Figure 11. They, along with grain corn and soybeans, do figure in estimating a proxy area of farmland required to produce dairy products, poultry, meat and eggs which appears in later calculations of required future production and current yields (Appendices 3, 4 and 5). The farmland needed to grow the food Ontario ideally needs is given in Figure 12.

**Figure 12: Farmland Requirements to Feed Ontario according to *Canada's Food Guide*; 2009 and Three Scenarios to 2036(excluding wastage)(from Appendix 4 and 5)**

Food Group	Farmland Required (thousand ha)								
	2009 Baseline			2036 Growth Scenarios					
	Area of farmland in use	Land needed for an ideal diet in 2009	Land deficit or surplus	Low growth land need	Land deficit or surplus	Medium growth land need	Land deficit or surplus	High growth land need	Land deficit or surplus
Vegetables & Fruit	60.1	106.5	-46.3	120.6	-60.5	132.6	-72.5	145.3	-85.2
Cereal Products*	595.0	253.2	+341.8	289.8	+305.2	318.7	+276.3	349.1	+245.9
Dairy Products, Meat & Alternatives**	3,609.8	3,410.4	+199.4	5,072.2	-1,462.5	5,578.6	-1,968.8	6,110.8	-2501.1
<b>Totals ***</b>	<b>4,264.9</b>	<b>3,770.1</b>	<b>494.8</b>	<b>5,482.6</b>	<b>-1,217.7</b>	<b>6,029.9</b>	<b>-1,765.0</b>	<b>6,605.2</b>	<b>-2,340.4</b>
*omits grain corn and soy beans **these animal-based food groups are joined to enable proxy land need estimates to be made from the land devoted to feed crops (grain corn, soybeans), hay and pasture *** may show variation due to rounding									

Figure 12 is fully expanded in Appendix 5. From it, we may state that 0.29 hectares of farmland per capita were required to feed Ontario's 2009 population of 13,210,700. This lies between Peters and colleagues 2007 estimates of 0.18 and 0.86 hectares per person for New York State for diets without and with meat, respectively (see Figure 10). The plant-based categories of Vegetables and Fruits along with Cereal Products are derived directly from OMAFRA's 2009 production estimates and reported land areas under production. The category of Dairy Products represents the Milk and Alternatives food group from *Canada's Food Guide*. It and the other animal-based food group of Meat and Alternatives have been aggregated in order

to derive a proxy land requirement value based on the amount and producing areas of grain corn, soybeans, hay and pasture in the province.

In 2009, at 595.0 thousand hectares, there was more than enough land devoted to Cereal Products in 2009 to feed the province; there being a land surplus of 341.8 thousand hectares, even though grain corn and soybeans were excluded from the group. In that year, however, there was not enough production of Vegetables and Fruit to meet the recommendations of *Canada's Food Guide*. For this group there was a land deficit of 46.3 thousand hectares that would be required to meet the nutrition guidelines.

Vegetables and Fruits and Cereal Products can be directly related to the land areas in production. Although production data exist for Dairy Products and numbers of animals are recorded, it is not easy to convert live animal numbers to edible portions although an attempt is made in Appendix 3. Neither the Dairy Products nor the Meat and Alternatives groups can be directly related to their land base, there being no such data available. Therefore these two animal-based categories were joined in order to produce a proxy area of land based on the reported amount of farmland devoted to feed crops, including grain corn and soybeans, hay and pasture. Together, these two groups show a land surplus of 199.4 thousand hectares in 2009.

Figure 12 shows not only the 2009 baseline figures but also figures for each of the three population growth scenarios to 2036. These demonstrate an increasing total land deficit for each scenario, from 1,217.8 thousand hectares in the low growth scenario to a high of 2,340.4 thousand hectares in the high growth scenario. The pattern of deficit remains the same for each food group and in the high growth scenario only the land required for Cereal Products remains in surplus in 2036.

## B.4 Accounting for Wastage

Thus far the estimates for farmland requirements do not take into account the wastage that occurs between the field and the fork, i.e. the food value chain. It has been reported to be very high in Great Britain<sup>66</sup>In a 1997 report for the *Food Review*, an organ of the USDA, Kantor and colleagues provide estimates of food losses in the United States:<sup>67</sup>

...about 96 billion pounds of food, or 27 percent of the 356 billion pounds of the edible food available for human consumption in the United States, were lost to human use at these three marketing stages in 1995 [i.e. food retailer, consumers and food service establishments, and plate waste in households and food service establishments]. Fresh fruits and vegetables, fluid milk, grain products, and sweeteners (mostly sugar and high-fructose corn syrup) accounted for two-thirds of these losses.

Kantor and colleagues do not include losses elsewhere in the food chain, such as in processing, loss through insects or pests or food left in the fields. If they had, the loss would have been considerably larger than the 27% reported in the three marketing stages they report. A recent work by journalist Jonathan Bloom puts the rate of wastage at close to half of production in the United States.<sup>68</sup>

In Canada, a journalist for *Maclean's* magazine has recently revealed major food wastage in this country.<sup>69</sup> A 2010 work from the George Morris Centre, an independent agricultural think-tank in Guelph, Ontario reports up to 40% loss of food in Canada throughout the food chain

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<sup>66</sup>e.g Chung, Andrew, 2008: "How We Waste Food" *Toronto Star* May 25 online reporting on a 2008 study on food waste in Great Britain by the Waste and Resources Action Programme

<sup>67</sup>Kantor, Linda Scott, Kathryn Lipton, Alden Manchester and Victor Oliveira, 1997: "Estimating and Addressing America's Food Losses" *Food Review* January-April, pp. 2-12

<sup>68</sup>Bloom, Jonathan, 2010: *American Wasteland: How America Throws Away Nearly Half of its Food* Cambridge MA: Da Capo Press

<sup>69</sup>Macdonald, Nancy, 2009: "What a waste" Toronto: *Maclean's* magazine online service, November 9 <http://www2.macleans.ca/2009/11/09/what-a-waste/>

(Figure 13), the largest loss occurring in the home by consumers.<sup>70</sup> It may be assumed that Ontario is representative of the country.

**Figure 13: Percentage of Food Waste in Canada, from Field to Home**  
(source: Gooch, 2010, p. 5)

Field	9%
Transportation/Distribution	3%
Food Service/Hotel/Restaurant/Institutional Food Outlets	8%
Packaging/Processing	18%
Retail Stores	11%
Home	<u>51%</u>
	100%

Some food waste is potentially recoverable for animal feed, fertilizer or other industrial purpose, and even for human consumption through e.g. food banks. As well, detailed breakdowns of waste within the different food groups of Ontario production are not known with any certainty. Therefore it is difficult, even unrealistic, to give a simple correction factor for wastage for Ontario's production. If Gooch's figure of 40% is correct, then a huge, but unknown, area of Ontario farmland and production is essentially wasted as well. The question of waste was addressed for New York State by Peters and colleagues' 2007 study, which probably accounts for the large discrepancy between the land estimates of this work and those in Figure 10 where we apply their ratios to Ontario. The question of wastage in terms of actual farmland in Ontario must be addressed in further work.

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<sup>70</sup> Gooch, Martin, Abdel Felfel and Nicole Marenick, 2010: *Food Waste in Canada Value Chain Management* Centre(of the) George Morris Centre, Guelph, ON

## PartC: Conclusions

The information contained in Figure 12 and associated Appendices answers the basic question posed by this study: how much farmland is required for Ontario to feed itself now and in 2036. To feed the 2009 population a diet that adheres to *Canada's Food Guide* required 3,770.1 thousand hectares. With 4,264.9 thousand actual hectares in production during the baseline year of 2009, Ontario had enough total farmland to provide such a diet to every resident, with a surplus of 494.8 thousand hectares.

The future is less secure, however. Holding the amount of land, yields and production types constant, in all three population growth scenarios predicted by Statistics Canada, there is an increasing deficit in farmland available to theoretically feed the province. In other words, the self-sufficiency of 2009 will be lost by 2036. This deficit ranges from 1,217.7 hectares, in the low growth scenario, through 1,765.0 hectares in the medium growth scenario to 2,340.3 hectares in the high growth scenario predicted by Statistics Canada.

The projections calculated for this report assume no change in the farmland base, in yields, or in production types over time and this is plainly unlikely in reality. The farmland base itself is clearly declining (Figure 5) as farms cease production. However, increases in yields or changes in production types could well occur. Any increase in yields will be a matter of further crop research, increased efficiency and intensification of production. Changes in production type could occur in response will to market signals and personal choice of farmers themselves.

The work here also assumes that the population adheres to the ideal diet outlined in *Canada's Food Guide*, which may also be an elusive ideal. Recent trends towards better nutrition are seen, according to Statistics Canada and Health Canada, but ample room for improvement

remains<sup>71</sup>. We note that Canada's nutrition data do not differentiate between domestic and imported food products.

Finally, wastage of food throughout the food chain has not been included in the estimates. Much more work would have to be done to derive correction factors related to each food group, not the least of which would be to disentangle imported food and domestic food once they are together in the food chain. This would be a large undertaking.

What can be counted on with certainty is ongoing population growth and this is the parameter that does vary in this study. Ontario has the largest population of any province and it is growing from immigration from other countries, in-migration from other provinces and natural increase. These growth factors are closely related to economic factors such as job markets and national immigration policy.

The work here indicates that, although Ontario could have been potentially self-sufficient in 2009, the province is nearing its capacity for potential self-sufficiency and may already have surpassed it. A comparison of the 4,264.9 thousand food-related hectares in production in 2009 revealed in this report and the 4,410.0 thousand hectares in food-related production in 2006 (see discussion following Figure 4) signals a decline in the farmland base of 145.1 thousand hectares over three years. While the surplus of land for Cereal Products is large, the deficits in Vegetables and Fruits and Dairy Products are particularly notable. More work will be necessary to track long-term trends in production for the province.

The implications of these findings are several. The relationship between Ontario's growing trade imbalance and these findings is interesting to ponder, especially in regards to fruit

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<sup>71</sup>Canada, 2004: *Canada's Nutrition and Health Atlas* Health Canada website

and vegetables (see Figure 1 and associated discussion). Whether the production and land deficits reported here are a cause or an effect of this trade imbalance, or represent simply dietary choice and response to market signals, is an interesting question. We will remember that milk, eggs and poultry production is strictly regulated to match demand in Ontario. More work will have to be done to discover the relationship between dietary choices and production.

The relationship between self-sufficiency and food security remains a matter for debate. This work makes a direct connection between them and asserts that, for any single jurisdiction, reliance on trade to meet domestic supply cannot be relied upon indefinitely. This work demonstrates that the self-sufficiency ratio of Ontario is declining and suggests that the risk for food insecurity in Ontario is growing. Coupled with ongoing population growth and the declining farmland base reported in Figure 5, the deficits reported here can be expected to increase into the future unless significant intervention in the agricultural sectors and associated land base occurs to change the trends. Addressing the relationship between food security and self-reliance would require a frank and open exploration not only of the ideological underpinnings of the world's food trading system, but a large number of policy domains both within the province and beyond. This also is an area where more work should be done. It is to be hoped that the questions of food security and self-sufficiency are prominent in the ongoing construction of a National Food Policy and that they both are linked to domestic production and the protection of its farmland base.

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## Appendices

Appendix 1: Ontario Crop Production, by *Canada's Food Guide* Group; 2008-2009

Appendix 2: Ontario's Food Serving Needs, by *Canada's Food Guide*; 2009 and Three Scenarios for 2036

Appendix 3: Production Yields, by *Canada's Food Guide* Groups; 2009

Appendix 4: Ontario's Serving Needs by *Canada's Food Guide* Food Group in tonnes; 2009 and 2036

Appendix 5: Linking Ontario's Production with its Needs and Land Requirements, by *Canada's Food Guide* Groups and Servings; 2009 and 2036