



**Innovations in Farm Families and Rural Communities:  
Capacity Development for Broadband Use in Southern  
Ontario**

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## Preface

This paper has emerged from a set of discussions among Ontario researchers convened by Ontario's Ministry of Government Services, Office of the Corporate Chief Strategist, Information and Information Technology Strategy, Policy and Planning Branch and its preliminary meeting, *Toward a Broadband Research Agenda for Ontario, Academic Workshop: Urban, Rural and Remote Contexts* held on December 8, 2006 at the University of Toronto.

The Ministry called for papers focus thematically on a strategic area of broadband research. The working papers are to provide a *state-of-the-art* look at the Ontario context and consider best practices/directions in other jurisdictions, including the implications for the role of government, the private sector, the community, and academia in supporting the utilization of broadband for social and economic development. These studies will identify key topic areas and questions for further collaborative research activities as well as inform government policy development. These areas are a) creating and supporting a "culture of use" for social and economic benefits of broadband; b) ensuring quality of life and managing social change in rural environments through broadband access, and c) exploring new opportunities for e-business, especially for farm families and rural communities. The working papers will be available on the website of the Knowledge Management Development Institute, University of Toronto in order to facilitate further discussion and development of research questions within the community of knowledge and practice.

This paper focuses on rural connectivity in southern Ontario and is prepared by researchers in rural extension studies, agricultural innovation systems and planning at the School of Environmental Design and Rural Development (SEDRD) at the University of Guelph. All errors and omissions and opinions expressed in this paper are the responsibility of the authors.

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## Executive Summary

*Ontario's future prosperity depends largely on its ability to continue to adapt, innovate and strengthen its competitive advantage.*

### 2006 Ontario Economic Outlook and Fiscal Review

The promise of high-speed participation in Canada's knowledge economy has not been achieved in rural Canada. Studies conducted by Statistics Canada (1999-2004) found that the nation's rural areas tend to have a far lower internet use due to factors such as an older population with lower educational attainment and lower household income (Singh, 2004; Statistics Canada, 2001). This is however, a national overview and its generalization is weak when placed within the specific context of southern Ontario, where in many areas educational attainment and household income are far from the lowest in Canada. Ontario's diverse and changing farms and rural communities are becoming increasingly aware of the importance of information and knowledge in the new 'bioeconomy'.

This paper discusses the context of broadband in rural southern Ontario. The *capacity to innovate* is used in this study as a way to understand rural connectivity through broadband access and use as a set of technical and institutional capacities. Specifically, analysis focuses on a) managing stakeholder divides, b) fostering participation and interactive learning, and c) enabling the environment for innovation (infrastructure and policy).

The highly populated belt of southern Ontario is a region of tremendous social and environmental change as well as economic importance and ecological value to the Province. Technological, organizational and institutional capacities exist to support innovations that create economic, social, political and environmental benefits from

broadband use. The study finds examples of broadband being used to support award-winning agricultural innovation, new organizational partnerships (especially between public and not-for-profit private sectors) and new rural producer networks and virtual spaces for participation in policymaking and planning.

Further examples identified in this study suggest that user-involved supply provision and demand-driven service broadband provision have occurred, often with federal, provincial and municipal governments acting as catalysts, and not just funding and regulatory agencies in the system. However, this study also notes the persistence of the “rural digital divide” in southern Ontario that disadvantages many inhabitants living outside the urban shadow or being left on ‘islands’ which lack connectivity. For many farm families and rural communities in southern Ontario there is only an initial taste of the benefits of broadband for economic, social and environmentally-sound development. Further study is needed of to assess the household impact of these current and prospective trends.

Recommendations arising from this study include:

In the 2007 budget announcement indicating \$10 million in support of rural broadband, the Province of Ontario has taken a clear stand to build technological, organizational and institutional capacities for rural broadband. As the findings presented in this study suggest, there are a number of existing organizations and innovations occurring that the public sector (federal and provincial and sometimes in tandem) have incubated. The following recommendations are proposed to help move forward.

**Recommendation 1:** The Province direct its investment into strategic partnerships involving public and private (for profit and not-for-profit) sector agencies that strengthen the technological, organizational and institutional capacities that develop agricultural and rural innovation and contribute to socio-economic and environmentally sound development.

**Recommendation 2:** In southern Ontario, areas of moderate to high population density and low broadband coverage combined with either a) prevalence of small and medium sized family farms, or b) higher percentage of home-based workers with potential for teleworking and tele-cottage industries should be considered “hot spots” for investment in broadband infrastructure and capacity development.

**Recommendation 3:** Successful agricultural and rural innovators confirm that innovation is not a one-time phenomenon; it is an ongoing process. Farm and non-farm businesses using broadband services and applications need back-up. Not only is knowledge management about accessing the worldwide web, it is also about joining the Web and this requires businesses to gain an additional set of management skills that are not addressed sufficiently in current programming offered by public and not-for-profit agencies.

**Recommendation 4:** Broadband is a shared resource, and as such, communities require opportunities to participate and interact in its development and eventually, in its monitoring. This involves outreach to rural communities and to both farm and non-farm users of broadband. Efforts by private sector in this direction should be encouraged further by the public sector. Awareness creation, effective communication and representation by the local level will contribute to further technological, organizational and institutional innovations.

Overall, the results and recommendations presented in this paper argue for renewed effort by all partners for broadband access in rural southern Ontario which offers opportunities for innovation among agricultural and rural communities.

## Acronyms

|        |   |
|--------|---|
| AAC    | Agricultural Adaptation Council                         |
| MGS    | Ministry of Government Services                         |
| AAFC   | Agriculture and Agri-Food Canada                        |
| ROMA   | Rural Ontario Municipal Association                     |
| TORC   | The Ontario Rural Council                               |
| AKIS   | Agricultural Knowledge and Information Systems          |
| BB     | Broadband   |
| CD     | Capacity Development                                    |
| CFBMC  | Canadian Farm Business Management Council               |
| DSL    | Digital Subscriber Line                                 |
| FFRL   | Foundation for Rural Living                             |
| GIS    | Geographic Information Systems                          |
| ICTs   | Information and Communication Technologies              |
| ISDN   | Integrated Services Digital Network                     |
| ISPs   | Internet Service Providers                              |
| ITU    | International Telecommunication Union                   |
| MBDCs  | Municipal Business Development Corporations             |
| NIS    | National Systems of Innovation                          |
| NRCs   | National Research Councils                              |
| OECD   | Organization for Economic Co-operation and Development  |
| OMAFRA | Ontario Ministry of Agriculture, Food and Rural Affairs |
| R&D    | Research and Development                                |
| RKIS   | Rural Knowledge and Information Systems                 |
| SoI    | Systems of Innovation                                   |
| STI    | Science, Technology and Innovation                      |
| TORC   | The Ontario Rural Council                               |
| ToT    | Transfer to Technology                                  |
| VoIP   | Voice over Internet Protocol                            |
| WiFi   | <b>W</b> ireless <b>f</b> idelity                       |
| WLAN   | Wireless Local Area Networks                            |
| WLL    | Wireless Local Loops                                    |



## Introduction

The 'knowledge society' of the 21<sup>st</sup> century features new information and communication technologies (ICTs) changing the lives of individuals, the livelihoods of communities and indeed, the wellbeing of entire nations (Castells, 1997). In Canada, few communities have been left untouched by the information revolution. Some however, have been characterized by their lack of connectivity, ending up on the wrong side of what is often referred to as the 'digital divide'. In particular, rural Canada, even in its more densely populated areas such as southern Ontario, faces distinct challenges in being part of the wider knowledge society (Singh, 2004).

The underlying argument for bridging the rural digital divide in Ontario is that rural people and institutions could make effective use of the world's information and knowledge resources if they had the means to access them. Rural communities also hold a wealth of knowledge. Improved knowledge management, it is argued, underlies a process of capacity development and innovation with potential economic, social and environmental benefits for all people and institutions in Ontario (Pant and Hambly, 2006).

With an aim to develop a better understanding of the rural digital divide in southern Ontario this paper starts with a clarification of the key definitions of and thresholds used to determine 'rural' and 'broadband'. Subsequently, the paper turns to the conceptual approach used here to consider broadband not simply as a factor for production but as the 'capacity to innovate'. Drawing from the literature on new institutional economics and rural development literature, the two approaches of Systems of Innovation (SoI) and Capacity Development (CD), taken in this paper implies that broadband rural capacity can be built locally among individuals and organizations and simultaneously scaled up to develop strong systems of equitable and environmentally sustainable socio-economic development.

Two research questions are addressed. First, what are the key capacities to develop for innovation among agricultural families and rural communities in southern Ontario through broadband use? Second, what are the partnerships necessary to support rural broadband capacity and innovation in order to ensure quality of life through new economic opportunities and social wellbeing? Within the specific context of southern Ontario, it is important to grapple with the current shifts occurring in rural demography and broadband coverage and assess their implications for the future ‘capacity to innovate’.

The final section of the paper returns to the policy implications of the rural digital divide in southern Ontario. Policy recommendations that address investment in infrastructure, representation and participation in processes of developing this rural connectivity and financial resources to expand existing connectivity and its use are presented.

## **Defining ‘Rural’ and ‘Broadband’ in southern Ontario**

Analysis of rural broadband in southern Ontario requires definitions of the two terms ‘rural’ and ‘broadband’ because of variation within the definitions used by key agencies and specialists in the field.

Current definitions of ‘rural’ are based on geographic distribution of population size and density. Statistics Canada’s commonly used definition of rural communities includes small towns, villages and other populated areas with a population of less than 1,000 and a population density less than 400 per square kilometer according to the current census.

Geographically, rural areas include fringes of census metropolitan areas and census agglomerations that may contain estate lots, as well as agricultural, undeveloped and non-developable lands. Urban, on the other hand, comprises areas with a population of at least 1,000 and no fewer than 400 persons per square kilometer.<sup>1</sup> For the purpose of comparisons among Organization for Economic Development (OECD) member countries which includes Canada, OECD uses a threshold of population density of 150 people per square kilometer or less to define 'rural' (OECD, 1994). Evidently, the OECD definition allocates much sparser population to rural areas as compared to the rural population defined by the Statistics Canada.

The Ontario Ministry of Agriculture, Food and Rural Affairs (OMAFRA) operates with a definition that considers rural southern Ontario to be outside any of the following cities of Hamilton, Ottawa, London, Windsor, the Greater Toronto Area and the Regions of Niagara and Waterloo. Within these seven urban areas, municipalities with populations of less than 100,000 are also considered rural.<sup>2</sup>

The second definition of importance to this study is to specify what is meant by broadband. The term broadband derives from bandwidth, which in radio communication is defined as the range of frequencies occupied by a modulated (frequency or amplitude) carrier wave. It implies that a broadband includes a wide of range of frequencies while a narrowband includes a narrow range of frequencies (Hz or Hertz per second). Unlike analog systems, the term bandwidth in digital systems has a metaphorical significance as the latter is concerned with the rate of digital data transfer (bps or bits per second).

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<sup>1</sup> See: [http://geodepot.statcan.ca/Diss2006/Reference/COGG/Index\\_e.jsp](http://geodepot.statcan.ca/Diss2006/Reference/COGG/Index_e.jsp)

<sup>2</sup> See: [http://www.reddi.gov.on.ca/insight\\_ruralontarioprofiles.htm](http://www.reddi.gov.on.ca/insight_ruralontarioprofiles.htm)

Conventionally, the focus of broadband is high-speed Internet, but there are huge discrepancies in a threshold that defines it. The International Telecommunication Union defines broadband as a transmission capacity that is faster than primary rate Integrated Services Digital Network (ISDN) at 1.5 or 2.0 Megabits per second (Mbits).<sup>3</sup>

In the southern Ontario context, the definition of broadband is a moving target because its technology (e.g., DSL, Cable Modem, fiber optics, WLAN, WiFi, etc.) evolves rapidly. Often the term is used innocuously referring neither to a certain speed or a specific service. Following Vargo Daggett (2007), broadband is used in this paper to refer to a set of services that provides sufficient capacity to enable today's applications, such as telephony or VoIP (Voice over Internet Protocol) or P2P (person to person) video networking, as well as encourage the development of new uses of ICTs.

In reality, ICT applications must be considered in terms of their allocation efficiency, which is the ratio of goodput of an application (time taken to upload or download data of a particular size) to the allocated throughput (speed availed by the service provider). The former is less than the latter due to rollbacks and time spent waiting for the network. 'Dial up' service which is available through much of rural southern Ontario provides some access to the Internet, but the allocation efficiency is often low. In information flow models, this phenomenon is called 'noise' which ultimately disrupts or distorts the information flow. The allocation efficiency is important to consider in the context of rural

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<sup>3</sup> See: [www.itu.int/osg/spu/publications/birthofbroadband/faq-en.html](http://www.itu.int/osg/spu/publications/birthofbroadband/faq-en.html)

southern Ontario as the remoteness and often rugged topography further aggravates the noise phenomenon.

The two terms, 'rural' and 'broadband' are combined in this paper in order to speak to the service and applications of high-speed Internet in rural southern Ontario. Before outlining its current and potential infrastructure and use, it is necessary to explain the conceptual basis for positioning broadband as an essential component of innovation and socio-economic development in rural southern Ontario.

## **Systems of Innovation and Capacity Development**

Two bodies of literature with contributions from both theorists and practitioners frame this study. The first and more theoretical work is referred to as the Systems of Innovation (SoI), widely used to guide innovation policy in OECD countries and derived from the wider field of the national systems innovation in manufacturing (Edquist, 1997; Edquist & Hommen, 1999; Lundvall, 1992; Lundvall, Johnston, Andersen, & Dalum, 2002; Pavitt, 1999). The second field of literature relevant to the study is driven mainly by practitioners and researchers of capacity development who have moved beyond notions of training individuals to building learning organizations and systemic change in institutions (Morgan, 1998; Horton, 2000; OECD, 1997). These two areas of literature have recently been combined to examine capacity for innovation (CIDA, 2000; Clark, Yoganand, & Hall, 2002; Hall, 2005; Morgan, 1998; Velho, 2004). Much of this scholarship has been applied in international contexts, although recent efforts by federal agencies in Canada have used elements from the SoI literature (AAFC, 2007) and the CD frameworks (Health Canada, 2003). Recently, the two bodies of literature pave the theoretical foundation of the argument that broadband can be a source of innovation and competitiveness not just a factor for production that implies an additional operational expense for farm families and rural communities (Firth & Mellor, 2005).

### ***Systems of innovation in rural development and agriculture***

Systems thinking in rural development and agriculture challenges the status quo of the functionalist approach often referred to as the Transfer of Technology (ToT) paradigm. This linear process whereby research was the only knowledge producer, extension the only knowledge disseminator, and farmers the ultimate and passive recipients of the information being disseminated has been set aside. Many theorists now perceive technical change to be a simultaneous and recursive process rather than sequential leading to blurred lines between functions of research (basic versus applied) and R&D structures (public versus private sector actors) (Wolf and Zilberman, 2001).

Technologies too have changed. The frontier technologies are ever more intangible, such as digital information and communication networks, biotechnology and nanotechnology. The ToT paradigm as outlined in the classic text “Diffusion of Innovation” by Rogers (2003) viewed technology as transferable to targeted clients, positing adoption or rejection of technology as an individual decision.<sup>4</sup> Yet, social research has documented well that individuals’ adoption decision is influenced by a number of factors- the nature of a technology, perception towards the technology, and influence from organizational and institutional factors at large (refs). An individual seldom moves through the overly simplistic and linear adoption process independent of the wider organizational, institutional, political and other related environments.

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<sup>4</sup> The (linear) stages of adoption process were characterized by awareness, interest, evaluation, trial and adoption. Clients were labeled as innovator, early adopter, early majority adopter, late majority adopter and laggards (Rogers, 2003).

One attempt to conceptualize knowledge generation and transfer mechanisms in rural development and agriculture from a systems perspective is referred to as Agricultural Knowledge and Information Systems (AKIS). This approach notes the difference between knowledge and information, and recognizes pluralistic knowledge creation, exchange and use (Röling, 1990). Information consists of a pattern imposed on data which simultaneously affects the interpretation of those data and enables them to be transmitted while knowledge consists of a meaningful experience. When one puts information in a theoretical and operational context, it becomes knowledge. Knowledge can not be transmitted to others unless encoded or transformed. Knowledge created in one component of the system is transformed into information for use in the other component of the system. The AKIS is a set of agricultural organizations and/or persons, and the links and interactions between them, engaged in such processes as the generation, transformation, transmission, storage, retrieval, integration, diffusion and utilization of knowledge and information, with the purpose of working synergistically to support decision making, problem solving and innovation in a given country's agriculture or a domain thereof (Röling, 1990:1).

There are apparent challenges to managing the divides between multiple stakeholders, especially as systems thinking moves into the cross-sectoral and multi-occupational nature of rural livelihoods. Although the AKIS approach emphasizes interactive learning and innovations in agricultural production, market integration is relatively low (FAO, 2000; Rivera, 2004). In other words, the for-profit private sector is overlooked in this framework and institutional innovation for improved public-private partnerships becomes essential to technical innovation in rural development and agriculture.

The challenges to manage divides between stakeholders remain an all-time challenge for rural and agricultural development especially as agriculture has become an industry with cross-sectoral concerns in health, environment and energy (Agricultural Institute of Canada, 2006). Promoting innovations in rural areas requires coordinated support to foster innovation partnerships along agricultural value chains, involving research,

extension and education to create enabling environments for development. To this end, the System of Innovation is defined as,

“...a network of organizations, enterprises, and individuals focused on bringing new products, new processes and new forms of organization into social and economic use, together with the institutions and policies that affect their behavior and performance.” (World Bank, 2006: 2)

The SoI concept requires the analysis of multi-stakeholder collaboration for innovations in rural development and agriculture. It includes a strong focus on stakeholder relationships featuring, but not necessarily limited to, an emphasis on public-private partnerships (Biggs, 1990; Uphoff & Krishna, 2004; Wolf & Zilberman, 2001; World Bank, 2006). While seeking to overcome the limitations of the ToT and AKIS approaches (see Table 1), SoI provides a useful conceptual basis for examining the potential broadband holds for rural capacity development and innovation.

**Table 1. Defining Features of the ToT, AKIS and SoI Approaches to Rural Development and Agriculture**

| Defining feature | ToT   | AKIS   | SoI  |
|------------------|---|--|--|
| Purpose          | Strengthening the technology delivery   | Strengthening communication and knowledge delivery service to people in the rural sector   | Strengthening the capacity to innovate throughout the rural sector including but not limited to the agricultural production and marketing system and connecting across sectors (health, environment, energy, etc.) |
| Actors           | Government agricultural research organizations, universities or faculties of agriculture, extension services, and farmers | Government research organizations, universities or faculties of agriculture, extension services, farmers, NGOs, and entrepreneurs in rural areas | Potentially all actors in the public and private sectors involved in the creation, diffusion, adaptation and use of all types and sources of knowledge relevant to rural areas                                     |
| Outcome          | Technology invention and technology transfer  | Technology adoption and innovation in agricultural production and rural development  | Combinations of technical and institutional innovations throughout the production, marketing, policy research and enterprise domains   |
| Organizing       | Using science to  | Accessing agricultural   | New uses of (old and/or new)   |



| Defining feature         | ToT   | AKIS  | SoI   |
|--------------------------|---|---|---|
| principle                | create inventions                             | knowledge   | knowledge for social, economic and environmental change   |
| Mechanism for innovation | Technology transfer                           | Interactive learning  | Interactive learning; stakeholder relationships; public-private partnerships  |
| Market integration       | Very low                                      | Low   | High  |
| Role of policy           | Resource allocation, priority setting         | Enabling framework  | Integrated component/actor and enabling framework   |
| Capacity development     | Infrastructure and human resource development | Strengthening communication between stakeholders in rural areas | Strengthening interactions between actors; institutional development and change to support interaction, learning and innovation; creating an enabling environment |

Source: Authors; World Bank (2006)

### ***Capacity development***

Building capacity in rural areas of Canada and the world increases the human and social capital necessary for the sustainable development of these regions. Historically, capacity building is associated with the practice of agricultural extension and education where the focus was initially on individual and group training by ‘experts’ (the ToT paradigm) and subsequently, participatory, learner-oriented teaching (AKIS). The focus however was oriented towards individual clients and not the structural barriers that limit the existence of and use of one’s capacity. The term Capacity Development (CD) is therefore used to refer to,

...the organizational and technical abilities, relationships and values that enable countries, organizations, groups and individuals at any level of society to carry out functions and achieve their development objectives over time” (Morgan, 1998)

In the CD concept, change is seen as a given and indeed, a necessity for overcoming barriers to development implicating all forms of capital – human, social, economic, political and ecological (Morgan, 1998). Often capacity building programs were believed to have failed due to resource constraints. CD considers resource constraints as influencing the direction of capacity building, and they may in fact, be useful in overcoming barriers and implementing innovative actions. In this respect, capacity

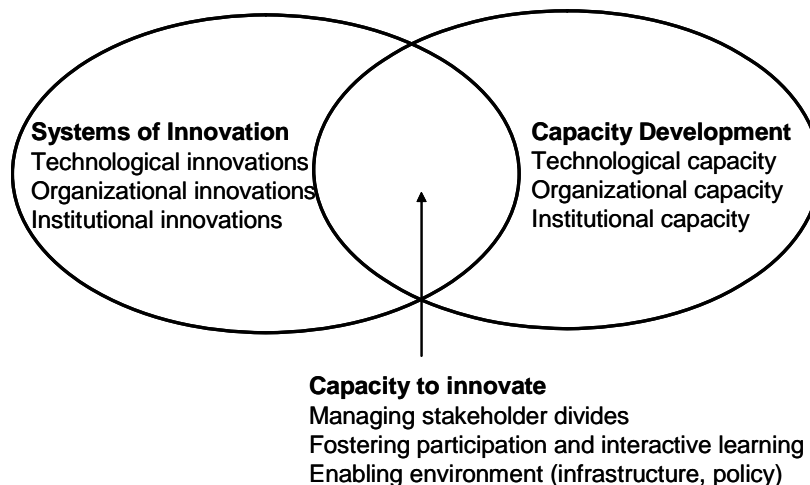
development can take several forms from building technical competency, changing attitudes (as well as knowledge and skills), redesigning policies and programs and facilitating communication, teamwork, motivation and leadership. Interventions occur at individual, organizational, inter-organizational or network, and overall systems levels, including the enabling environment (infrastructure and policy).

### **Capacity to Innovate**

SoI paradigm advocates capacity development as strengthening interactions between stakeholders; institutional development and change to support interaction, learning and innovation; and creating an enabling environment through the provision of infrastructure and policy. This entails,

... [the development of] a context specific range of skills, actors, practices, routines, institutions and policies needed to put knowledge into productive use in response to an evolving set [of] challenges, opportunities and technical and institutional contexts. (Hall, 2005)

As Figure 2 illustrates, in effect, CD and SoI intersect so that divides between key stakeholders can be identified and managed, processes of participation and interactive learning can be built for and through the innovation process, and the enabling environment of policy and infrastructure is prioritized. This approach to understanding rural connectivity through broadband access and use views capacity for technological, organizational and institutional innovations, not solely the technological innovation of broadband infrastructure.



## **Figure 1. Capacity to Innovate**

### **Research Questions and Methodology**

This paper set out to examine the current situation of the rural digital divide in southern Ontario. This study set out to explore two questions:

1. What are the key capacities that need to be developed in order to identify and support innovation among farm families and rural communities in southern Ontario through broadband use?
2. What partnerships for rural broadband capacity and innovation exist and how can they develop further to ensure quality of life through new economic opportunities and social well-being?

The research process was undertaken over a six week period and involved review of international and national literature on rural broadband and innovation among farm families and rural communities. Secondary data on rural broadband and infrastructure was compiled. Semi-structured interviews were conducted with 14 key informants from across different stakeholder groups (public, private – for-profit and non-profit). Existing award-winning cases of on process and productive innovation among farmers were reviewed. Further cases of municipal and community level broadband and telecom initiatives dating back to the early 1990s were examined. A meeting convened on March

22, 2007 by The Ontario Rural Council (TORC) in Ingersoll on rural broadband provided additional input from group discussions.

## **Rural Southern Ontario**

In southern Ontario, the need for innovation and capacity development in agriculture and rural development is widely cited among civil society, academics and policy statements such as “Growing Strong Rural Communities – Ontario’s Rural Plan (2004-2007)”.<sup>5</sup> Rural southern Ontario is in the process of unprecedented change for a number of reasons, many of which are propelled by demographic shifts and a socio-economic balancing act between sub-urban expansion and rural development that involve a renegotiation within the rural landscape in terms of farm and non-farm households and land use (Milburn, 2007). Broadband coverage in rural southern Ontario is increasing but in an island type formation. A summary of these key changes is presented here and illustrated with maps. Data are provided in the Appendices.

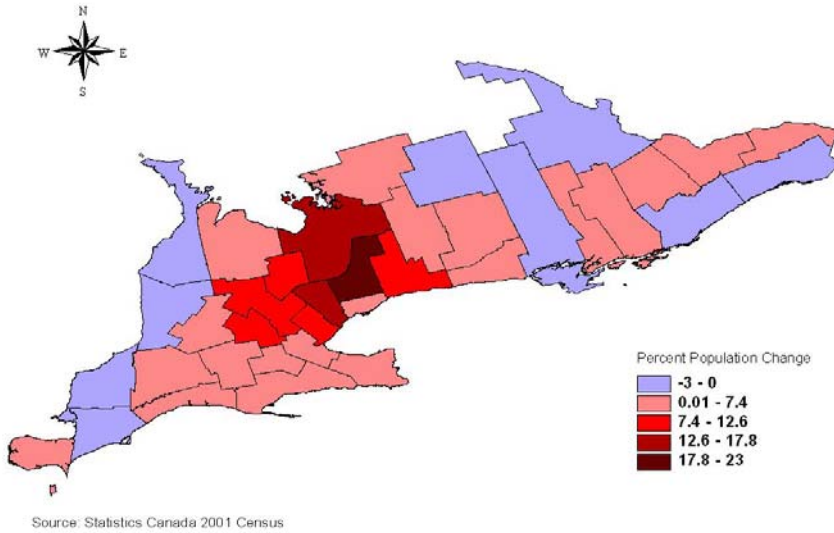
### ***Population and Age Shifts in Rural Southern Ontario***

Ontario forecasts that its population will increase by 12 percent between 2006 and 2016 and 30 percent between 2006 and 2031 (Ontario Ministry of Finance, 2007). Figure 2 and Appendix 1 present the 1996-2001 population increase and identifies the present key growth areas.

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<sup>5</sup> See for instance reports listed in the reference section of this paper from the Agricultural Adaptation Council (AAC), the Centre for Rural Leadership, Sparling (2006) and OMAFRA’s annually updated Rural Plan (2007).

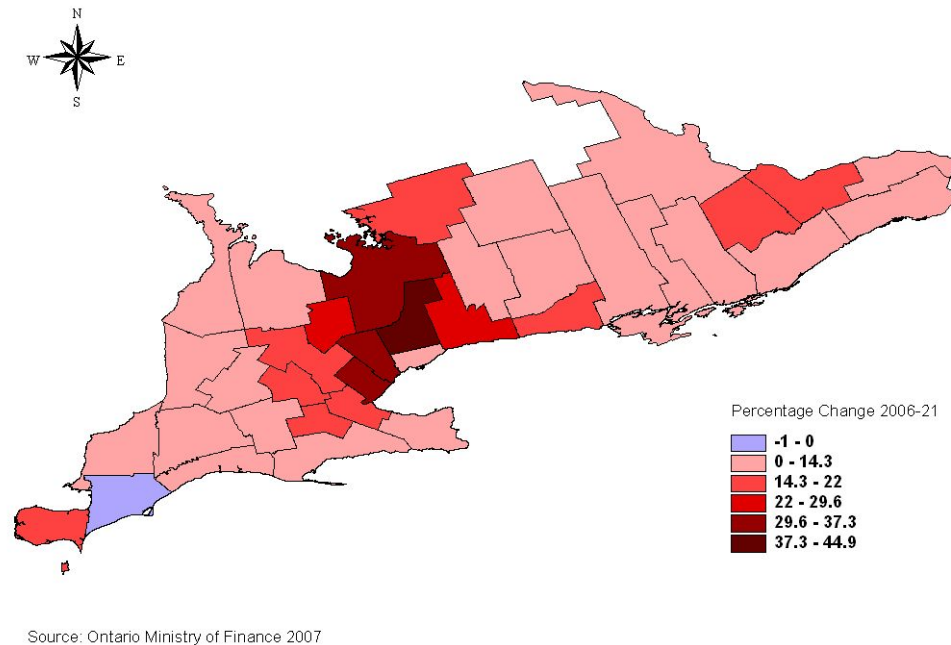
## Percentage Population Change 1996-2001



**Figure 2: Percentage Population Change 1996-2001**

The spatial dimension of projected population growth between 2006 and 2021 is illustrated in Figure 3 and Appendix 2.

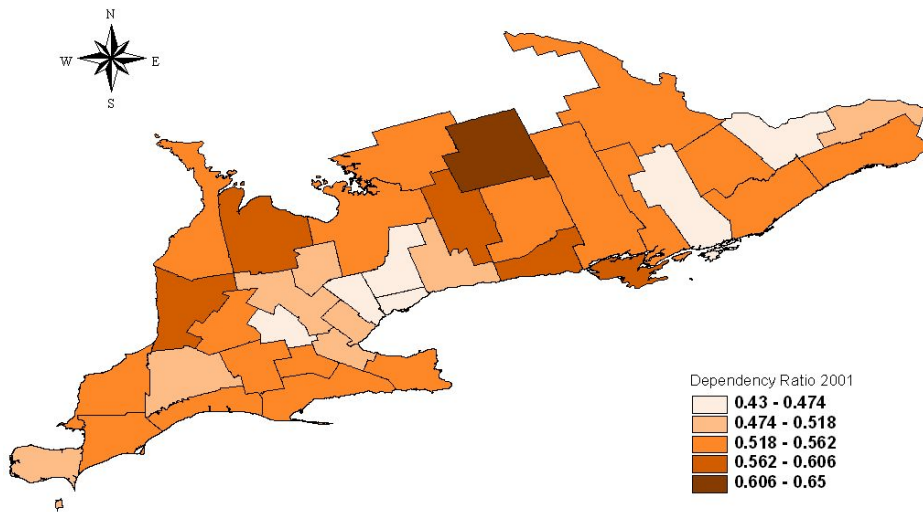
## Forecast Population Change 2006 - 2021



### Figure 3: Forecast Population Change 2006-2021

Although the rural population in southern Ontario will increase, the number of small and medium sized farms will decrease in the rural landscape. Within rural communities, the age structure will also shift. A map (Figure 4) of the Dependency Ratio (defined as the number of persons younger than 15 and older than 65 divided by the number of persons 15 to 64) is an indicator of the economically active proportion of the total population. The higher Dependency Ratios which characterize many of the rural areas reflect both their aging population and the out-migration of young people as a result of limited employment opportunities.

### Dependency Ratio 2001



Source: Statistics Canada 2001 Census

### Figure 4: Dependency Ratio 2001

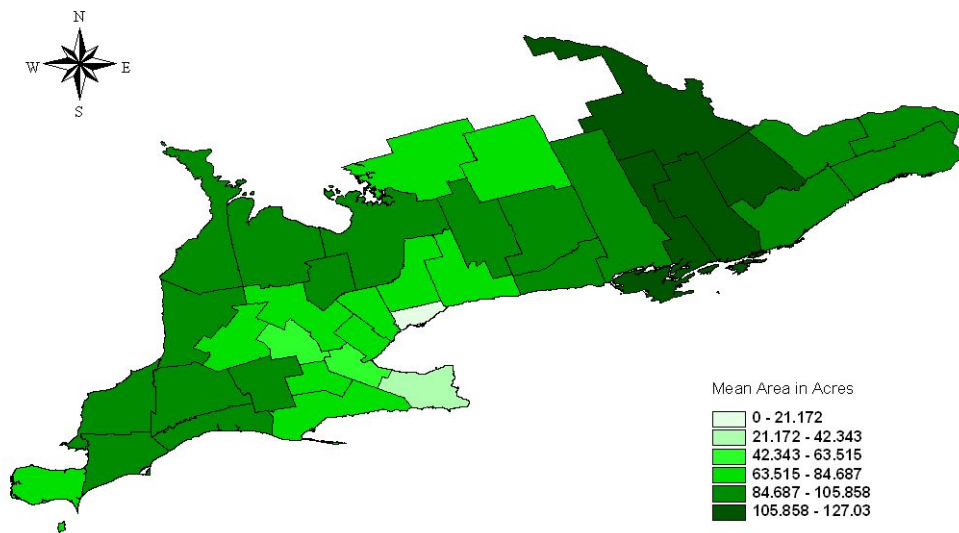
#### ***Ontario Farms and the Agri-Food Sector***

Ontario has the largest agricultural and food processing sector in Canada accounting for sales of \$30 billion (OMAFRA, 2007). The agri-food industry, including farmers, processors, wholesalers and retailers provided 727,000 jobs in Ontario in 2005. This

translates into 11 per cent of Ontario’s employment. In 2005, the value of Ontario agriculture and food exports topped \$8.55 billion.

Southern Ontario farms are mainly small and medium sized. The spatial variation in average farm size (Figure 5 and Appendix 3) reflects both peri-urban well as soil quality and other agro-ecological influences. The agricultural sector is dealing with the emergence of larger processing and retail (super-store) companies. As Ontario agriculture and food policy analyst, David Sparling argues, “large farms are investing and growing, small farms aren’t” (Sparling, 2006:5). Strategies to revitalize family farms tend to emphasize the new ‘bioeconomy’ which foresees more effective and efficient crop and livestock production that offers the market a wide range of food variety, high-value exports or high-value products including natural health foods, bioproducts and fuels. The goal is the success of farms in Ontario, not simply survival (ibid).

### Mean Farm Area (Acres) 2001



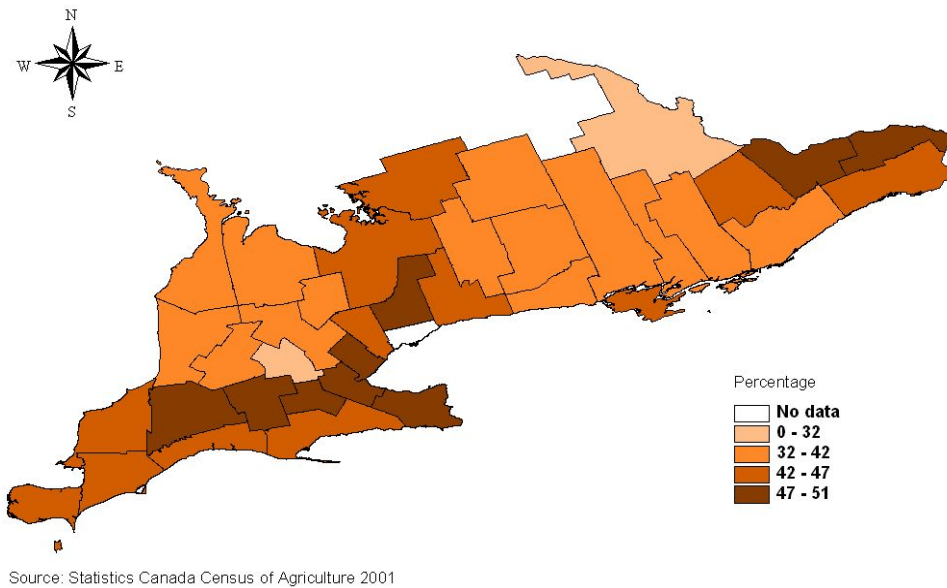
Source: Statistics Canada Census of Agriculture 2001

**Figure 5: Mean Farm Area (Acres) 2001**

Communication, information and knowledge management are central to growing the bioeconomy argued one key informant in the study. Product development and product

distribution require vast knowledge of outside competitors as well as the needs of consumers. Information is also necessary to support product branding, attending to property rights and launching new campaigns such as “buy local, buy fresh” that appeal to urban consumers’ ethics for sustainable rural communities. Figures 6, 7 and 8 and Appendix 3 compile data available from the 2001 Census on farm use of computers, email and internet, respectively. These maps provide an important baseline for the expansion of rural broadband and it is expected that 2006 Census data will soon provide an updated image of the use of ICTs by Ontario farmers.

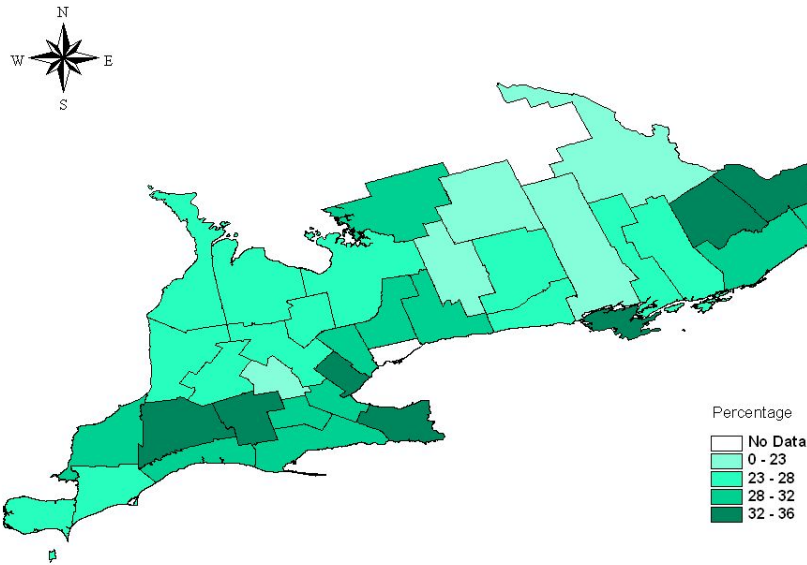
### Percentage of Farms with Computers 2001



**Figure 6: Percentage of Farms with Computers 2001**



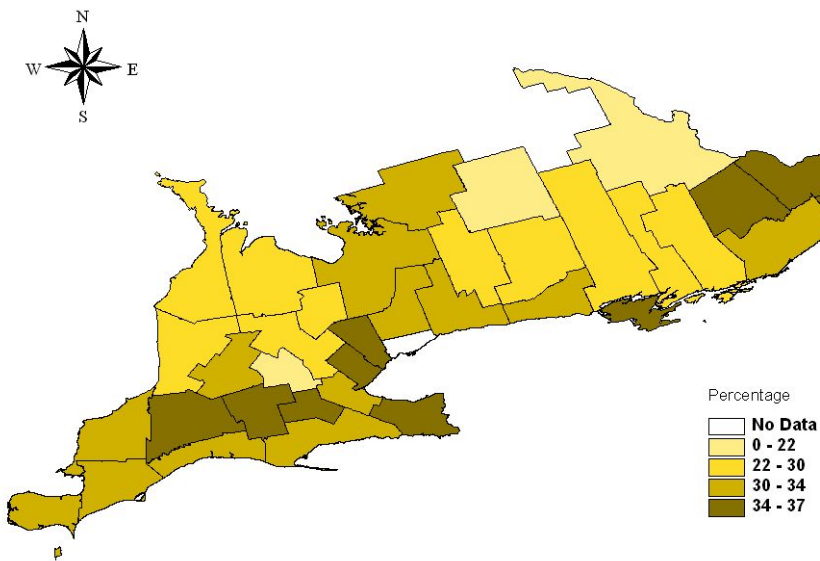
## Percentage Farms with E-Mail 2001



Source: Statistics Canada Census of Agriculture 2001

**Figure 7: Percentage of Farms with Email 2001**

## Percentage of Farms with Internet 2001



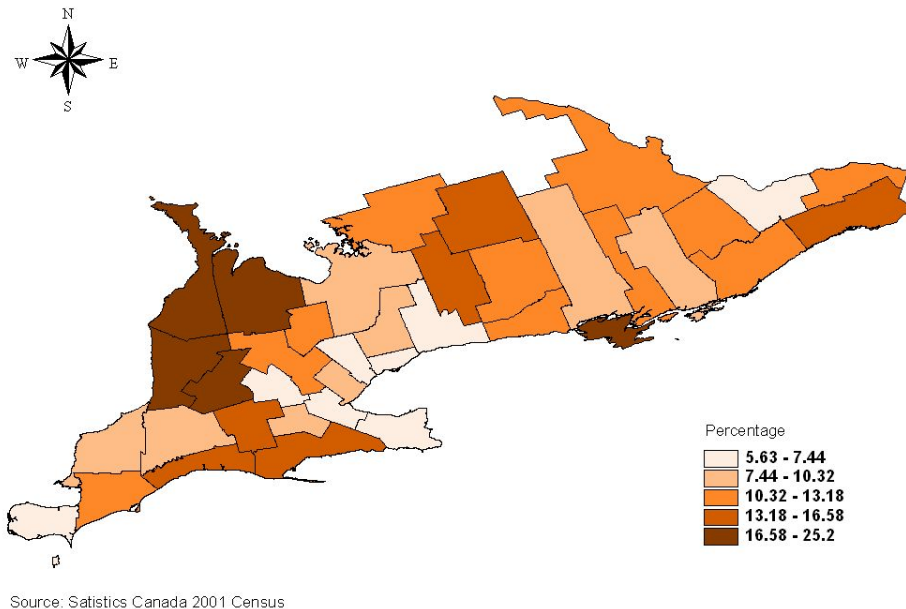
Source: Statistics Canada Census of Agriculture 2001

**Figure 8: Percentage of Farms with Internet 2001**

### ***Non-Farm Rural Employment and Education***

Data on the place of work for rural southern Ontario residents suggests that some rural municipalities, more than others, would benefit from improved opportunities to work from home either in the form of teleworking or self-employment in what has been referred to as networked or ‘telecottage’ industries (Telework Association, 2007). Figure 9 and Appendix 4 summarize the percentage of persons employed in remunerated, home-based work. Noteworthy are the group of census divisions encompassing Huron, Bruce and Grey Counties which exhibit a high rate of persons working at home. These areas would fit well with the notion of the telecottages. The census divisions bordering GTA and Ottawa (mid-orange) are more typical of the teleworking areas of rural southern Ontario.

#### **Percentage Persons Working at Home 2001**



**Figure 9: Percentage of Persons Working at Home 2001**

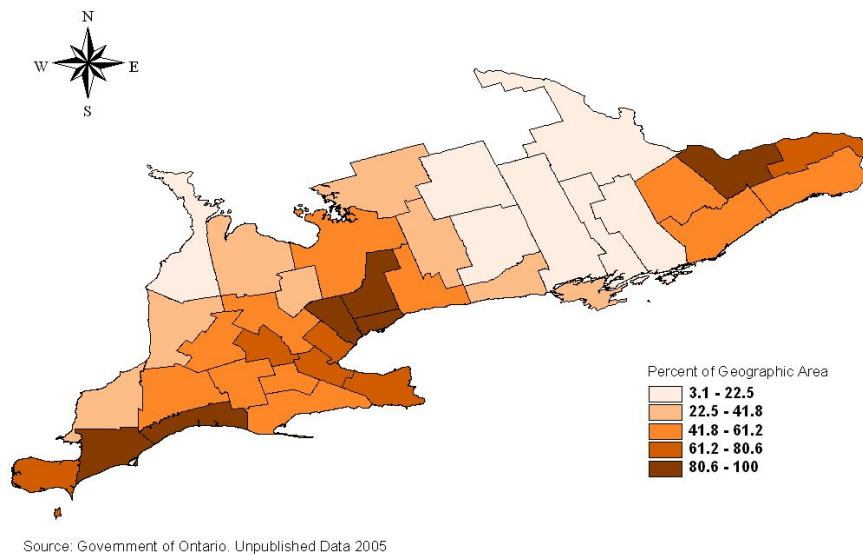
It is apparent from the analysis conducted in this study that census data provides a poor basis for the assessment of educational levels in rural municipalities. The presence of a college or university, a large civil service or high-tech industries in one or two

municipalities skews educational levels in some Census Divisions. Overall, southern Ontario has a highly educated rural population (Appendix 5). It is also noted by Statistics Canada that nationally, female adult farm residents are more highly educated than their male counterparts. With further study, educational attainment should be assessed as a relevant factor for the analysis of off-farm employment as well as for home-based business in which broadband access and use may be essential.

### ***Broadband Coverage and Internet Use***

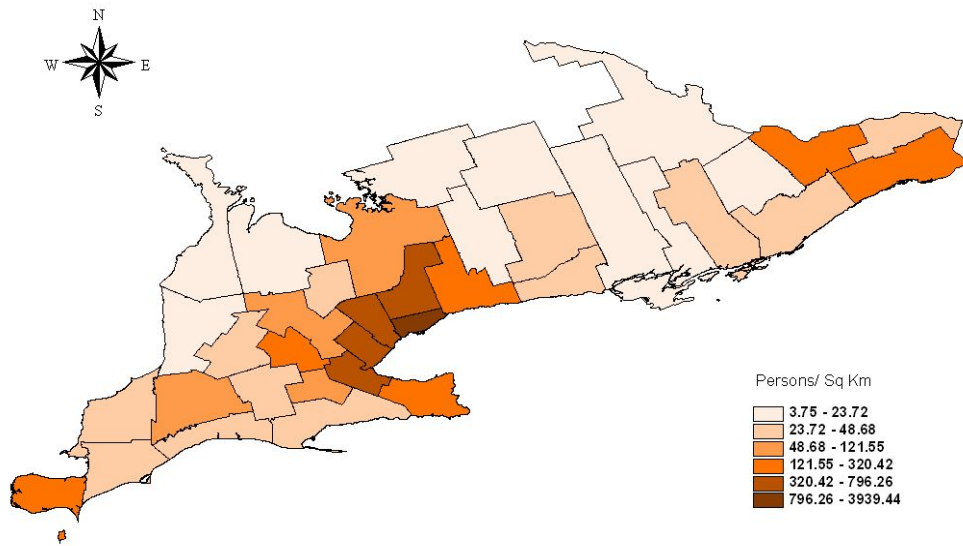
Accurate and updated broadband coverage maps are difficult to obtain and verify. At this present time, the study has been able to aggregate data at the Census Division level and presents a general overview of the spatial geographical coverage for broadband in southern Ontario (Figure 10). From this information it is possible to identify both the urban shadow effect from large metropolitan areas as well as islands of connectivity among the Census Divisions.

#### **Percentage of Geographic Area Served by Broadband 2005**



**Figure 10: Percentage of Geographic Area Served by Broadband 2005**

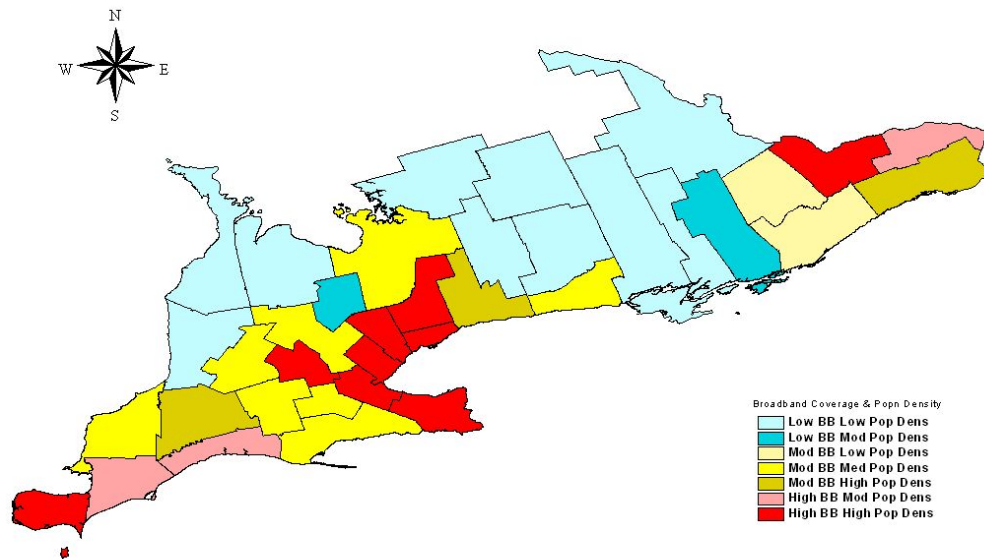
## Population Density 2001 (Persons/ Sq Km)



Source: Statistics Canada 2001 Census

**Figure 11: Population Density 2001**

## Broadband Access and Population Density



**Figure 12: Broadband Access and Population Density**

Combining population density (Figure 11) and the proportion of the Census Division area with broadband service shows the interaction between population density and broadband coverage (Figure 12). The (red) areas where both population densities are high and broadband coverage is also high are areas of relative strength. The (two yellow and bright blue) areas are islands of relative weakness and therefore of concern because there is high population warranting potential demand for broadband with a current situation of low coverage.

Relevant to this study is a comparison of the population density and broadband coverage map (Figure 12) with that of the mean farm area (Figure 5). Those census divisions with large mean farm areas would probably benefit from expansion of the broadband coverage.

In effect, rural Southern Ontario is experiencing significant change as rural/urban divides are renegotiated, and access to broadband increases. The forecasted population growth for southern Ontario combined with the imperative of high-speed Internet access for the bioeconomy as well as opportunities for non-farm employment (teleworking, telecottages) and education are drivers for investment and development of technological capacity as well as organizational and institutional capacities. As discussed in the following section of this paper, lessons can be learned from existing programming in broadband in rural southern Ontario.

## **Innovation through Rural Broadband**

Existing capacity development initiatives for farm and non-farm communities in rural southern Ontario and findings are summarized in Table 2.

**Table 2: Broadband Capacity Development Initiatives in southern Ontario\***

| Actor                             | Type of Agency  | Title of Initiative  | Category of Service / Application**     | Description of programming, service or application  |
|-----------------------------------|---|--|---|---|
| OMAFRA                            | Public  | Various projects   | 1                                       | OMAFRA's main agriculture and rural portal (including the Agricultural Information Contact Centre) <a href="http://www.omafra.gov.on.ca">http://www.omafra.gov.on.ca</a>  |
|                                   |   | Growing Strong Rural Communities - Ontario's Rural Plan (OMAFRA, 2007) |   | ORP does not specifically discuss the development of rural broadband. It does however identify a number of initiatives relevant to broadband including: an E-Learning Pilot Project involving 50 school boards support to the Ontario Digital Library project <a href="http://YouthConnect.ca">YouthConnect.ca</a> a web forum to engage rural/remote youth   |
|                                   |   | Rural Economic Development Data and Intelligence (REDDI)               | 4, 5                                    | Information and learning resources for local economic development in Ontario Including the Business Retention and Expansion Program's on-line leadership resources <a href="http://www.reddi.gov.on.ca/index.htm">http://www.reddi.gov.on.ca/index.htm</a>  |
| Agricultural Adaptation Council   | Private - Not for Profit – Coalition of 62 agricultural, agribusiness and rural organizations | Agricultural Management Institute                                      | 1, 4, 5, 6<br>2 (GGAEO)<br>3 (AgVision) | Administers AMI Program – an initiative of the federal, provincial, territorial Agricultural Policy Framework design to position Canada's agri-food sector as a world leader. Until 2008, the AMI provides \$5million in funding for projects to develop business management tools, products, information, resources and training for farm families, farm managers and farm business advisors. Approved projects to focus on broadband access or use include:<br><br>Groupement de gestion agroenvironnementale de l'Ontario <i>My Farm the Internet</i> – a website designed to offer francophone Ontario farmers a source of information in French and to make data and farm plans more accessible via the internet<br><br>AgVision "Top Managers" information sharing to advance agriculture<br><br>AAC supports links to federal E-government resources for farmers at <a href="http://FarmChoices.ca">FarmChoices.ca</a> |
| Ontario Federation of Agriculture | Private- not for profit   |  | 1, 4, 5, 6, 8                           | Canada's largest farm organization with 38,000 farm family members and 36 commodity group members Advocacy within the process of the Ontario Rural Plan (2004) for improved   |

| Actor                                   | Type of Agency   | Title of Initiative | Category of Service / Application** | Description of programming, service or application  |
|---|--|---------------------|-------------------------------------|---|
| Ministry of Economic Development and    | Public   |                     | 2, 6                                | <p>telecommunications including rural broadband</p> <p>OFA supports a website of resources for its members including the Ontario Farm Distress Line (email and telephone hot-line)<br/> <a href="http://www.ofa.on.ca/site/home.asp">http://www.ofa.on.ca/site/home.asp</a></p> <p>Connect Ontario<br/> COPSC – Partnership for Smart Communities<br/> COBRA - Broadband Regional Access</p> <p>Major provincial programs (2000-04) that aim to bring affordable, high-speed telecommunications to northern and rural communities by providing the necessary broadband infrastructure (involved approx. 20 municipalities of rural southern Ontario).</p>   |
| Ontario Telecommunications Organization | Private – not for profit<br><br>Association of public-private agencies |                     | 8                                   | <p>OTA represents 19 Independent local exchange carriers that together serve approximately 100,000 access lines across rural Ontario. <a href="http://www.ota.on.ca">http://www.ota.on.ca</a></p> <p>The independent telecos have made significant contributions to technological capacities in rural communities including initiatives such as</p> <p>Elginconnects<br/> <a href="http://www.elginconnects.ca/portal/site/comm">http://www.elginconnects.ca/portal/site/comm</a></p> <p>Partnership between independent telecom Halton Hills Hydro / Fibre Optics and Wave Rider to offer high-speed internet in Halton Region <a href="http://www.hummingbirdwireless.ca/">http://www.hummingbirdwireless.ca/</a></p> |
| Ministry of Research and Innovation     |  |                     |                                     | <p>MRI was created to the government’s commitment to innovation across all sectors of the Ontario economy. The focus on investment and capacity development includes emphasis on research teaching. Various programs of funding are offered.<br/> <a href="http://www.mri.gov.on.ca">http://www.mri.gov.on.ca</a></p>   |
| Rogers Communications                   | Private  |                     | 2                                   | <p>Rogers Communications Inc. is a diversified Canadian communications and media company engaged in wireless, cable television and voice and data networks.</p>   |

| Actor           | Type of Agency | Title of Initiative  | Category of Service / Application** | Description of programming, service or application   |
|-----------------|----------------|--|-------------------------------------|--|
| Bell Canada     | Private        |  | 2                                   | <p>Rogers has joined Bell in launching the Inukshuk Internet Inc. a Canada-wide wireless broadband network expected to initially reach more than two-thirds of Canadians by 2008. The initiative includes a Learning Plan that seeks private not-for-profit community partnerships to enhance content or connectivity related to learning and the Internet (\$720K minimum of funding available for Ontario in 2007 call for proposals)<br/> <a href="http://www.inukshuk.ca/">http://www.inukshuk.ca/</a></p> <p>Bell (BCE Inc.) is Canada's largest telecom in wired and wireless systems. Bell participated in Industry Canada's BRAND pilot program.<br/> <a href="http://www.bce.ca/">http://www.bce.ca/</a></p>  |
| Industry Canada | Public         | <p>National Broadband Task Force (2001-04)</p> <p>Broadband for Rural and Northern Development (BRAND) Pilot Program</p> | 2                                   | <p>BRAND was created to assist those communities without broadband access. Most often, improved access is necessary in First Nations, northern and rural communities in order to provide services in the areas of health and education, as well as to augment economic opportunities. The Broadband Pilot Program supported 154 projects for business plan development funding (\$4.2m) and two rounds of implementation funding, 63 projects (approx. \$80m). The program ended in 2004. The 15 beneficiaries of the BRAND program in southern Ontario were:</p> <ul style="list-style-type: none"> <li>South Dundas Economic Development Corporation</li> <li>Communities of Eastern Ontario Network</li> <li>HQ Net Community Broadband Network</li> <li>Waterloo Regional Library</li> <li>Huron Business Development Corporation</li> <li>Technology Alliance Group for Kawartha Lakes</li> <li>Elgin Community Futures Development Corporation</li> <li>Corporation of the County of Grey</li> <li>The Corporation of the Municipality of Chatham-Kent</li> <li>Southern First Nations Secretariat</li> <li>The Corporation of Haldimand County</li> <li>County of Lambton</li> <li>York Region District School Board</li> <li>Community Information Access Centers of Canada</li> </ul> |



| Actor                            | Type of Agency   | Title of Initiative                             | Category of Service / Application** | Description of programming, service or application  |
|----------------------------------|--|---|-------------------------------------|---|
| The Ontario Rural Council        | Public – not for profit<br><br>Network of public and private members |   | 1, 7, 8                             | <p>Greater Peterborough Areas Development Area<br/> <a href="http://broadband.gc.ca/index.htm">http://broadband.gc.ca/index.htm</a></p> <p>Since the late 1990s, Industry Canada has also supported other broadband programs in rural southern Ontario including Community Access Program (CAP) and SMART Communities.</p> <p>TORC is a multi-sector council of public and private sector organizations that convenes annual for a and networks on issues of relevance to rural Ontario such as health, environmenta and capacity building, including meetings in 2007 on rural broadband. <a href="http://www.torc.on.ca">http://www.torc.on.ca</a></p>    |
| Foundation for Rural Living      |  |   | 8                                   | <p>FRL offers the Rural Philanthropy Resource Network self-described as a central, virtually accessible infrastructure to directly support rural fundraising and nonprofit management, placements for Rural Development Officers in several agencies in a variety of communities to assist with planning and execution of strategies and professional facilitation from a management team.<br/> <a href="http://www.ruralphilanthropy.ca">http://www.ruralphilanthropy.ca</a></p>   |
| Centre for Rural Leadership      | Private - Not for Profit   | Agriculture and Rural Leadership Program (ARLP) | 4, 7                                | <p>The Centre for Rural Leadership, incorporated in 2002, is an organization designed to offer agricultural and rural leadership programming.</p> <p>In 2006 the Ontario Agricultural Training Institute (OATI) joined with the Centre’s programs. OATI offered producer education courses for “Webinar” delivery over the internet through narrow band width telephone dial up connections. The courses will help address producer skills development needs in two critical areas – commodity marketing strategies, and attracting and retaining agricultural labour.<br/> <a href="http://www.ruralleadership.ca/">http://www.ruralleadership.ca/</a></p> |
| Agriculture and Agri-Food Canada | Public   |   | 1, 4, 5                             | <p><b>FarmChoices.ca</b>, free service for Canadian farm families and workers, is an interactive website allows users to assess their skills and explore career and business options for growth and change. Also available in CD-ROM and workbook formats, the resource</p>   |

| Actor                                     | Type of Agency           | Title of Initiative | Category of Service / Application** | Description of programming, service or application   |
|---|--------------------------|---------------------|-------------------------------------|--|
| L'Union des cultivateurs franco-ontariens | Private - Not for Profit |                     | 1, 4, 5, 6, 8                       | allows users to develop a personal portfolio of skills, abilities and knowledge.<br><a href="http://www.farmchoices.ca/">http://www.farmchoices.ca/</a><br><br>Renewal programs and initiatives (e.g. Canadian Farm Business Advisory Services & Planning and Assessment for Value-Added Enterprises) are intended to provide producers with access to information, skills, knowledge, and advisory services in farm business management.<br><a href="http://www.agr.ca/ren/index_e.cfm">http://www.agr.ca/ren/index_e.cfm</a><br><br>Canadian Agricultural Skills Service (CASS) program provides funding to beginning and established farmers and their spouses to develop a learning plan and take courses to help them gain the skills they need to reach their goals. CASS will assist farm families to acquire on-farm skills, or skills and training to pursue other income options, or both. The Ontario Region contact is: Colleges of Ontario Network for Education and Training (CON*NECT)<br><a href="http://www.agr.ca/ren/index_e.cfm?s1=cass-scdca&amp;page=intro">http://www.agr.ca/ren/index_e.cfm?s1=cass-scdca&amp;page=intro</a> |
| 4-H Ontario                               | Private - Not for Profit |                     | 1, 7                                | L'Union des cultivateurs franco-ontariens est un mouvement voué à la défense et à la promotion des intérêts économiques et socio-culturels de tous les agriculteurs franco-ontariens. <a href="http://www.lavoieagricole.ca">http://www.lavoieagricole.ca</a><br><br>4-H is a youth focused community organization. Its website offers various e-services and updates on events and resources for its volunteers and membership.<br><a href="http://www.4-hontario.ca/">http://www.4-hontario.ca/</a>  |

\*\* This is not a list of organizations involved in agriculture and rural development, only those agencies reported by respondents to be relevant to rural broadband in southern Ontario. OMAFRA has 305 organizations in “The List” a database of agricultural and rural focused agencies in the Province (including producer associations).

**\*Categories of Broadband Service or Application**

- General rural and agricultural public extension services including email help-desks, distress lines and on-line directories of services
- Web access and applications for agricultural or rural-based business and households
- Websites for community and family farm promotion and public relations

E-learning courses and on-line conferences, advisory services and skills retraining  
Farm business management resources on-line  
On-line public consultations for policy development  
Open information exchange networks for membership  
Closed information exchange networks for membership

Overall there are many different uses of broadband in rural southern Ontario. Key informants referred to many uses and on-line services accessed by farm and non-farm individual users and these were coded into the seven categories listed in Table 2. It is apparent that there is substantial organizational capacity and institutional capacity existing for rural broadband expansion in rural southern Ontario.

Yet, before this discussion continues, the obvious question is whether or not farm families and rural communities in rural Ontario today actually derive benefits from becoming more innovative due to their access to and use of ICTs that are supported by their own producer or community organizations as well as by a range of public and private sector partnerships in rural broadband? Without a more detailed survey of farm families and members of the non-farm rural community, it is impossible to assess the impact of broadband at the level of the rural firm or household. This is research that needs requires ongoing attention in the changing context of rural southern Ontario. However, in this study it was possible to investigate agricultural innovators who received Provincial awards and to examine the use and benefit of high-speed internet access for their innovation. The results are summarized in Box 1. These results suggest that use of broadband among award-winning agricultural innovators in Ontario.

Box 1: Broadband Access and the Ontario Agricultural Innovation Awards

In a OMAFRA news release, dated March 8th 2007, Premier McGuinty stated that "Ontario's farmers have helped build a world-class agri-food sector in this province. By recognizing their hard work and investing in their innovative ideas, we can help farmers pursue new markets, attract investment and strengthen our rural communities". The five-year, \$2.5-million Premier's Award for Agri-Food Innovation Excellence recognizes that farmers have always been innovative in the running of their businesses and will continue to foster even greater innovation across the province's agri-food sector. Conditions of the award require that the innovation must be developed and used on an Ontario farm, must have the potential for use on a broader basis and must provide a positive effect on the agriculture industry.

Twenty-nine innovation awards have been released thus far; one \$100,000 Premier's Award of Excellence award, one \$50,000 Agriculture Minister's award, and 27 (out of a total of 55) \$5,000 Regional

awards. The majority of these awards were granted for improved farm practices and value added innovations, as well as for education, marketing, strategic alliances, and energy innovations.

Among the winners, 17 have easily found websites ranging from basic informational sites to sophisticated interactive sites featuring product ordering and purchasing capabilities. Nine award winners were recently contacted regarding the role of broadband access has in the development of their innovation. Only two of the nine respondents did not have access to broadband. They reported that the internet did not play a large role in the development of their innovation. In contrast, the responses from the majority of award winners were overwhelmingly positive towards the impact that Broadband internet access had on their innovation process. Statements included,  
“It was absolutely crucial. I can honestly say that without the internet, we wouldn’t be doing what we’re doing now; we wouldn’t have done it”

“I would say that it was crucial to development; for accessing research papers and the scientific community, and for finding different raw materials to experiment with...It’s a gateway to the information world.”

Applications of internet technology included product research, consumer education and e-mail communication, online sales and marketing, video documentation and diagnosis of problems. When asked to comment on internet use respondents further commented that,

“For communication purposes, it’s definitely important. We use it for research and for working with companies to develop advertising materials”

“When there’s a problem with the equipment, we can video the problem and send it through the internet to the manufacturer for a diagnosis. 20 years ago they would have had to bring in someone from at least the United States or even overseas”.

“We sell products on-line; this is an increasing component of our business; our internet sales sort of grew together with broadband.”

This study suggests that there are opportunities for innovation among medium and small-scale agricultural producers in Ontario due to new ICTs. Award-winning innovators are making use of broadband but so too are the organizations serving farmers and rural areas. Individual farmers and their organizations are increasingly setting up commodity portals and web sites for promoting themselves and/or seeking new markets. There is a wide range of services and applications of high-speed internet for farm families and to a lesser extent, non-farm rural residents. Many rural organizations have websites and on-line networking and e-learning opportunities for their members, available only insofar as their members have reliable access.

There is also another apparent trend that signals innovation through the use of broadband in rural Ontario. This is the dismantling of conventional paper-based and face-to-face

public-sector extension services. Paper copies are now available as PDFs and face-to-face contact is available as government supported client advisory services or consultancy services through membership. Nevertheless, in a recent study of small to medium poultry producers in southern Ontario suggests that the technological push is as important as the demand pull for broadband use (see Box 2).

#### Box 2: Internet Use among Small and Medium Size Poultry Farms

A 2006 survey (Sykanda, 2007) of information flows among of poultry producers in southern Ontario found that 96 percent of farmers had a computer on the farm, with 92 percent indicating that they had an internet connection. However, only 17 percent of farmers indicated that they had a high speed internet connection.

The depiction of the internet as a slow and inefficient channel for accessing and receiving irrelevant or excessive information became a recurring theme among farmers when asking about the role internet-based information sources play in the management of their farms. Many farmers related a lack of internet use to the slow speed of information access and retrieval compared to other, more traditional channels such as the telephone or fax, or interpersonal networks.

Other findings from this study confirm that interaction between farmers and their information sources is becoming increasingly mediated through the internet. The presence of the internet as an information source among this sample group appears to be driven to a large extent by a technological push rather than by a demand pull dictated by the farmers' requirements. While farmers indicated that there has been an increase in the amount of information that they are both seeking out and receiving from internet-based sources, it simply does not have the control, accountability, and trust that they require for the adoption of new innovations or farming practices.

## Partnerships for the Capacity to Innovate

The Systems of Innovations (SoI) approach argues that the roles and responsibilities for change are distributed among different stakeholder groups from the public to private sectors and within the private sector among for-profit and non-profit groups. Capacity development also implies that action is taken at the individual, organizational and system-levels. The need for the SoI approach and is to ensure that market considerations which require private (for-profit) partnerships are also taken into account in knowledge and information systems initiatives. The *capacity to innovate* is used in this study as a

way to understand rural connectivity through broadband access and use as a set of technical and institutional capacities. Specifically, analysis focuses on a) managing stakeholder divides, b) fostering participation and interactive learning, and c) enabling the environment for innovation (infrastructure and policy).

The findings of this study suggest that the rural digital divide is not just a technological capacity that still needs to be built. It is also the organizational and institutional capacities that divide stakeholders. There is a substantial number of actors involved in capacity development and innovation in Ontario's rural and agri-food sectors. These agencies include both public and private agencies. There are programs in which innovative partnerships have been achieved but these are mainly partnerships of public to not-for-profit private sector agencies. The public sector (federal and/or provincial) has provided funding, in several cases rather substantial funds, and served as a catalyst for action that is implemented by not-for-profit private sector agencies (also referred to as non-governmental organizations). *These initiatives would fit well within the AKIS approach to agriculture and rural development but not necessarily into the SoI approach, if the role of the market and for-profit private sector are not taken into account.* There are new private sector initiatives such as the Inukshuk Internet Inc. and the ongoing work of the independent telecom cooperatives and companies with municipalities that warrant close attention by all stakeholders.

The profit-oriented to not-for-profit private sector partnerships are less common at the present day but should become more important in the future, if the SoI perspective comes into play. There is also an interesting link to these partnerships in that many not-for-profit agencies have board members from the profit-oriented agencies, including producers associations that represent small, medium and large agri-businesses and rural enterprises. It is also noted that as the private sector (profit to not-for-profit) relationships change so too would the more conventional public to not-for-profit private sector partnerships reinvent themselves through fostering participation and interactive learning. Ultimately, there will be adjustments to create the enabling environment.

Additional stakeholder analysis and pilot programs for new partnerships are required for the way forward. There may be specific groupings of agencies which would be innovation catalysts for specific areas of southern Ontario. Agencies that advance thinking for prioritizing investment may collaborate. Those agencies that might be most trusted by farmers and rural residents would come together to assure effective policy implementation. Southern Ontario is changing and rural connectivity can build on existing organizational and institutional capacities so that the next decade of change in the Province is one in which all possible opportunities for innovation through broadband access and use are available to family farms and rural communities.

## **Policy Recommendations and Conclusion**

In the 2007 budget announcement indicating \$10 million in support of rural broadband, the Province of Ontario has taken a clear stand to build technological, organizational and institutional capacities for rural broadband. As the findings presented in this study suggest, there are a number of existing organizations and innovations occurring that the public sector (federal and provincial and sometimes in tandem) have incubated. The following recommendations are proposed to help move forward.

**Recommendation 1:** The Province direct its investment into strategic partnerships involving public and private (for profit and not-for-profit) sector agencies that strengthen the technological, organizational and institutional capacities that develop agricultural and rural innovation and contribute to socio-economic and environmentally sound development.

**Recommendation 2:** In southern Ontario, areas of moderate to high population density and low broadband coverage combined with either a) prevalence of small and medium sized family farms, or b) higher percentage of home-based workers with potential for teleworking and tele-cottage industries should be considered “hot spots” for investment in broadband infrastructure and capacity development.

**Recommendation 3:** Successful agricultural and rural innovators confirm that innovation is not a one-time phenomenon; it is an ongoing process. Farm and non-farm businesses using broadband services and applications need back-up. Not only is knowledge management about accessing the worldwide web, it is also about joining the Web and this requires businesses to gain an additional set of

management skills that are not addressed sufficiently in current programming offered by public and not-for-profit agencies.

**Recommendation 4:** Broadband is a shared resource, and as such, communities require opportunities to participate and interact in its development and eventually, in its monitoring. This involves outreach to rural communities and to both farm and non-farm users of broadband. Efforts by private sector in this direction should be encouraged further by the public sector. Awareness creation, effective communication and representation by the local level will contribute to further technological, organizational and institutional innovations.

In conclusion, there should be a conscious effort to avoid generalized statements that lead to “one size fits all” interventions for rural connectivity. This would be a false representation of the current literature, documentation and respondents input. It would also go against the existing context and prospective forecasts of Ontario’s rural demography and infrastructure. There should be no generic approach to broadband and to do so would negate the opportunity for innovation which entails context specific capacities. While the research contained in this paper is preliminary it informs policy recommendations that seek to support stakeholders and make investment as efficient and effective as possible.



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