ONTRACE WHITE PAPER

Perspective on the Impact of Agriculture & Food Traceability on Public Health

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ABSTRACT

Canada's and Ontario's agriculture and food industry competes on a global stage. We have a reputation for safe, high quality food which is a critical link in better personal and public health.

The challenge for the agriculture and food industry has not been in developing good, nutritious foods; but in finding reliable and credible ways to communicate the value of food products to consumers. The capacity to rapidly identify and reliably trace the source or provenance of products and deliver credible information is increasingly being demanded by trading partners, governments and consumers.

This paper considers policy issues regarding the impact of agriculture and food traceability on public health and economic development within the context of the Federal and Provincial governments' commitment to mandatory traceability by 2011.

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1.0 Introduction and Background

This paper identifies and considers policy issues relevant to impact of agriculture and food traceability on public health and economic development and trade, within the context of the federal-provincial-territorial (FPT) governments' commitment to mandatory trace by 2011.

What is traceability?

"Traceability systems are essentially record-keeping systems that are primarily used to help keep information related to products with different attributes separate from one another. When information about a particular attribute of a food product is recorded from creation through marketing, traceability for that attribute is established". (AAFC, 2007)

Successful traceability has three key essential components: identification of animals or products, identification of premises, and movement tracking.

Although there are several perspectives on traceability, for purposes of this report, traceability is defined as the ability to follow an item, or a group of items, whether animal, plant, food product or ingredient, from one point in the supply chain to another, either backwards or forwards.

Risk Management and Traceability in the Context of Supply Chain Management

Traceability systems are effective tools to share information along the agriculture and food chain, reducing risk and the economic impacts of an emergency, or increasing the commercial gain from specific product information. Risk management is a significant business component for any agriculture or food business; companies have developed safety and quality compliance programs to react to potential emergencies, recalls and withdrawals. Traceability systems significantly reduce response time when an animal or a plant disease outbreak occurs by providing companies and governments with information to rapidly and accurately determine the location of the suspected products. There is compelling evidence that using a proactive approach, such as traceability in managing risks, can significantly reduce risks and lower insurance premiums. Some organizations, who have researched their risk management practices, have determined that insurance costs can be reduced by 20 percent and more (IBM, 2006).

Some governments, such as Japan and some European countries have already imposed traceability requirements as a risk mitigation tool to help protect public and/or animal health. The most proven traceability benefit in risk management comes from being able to more accurately identify suspected problem products, their location and source. An examination of the food industry indicates that traceability can cut the scope of the recall in half, and in some cases, the recall scope has been lowered by more than 95% (Sparling and Sterling, 2005). As well as reducing the amount of discarded product, reducing scope decreases the number of consumers affected and potential negative market impacts.

Sparling and Sterling (2005) summarized this well:

"One can assess the benefit of improved recall and risk management by considering the reduction in recall scope, the frequency of different types of recalls, the market reaction to recalls and withdrawals, and the liability exposure of a firm. Each of these calculations will yield quantifiable business benefits to the organization."

Recent traceability activities and commitments in Canada [1]

In June 2006, the federal, provincial and territorial (FPT) Ministers of Agriculture endorsed developing a joint industry-government framework for the National Agriculture and Food Traceability System by end of 2008 (focusing first on livestock and poultry).

More recently in July 2009, FPT Ministers, with the exception of Saskatchewan, committed to creating a comprehensive national traceability system for livestock and poultry. They agreed that a mandatory comprehensive national system for livestock traceability will be in place by 2011 and that implementation will be supported by national funding and regulatory framework. The Ministers pledged to engage key agricultural groups on the timing of implementation for each species. The *Growing Forward* policy framework and *Agricultural Flexibility Fund* would be used to provide support for implementation. Ministers also discussed the need for traceability for all commodity sectors.

Trends in the Ontario Agriculture and Food Industry

The Ontario agriculture and food industry is one of the most diverse in the world, producing over 200 agricultural commodities. The Province is known for its work in food technology research and development, and the agriculture and food sector exports $8.5 billion worth of commodities annually, accounting for 28% of Canada's total annual agriculture and food exports. The food and beverage processing sector alone is Ontario's second largest manufacturing sector, with half of Canada's top-ranked food and beverage manufacturers headquartered in Ontario.

Yet, public understanding and perception of agriculture has shifted significantly over the last few decades. As the number of people engaged in primary agriculture has declined, fewer people have a direct connection with or understand agricultural production. They are increasingly concerned about how their food is produced and where it originates[2]. They are also very interested in the quality and safety of their food (preferably cheap), the economic impact of their buying decisions on farmers, and environmental stewardship.

Betsy Donald in her recent paper for the Martin Prosperity Institute (2009, page 2) provides a succinct summary of some of the driving forces behind changes in Ontario's and Canada's agriculture and food industry:

> *Phenomena like food scares, declining rural communities, rising cultural awareness, and growing public unease around the social and ecological attributes of food are having the effect of motivating more people to eat 'quality' foods. Quality, of course, means something different to everyone. For the quality-seeking consumer of a specific ethnic product, quality may be defined as the ability to find an 'authentic' product from their homeland; for another it may be about consumer products grown locally; for another it may be about buying products free from certain allergens, synthetic additives, pesticides or herbicides regardless of the source. Knowledgeable consumers are searching for something different from what has traditionally been available from mainstream producers, processors or retailers.*

[1] For a brief history of traceability in Canada and Ontario, see Appendix A

[2] *Report on the Opportunity for an Ontario Food Traceability System among Consumers*, OnTrace (November 2009)

Consumers increasingly want reliable information and assurances about where their food came from and how it was produced. We will now explore the relationship between food and public health and the role of traceability.

2.0 Agriculture and Food Traceability and Public Health: A Compelling Argument

The interface between food safety and health [3]

The agriculture and food sector and public health are becoming more and more intertwined. The agriculture community, as a key source of food, has a huge role to play in the health of Canadians, and can help reduce burgeoning health-care costs. Indeed, both human health and the agriculture and food industry stand to benefit greatly from an integrated agri-food policy framework[4]. This raises many possibilities, and also poses questions. One of them is, what is the impact of traceability on public trust in food and on public health issues?

In the past two decades, food borne diseases have emerged as an important and growing public health and economic problem. Contamination of foodstuffs by microorganisms (e.g., bacteria, fungi, parasites, and viruses), chemicals (e.g., food additives, pesticides, and veterinary drugs), toxins and allergens can occur at any stage of the process from food production to preparation. In addition, food contamination may occur through environmental pollution (air, water, soil).

Food borne diseases, which are usually acute in nature (self-limiting and short duration), are an increasing concern for governments and industry, especially in terms of economic impact and social disruption. Several factors contribute to this situation, such as:

- Globalization of the world's food supply and the fluidity of worldwide shipments of fresh and frozen food;
- The finding that traditional agents are increasingly associated with foods that were not a previous concern (e.g. *Salmonella* on ready-to-eat salads packaged and distributed internationally);
- Migrant populations demanding their traditional foods in their country of settlement;
- Identification of new bio-agents that cause life-threatening conditions;
- Increasing number of outbreaks of food borne diseases being reported; and
- Impact of food borne disease on young children, the aging population and immuno-compromised people.

In the near future, food borne illnesses are expected to become a greater problem. This occurrence is anticipated, in particular, because existing pathogens are increasingly resistant to drugs, because new pathogens are emerging, and due to the continuing globalization of the food supply. Health Canada

[3] This section draws on Tyrchniewicz and McDonald (2007)

[4] *Traceability in Ontario's Agri-food System – Time for a Strategy*, David Sparling, OnTrace (2010)

estimated the impact of acute food borne illness on Canadians is significant, with the latest figures estimating between 11-13 million cases of gastro-intestinal illness per year at over $1 billion a year in direct healthcare costs and indirect losses in productivity (Health Canada, 2008). However, these cost estimates are modest. They fail to include the travel cost to obtain medical care, time lost from work caring for sick children, or the cost of chronic complications (such as the reactive arthritis associated with *Salmonella*).

Moreover, these estimates did not include costs to the food industry or public health costs. For example, even though the Bovine Spongiform Encephalopathy (BSE) crisis in Canada in 2003 had no direct consequences on the health of individuals, it had a major impact on the Canadian agriculture and food industry. The handling of this crisis by the Canadian Food Inspection Agency (CFIA), other government agencies, and the Canadian cattle industry helped limit economic losses. Yet the U.S. border still is not open to live cattle over 30 months of age. Canada's overall exports of beef have not recovered to the levels of 2002.

At the peak of the crisis in 2003 and 2004, BSE was estimated to have cost the Canadian cattle industry $11 million per day. Today, it is still estimated to cost the industry $1.5 million per day in lost revenue. If another situation like the BSE crisis were to occur, it will have a more devastating effect on the industry. Food prices could be affected by reduced volumes, making access to some types of food (e.g., meat, fresh produce) difficult for some of the population.

The development of novel foods, such as genetically modified foods, adds to consumer concerns. Internationally, new regulations on food authenticity, traceability and nutritional labelling are being considered. In Europe, new regulations are already being developed, thanks to a history of weak control over problems associated with food, animal feed, and animal diseases. European consumers are also crusading to restrict the production and use of foods and feed ingredients derived through biotechnology. People are demanding that these foods and food ingredients be identified clearly on labels. Similar concerns have been voiced by some consumers in Canada and the USA.

The food industry, for its part, has already developed systems to ensure food safety. These include chemical and biological inspection of final products and the introduction of safety control systems, such as Hazard Analysis and Critical Control Point (HACCP), as well as complying to other global standards such as ISO certifications and World Trade Organization (WTO) standards like the Sanitary and Phytosanitary (SPS) measures. These safety control systems are not in themselves traceability systems. But the implementation of a traceability system can support compliance with safety control system standards. Science-based traceability systems provide reliable product information and documentation, which are required by Canadian and international food safety standards. Establishing a food traceability system is a strategy government and industry use to win the confidence of consumers and address the documentation requirements required under multinational and bilateral trade agreements. Reliable and readily accessed traceability systems for agriculture and food are highly beneficial to the industry and the public sector, as well as to consumers.

Benefits of traceability for public health

An effective traceability system provides direct benefits of improved public health by empowering authorities to limit the scope and effects of an outbreak; and as a result, decreasing in the potential number of illnesses and lost public confidence. Traceability improves public confidence in the food supply by demonstrating rapid resolution of the outbreak, and less disruption to markets. Although consumers may stop purchasing suspect products from sources directly implicated in a recall, other related products not implicated in the recall might be impacted. For example, in 2009 recalled peanut products did not include retail peanut butter but many consumers stopped purchasing it. Sales of peanut butter dropped 60% and sales of peanut butter crackers (an implicated product) dropped 12% (IFT, 2009). Companies can benefit from market advantage from enhanced food safety efforts (being able to avoid being implicated in an outbreak), protecting their brand name, assuring product claims and maintaining consumer confidence. (IFT, 2009)

Consumers are also becoming more conscious and conscientious of the foods they eat. Traceability systems are their basic level are the means to share data. Consumers are becoming increasingly interested in the origins of their food, which can be answered by the technology of traceability. When consumers go a step further and choose to buy locally produced foods for health reasons, the most effective means of assuring them of the source and contents of their food is through traceability.

An area of further study by governments interested in the benefits of traceability on public health would be to understand how improved knowledge of food can translate into 'better' decision making by consumers for their own well-being. Does knowing the provenance or contents of our food make us wiser in our choices?

Costs of traceability for public health

Costs associated with a traceability system mean that the funds cannot be used by the company for other purposes. The costs of implementing and maintaining the capacity to identify the source of all inputs/ingredients to all products, to track product transformation within the facility, and to identify the location and time of shipment for all products can be significant (IFT, 2009). Data must be collected at "Critical Tracking Events" to ensure traceability is reliable. The resources used to acquire and maintain equipment dedicated to information management, supplies used in labelling, and the labour used in maintaining systems are all costs of product traceability. Adoption of improved automated systems is underway in many companies and supported by efforts in the agriculture and food industry. However, there will be costs in implementing a provincial system that allows efficient, rapid, reliable and electronic reporting of Critical Tracking Events.

In small and mid-sized companies, manual record keeping is common. Providing electronic data within a 24-hour period on product received, used and shipped, will require on-going updates of information. This will drive up costs (even incrementally) for all companies, but especially for companies that maintain manual data collection procedures. Those companies with manual input and data systems (like many farmers) may incur proportionally higher costs than with electronic, automated data delivery. However, technological changes are occurring rapidly and the benefits to the companies should be weighed against the additional costs of providing a traceability system (IFT, 2009).

Here then is the opportunity for technology firms; the market for developing equipment, services and software to help a broad base of agriculture and food businesses from the farm all the way to the store shelf, is significant. The challenge will be how to capture that opportunity in a way that serves the largest number of stakeholders at a low cost of ownership and operation.

3.0 Impacts of Traceability on Economic Development and Trade

Benefits of traceability for economic development and trade

Regulations for traceability are being driven by a variety of factors ranging from Bovine Spongiform Encephalopathy (BSE) and Avian Influenza to the new bio-security regulations for food importation into the United States and the E.U. requirements for traceability. These regulations have forced most agriculture and food companies to think about developing more responsive and robust food traceability systems and processes to meet legal and market access requirements. The prevailing sentiment is, "Ultimately traceability will be mandatory and it will simply cost my business and my customers more money" (Sparling and Sterling, 2005). In some cases, traceability is already a requirement for access to markets, especially in Europe and Asia.

A number of benefit studies have been undertaken in various jurisdictions to determine the impacts of traceability (Dagenais, 2009). Conclusions as to the benefits of traceability include:

- Lowering costs in managing disease outbreaks (in an FMD outbreak, traceability could reduce costs in Canada by $21 billion)
- Reducing and containing impacts of zoonotics (diseases that can be transmitted from animals to humans)
- Contributing to maintaining/regaining markets
- Reducing costs in administering Animal Health Programs
- Enhancing animal welfare by locating animals during natural disaster
- Decreasing the risk of unfounded liability claims by documenting who is **not** part of the problem.

Benefits to agriculture or food businesses go beyond the conventional goal of complying with legal requirements. A traceability system can also benefit production management. The following areas of benefits should be considered goals of a well-designed traceability system (Samarasinghe et.al, 2009).

Market Benefits: Traceability is essential to the survival of business in regulated markets. Food products need to be labelled or identified to facilitate its origins and contents to the consumer; this will become the norm in supermarkets as traceability regulations are implemented. Winning consumer trust based on the existence of a traceability system is also a market benefit. Traceability becomes a tool for marketing, and creates brand equity for products from a company.

Quality and Safety Management: The introduction of food traceability can be viewed as a strategic response by the company to the impact of an increase to consumers' overall risk perceptions of food products. Traceability is not food safety, although traceability strengthens food safety capabilities in a business. Reliable, accurate traceability information effectively reduces risk exposure by enabling food producers to identify, isolate and correct the problem quickly and efficiently. This protects public health and the economic fallout from incidents can be minimized.

Product Recall: Product recalls tend to be bad news, but companies that successfully manage a recall can turn the bad news into a good news story by effectively managing the crisis. A critical ingredient in effective management of a crisis is reliable and accurate information about a company's affected products and any associated food safety data. An effective traceability system helps reduce the impacts of a food recall, contains the scope of the crisis management effort, and limits the amount of product that must be removed from the food chain. More than that, traceability systems provide the assurance needed to restore consumer and market confidence.

Reduced cost of production: Integration of the data recordings used for traceability into a production system can reduce running cost. By establishing a localized traceability system at a certain point of the production chain, the end nodes are motivated to run their own traceability systems that comply with the requirements of other nodes. As a result, costly investment required for quality control will not be necessary when each end supply node adheres to standardized quality criteria.

As we have said, traceability systems at the farm level can be paper-based, although producers are using more computer systems. As a result, an economic benefit resulting from the implementation of traceability will be the introduction of systems to improve the efficiency of tracking products from the farm level, include the inputs (feeds, pesticides, medicines, etc.) into the farm products.

Software and hardware will be required to facilitate a whole value chain traceability system, and in many cases will require the introduction of hardware and software in phases to reduce the initial expenses of incorporating traceability. Products have already been developed, however expansion into other food and agricultural areas will create economic benefit through training, software and equipment sales. Governments would do well to encourage this potentially lucrative area of economic growth in the technology sector.

Costs of traceability for economic development and trade

Traceability costs are relatively easy to quantify and include services, technology and software costs, changes in processes, training and on-going operating costs. If a company's only reason for implementing a traceability program is to meet regulatory requirements, these costs can be a burden with little perceived payback. However, like other investments in process improvement, traceability can provide substantial benefits that extend beyond simply meeting regulatory demands (Sparling and Sterling, 2005).

Estimating costs incurred by individual companies and a sector to enhance traceability allows both public decision makers and company managers to assess the additional resources required to achieve traceability (IFT, 2009). The estimation of these costs also allows the evaluation of the costs relative to the effectiveness or benefits achieved through improved traceability. The cost estimation and analysis allow companies to assess how implementation of traceability affects their margins.

A variety of factors impacts the cost of a traceability system in agriculture and food. These factors include: the size of the company and its technological sophistication, the adaptability of existing tracking and record keeping processes within the company, and the relative competitiveness of the company. The availability of existing technologies from commercial vendors will also affect companies' costs, especially if they cannot adapt to existing systems and business practices.

Costs may also vary depending on the nature of the food product, including the harvest and packing location, how product is packed and shipped, its perishability and whether it is used in further processed product. An effective traceability system must be successful at the firm level and compatible with the supply chain. For this reasons, an often overlooked cost is the lack of standards.

Standards for data interoperability and systems interoperability are nearly non-existent in the agriculture and food industry. As a result, fragmented and widely disparate information management systems simply cannot work together to support the simplest of commercial transactions. And as a consequence, each step of the chain invests in its own technology and systems at a significant cost that is exacerbated by imposing incompatible requirements on others in the chain. The cost of failure to have and use industry standard protocols for data and communications has been estimated for packaged consumer goods in the USA to be in the billions of dollars per year. Why do the agriculture industry and its food partners think they are different?

Each company faces a different set of costs depending on its circumstances. To estimate industry level costs of a traceability requirement, it is necessary to develop a set of representative companies that generally cover the range of possible circumstances. For each type of representative companies, the existing system and required changes could be described, and an assumption regarding the typical product volume could be assigned. Then, using data collected through discussions with technology providers and companies, and company-level cost estimate could be developed for each type of representative company (IFT, 2009).

4.0 Cost sharing of Traceability: A Public Policy Issue

Benefits of Traceability

Tracking food products throughout an entire value chain has clear benefits from a regulatory perspective, and although compliance with regulations has been the primary reason for many existing traceability systems, companies are starting to recognize a range of financial benefits. The importance of "compliance traceability" and "value traceability" is an idea that is beginning to take hold in North America (IBM, 2006). The need for traceability for emergency management and incident response is

acknowledged by many in the food industry, and it is just recently some have accepted that whole-chain traceability can be used as a solution for other business purposes.

The agriculture and food industry and governments share a common desire to protect public health by reducing the risk of consuming a contaminated product or contracting a zoonotic disease. Governments also want to mitigate the public funds used to assist a seriously damaged industry or sector recover from an emergency such as an infectious disease outbreak.

Governments are well placed to work with industry groups to coordinate a traceability system and can offer regulatory and non-regulatory incentives to assist in reaching full compliance of the system. Most governments have recognized the need to invest in traceability systems to protect the public good and consumer confidence. Both industry and governments have legitimate information needs that can be met by traceability systems and provide each with benefits. An industry-government partnership is required.

Another economic reason to adopt a traceability system is to reduce the threat of a legal action or trade retaliation action against a company or a country producing unsafe food and the resulting financial damages (AAFC, 2007). As BSE showed us, the cost to the public purse often far exceeds the direct consequences of managing the emergency itself. These damages could include penalties, loss of trade, damage to a commodity's reputation and its loss of brand name equity (goodwill). Traceability systems are a means to share information, and also have the ability to clarify accountability along the supply chain. Improved traceability increases the identification and isolation of the source of a food safety problem. Establishing accountability enhances the effectiveness of the threat of liability to serve as an incentive for companies to ensure the quality of their products. If traceability increases the probability of detecting a food safety problem that can be traced to poor production or handling practices at a particular company, then the overall level of food safety should improve. Traceability acts as a disciplinary mechanism on the marketplace when combined with credible, effective and enforceable law. Improved traceability should also reduce the costs to downstream food retailers or processors of monitoring the activities of upstream suppliers and enforcing appropriate and safe production practices upstream (AAFC, 2007).

A further economic reason for enhanced traceability is the reduction in information costs for consumers arising from quality verification (AAFC, 2007). Traceability in and of itself does not deliver hard dollars to consumers; however, the quality assurances resulting from a traceability system provides value and benefits to them. Traceability allows for enhanced labelling related to food safety, animal welfare, etc. and this labelling provides a certain amount of product quality verification. The use of a traceability system can also be part of a larger quality assurance strategy or policy for food products that facilitates the verification of both food quality and source (AAFC, 2007).

A worthy public policy question is whether traceability is a private good or a public good. This has significant implications on how costs of providing traceability are shared along the agri-food chain, as well as the role of government in providing traceability for public health benefits. The next section presents an overview of the public versus private goods debate.

Traceability as a Public Good [5]

Private goods are provided in the marketplace at a cost to the consumer of the good or service. Food items, such as meats and vegetables are considered private goods, just as car repair service from a mechanic is considered a private good. Pure public and near-public goods are goods and services that many users can benefit from and with little or no direct cost to them. An example would be street lighting. These goods are different because the private market incentive to provide these goods is weak and from society's perspective they would be supplied at sub-optimal levels. In the case of pure public and near-public goods, governments typically intervene in the market place on society's behalf to ensure sufficient supply.

Toll goods (and club goods) are near-public goods that are excludable but non-rivalrous and they exhibit characteristics of both private and public goods. A common example of a toll good is an uncongested toll road or bridge. Having more than one car on the road doesn't affect its availability to other drivers, but it is possible to control access to the bridge from users not willing to pay. Club goods are also non-rivalrous and somewhat excludable. These are goods whose benefits are shared among a specific group of individuals and the costs of providing the good are shared among the club; and the benefits are limited to club members. Hobbs (2009) puts this into a traceability perspective:

> *The classification of private, public, toll and club goods within the traceability system takes two perspectives: (i) the traceability information itself, including the infrastructure that delivers that information; and (ii) the key 'benefits' or outcomes of a traceability system.*

Hobbs (2009) goes on to conclude that information provided by a traceability system should be considered a toll good. This information is not available to everyone because one must have authorized to access the data. It is non-rivalrous because more than one authorized user can access the same information without reducing its availability to others. And as with other toll goods, public or private availability of the traceability information is possible. If the information was only available as a private good, the owner of the information would have significant power over the data and system in general. This is a reason for government intervention; governments can enact regulation to ensure appropriate access to the information by the competent authority.

Public Good vs. Commercial Benefit

A significant challenge for whole-chain traceability is the balance of costs and benefits throughout the members of the chain. In other industries, it has been demonstrated that benefits will outweigh the costs when calculated for the entire chain; but not necessarily for each member of the chain. To ensure the participation of all members of the chain, it may be necessary to balance or re-balance the benefits and costs throughout the chain. Without this, some members of the chain might be unwilling to participate even though the overall chain benefits from the traceability system.

Economic efficiency demands that companies take all benefits and all costs into account when establishing production levels. This includes costs imposed on the company externally and benefits received by individuals other than the consumer. If the external costs are not accounted for, too much of

[5] This section draws upon Hobbs et al, 2009

the consumer good will be produced. If the social benefits are not accounted for, too little of the good will be produced.

Currently, regulatory compliance is the strongest motivating factor for implementing traceability systems. This however results in lowest potential business value. Only by opening up to improvement possibilities in other areas, can food businesses capture the power and full value of whole-chain traceability. (Sparling and Sterling, 2005)

While this externality problem exists to some extent for all goods, it is often considered to be small and therefore can be ignored. When there is potential for large negative impacts on public health, the externality issue provides a justification for public regulation (IFT, 2009). Without such regulation, profit maximizing companies may not allocate sufficient resources to activities protecting public health, particularly if the potential threat has a very low probability. While the threat of the potential legal claims by injured parties might provide some incentive for companies to provide additional resources to protecting public health, many companies' resources are small compared to the potential damages, providing little incentive to invest in the protection of public health at a socially optimal level.

Traceability is in precisely this scenario. Systems can provide direct benefits to companies by increasing efficiencies in the management of inventories, improvements in product flow and management of inputs, reducing costs associated with a product recall, and access to markets where buyers require traceability. These direct benefits may be sufficient to overcome the costs of implementing a traceability system, which would allow the food industry to respond more rapidly to product recalls and other events. Often critical in product recall situations, the failure to be able to fully trace product can have significant negative effects on the entire industry. (IFT, 2009)

Why should industry and governments share in the cost of traceability?

Private sector cost savings arising as a result of improved traceability systems include reduced costs associated with product recalls, cost reduction associated with maintaining consumer or market confidence in product, reduced materials and inventory management costs, as well as further cost reduction associated with reducing or eliminating the occurrence of firms not practicing due diligence. (AAFC, 2007)

Both governments and industry should invest in traceability. Benefits will exceed the costs, only if an integrated and comprehensive information system for traceability is built that can:

- Strengthen and protect consumer confidence in the event of an emergency;
- Help with all phases of emergency management from prevention/containment, planning, response and recovery and for all types of emergencies – from natural disasters, food safety recalls, animal or plant disease outbreaks, residues or agri-terrorism;
- Protect animal health in the event of contagious disease outbreak;
- Enable business to grow, retain or regain market access;
- Enhance brand protection when counterfeit goods enter or are identified in the market place;
- Enable lower insurance costs. Operators investing in traceability can gain a substantial savings in product recall cost and liability insurance fees;
- Reduce liability by enabling due diligence;

- Contain the scope of incidents in time and space before they become an emergency. For example, having pinpoint product withdrawal instead of a massive recall; or limiting large-scale animal culls;
- Raise efficiencies in supply chain management – by reducing inventory levels, matching input purchases and delivery to product output and sales.

Public cost savings associated with improved traceability systems include avoided costs associated with limiting (or eliminating) an outbreak of a food borne disease. These cost savings are typically measured in terms of reduced societal costs: medical costs, reduced productivity losses, as well as reduced psychological or other costs arising from a widespread food borne illness (AAFC, 2007).

5.0 Implementing a Cost Sharing Regime

The role of Regulations and Incentives [6]

Safe food and good nutrition are important to Canadians. Maintaining the safety of Canada's food supply is a shared responsibility among government, industry and consumers. However, much debate has occurred on implementation issues. Should we use voluntary or compulsory methods? Who should pay? These questions often reflect ideological viewpoints.

Cash (2004) has outlined ways that government can participate in regulating the food and health interface, and why government involvement is important. Some considerations include:

- Government intervention into the public realm is justified in the presence of market shortcomings. In terms of food policy and health, the single most important gap is the lack of full information, especially on the part of consumers. When a lack of information is a significant deficiency in the marketplace, a government can step in directly to provide information or can impose regulations to compel manufacturers to act to fulfill information requirements.

- The high societal costs of diseases related to food consumption are an important issue that would not be properly accounted for in the absence of interventions. In addition, there are other "special" roles assumed by government that are relevant here. The protection of children and a general interest in individual health beyond the costs imposed on society are all part of the debate regarding appropriate food and health policies.

- A related issue is the regulation of producers' and manufacturers' health claims. On the one hand, allowing producers to advertise the beneficial effects of their products can help bring about a healthier population. On the other hand, too many health claims lead to consumers being swamped with dubious information. The challenge for government is it must not allow health claims to be used as a marketing tool if the net effect is to decrease the public health. Second, it must proceed in ways that do not lessen the effectiveness of health promotion. The

[6] This section draws on Tyrchniewicz and McDonald (2007)

government must also consider the issue of validating the health claims.

- There is considerable debate regarding the regulations surrounding functional foods and nutraceuticals, which are both regulated by Health Canada.

- There is a perception that foods produced in Canada are subjected to more stringent food safety standards than are imported foods.

While the above discussion focused on the role of government in food safety, the same concepts apply to the role of government in food traceability.

Experience in Other Jurisdictions

This section reviews traceability experiences from other countries, in particular regions that have been using traceability, such as the European Union, Asia and the United States.

European Union:

The EU's General Food Law entered into force in 2002 and made traceability compulsory for all food and feed businesses in Europe. It requires that all food and feed operators have a traceability system that is able to identify where their products have come from and where they are going and to rapidly provide this information to the competent authorities. (European Commission, 2007)

The EU has published guidelines which require companies to document the names and addresses of the supplier and customer in each case, as well as the nature of the product and date of delivery. Companies are encouraged to keep information on the volume or quantity of a product, the batch number if there is one, and a more detailed description of the product, such as whether it is raw or processed. (European Commission, 2007)

	Overall responsibilities	Actions taken when a risk is identified
Food and feed businesses	• Identify and document information on products "one step forward and one step back" in the food chain.	• Immediately withdraw the affected products from the market and, if necessary, recall them from consumers. • Destroy any batch, lot or consignment of feed that does not satisfy food safety requirements. • Inform the competent authorities of the risk and of the action it has taken.
Member State authorities	• Monitor production, processing and distribution of food and feed products to ensure that operators have traceability systems in place. • Fix and enforce appropriate penalties for operators that do not meet EU requirements on traceability.	• Ensure that operators are meeting their obligations. • Take appropriate measures to secure food safety. • Trace the risk backwards and forwards along the food chain. • Notify the Rapid Alert System for Food and Feed (see box).
The EU	• Establishes sector-specific legislation on traceability as appropriate. • The Food and Veterinary Office of the European Commission carries out regular inspections to ensure that food and feed operators are meeting food safety standards – including the implementation of traceability systems.	• The European Commission alerts members of the Rapid Alert System for Food and Feed of the risk. • Requests information from operators to enable traceability and coordinates action by national authorities. • May impose import/export restrictions.

Source: European Commission, 2007

Japan

Japanese law requires a full traceability system only for domestic beef. For other foods, Article 3 of Japan's Food Sanitation Law requests that each operator keep records to identify all their suppliers and customers. The approached used is a "one-step-back" and "one-step-forward" record. Although this request is similar to Article 18 of the European Union's EC Regulation 178/2002, in Japan this type of record keeping is only recommended and is not compulsory. Japanese regulations do require labelling of the place of origin for fresh food and minimally processed food, not only at retail level but also at wholesale level. However, a record-keeping system to verify origin area by providing documentation is only recommended, not legally required, per Article 3 of the Food Sanitation Law. (Setboonsarng, et.al, 2009)

The Japanese Agricultural Standards (JAS) system was established in 1950 and is managed by the Ministry of Agriculture, Forestry and Fisheries (MAFF). One of the main components of the JAS system is its compliance certification systems. Products meeting the JAS requirements are allowed to display the JAS logo. These standards are voluntary. Originally, the JAS standards were intended to assure general product quality and standardized labelling. However, in the 1990s, MAFF expanded the JAS system to cover specific methods of production. These expanded standards, called Specific JAS, cover: processed meat products; free-range chicken; organic foods; and other products disclosing production history and methods (Setboonsarng, et.al, 2009). Producers and packers displaying the JAS logo are required to maintain records to verify production methods and segregation management.

While this is not a full traceability system, it provides a level of source verification, a precursor to traceability. The JAS standards were created to differentiate high-quality products from common products and are not expected to expand to encompass the entire food market.

MAFF has provided funding for projects such as developing traceability systems utilizing advanced ICT and formulating a handbook to guide the establishment of traceability systems. The handbook covers definitions, basic objectives of traceability, the role each operator should play to establish traceability, and how to proceed with the introduction of a traceability system. It outlines examples of general traceability systems as well as guidelines for specific food items (Setboonsarng, et.al, 2009).

USA[7]

The US has four key Acts associated with traceability. These Acts have been updated to reflect recent food related incidents, with the most recent being the addition of the "Tracing and Recalling Agricultural Contamination Everywhere Act.

Country of Origin **Labelling (COOL)**: mandatory COOL for beef, pork, lamb, fish, shellfish, fresh fruit, vegetables and peanuts. Birthplace, rearing, slaughter, and pack location information is required, as well as records identifying sources and recipients of food transactions. Traceability records from at least port of entry are required for imported products.

[7] Taken from Tyrchniewicz and Tyrchniewicz, 2009

***Federal Meat Inspection Act/ Poultry Inspection Act/ Egg Inspection Act*:** regulates meat and meat food products are unadulterated, wholesome, and properly marked/labelled/packaged. HACCP principles and traceability measures in case of a recall are required for meat and poultry.

Tracing and Recalling Agricultural Contamination Everywhere Act of 2009: amends the Federal Meat Inspection Act to direct the Secretary of Agriculture to establish a traceability system for all stages of manufacturing, processing, packaging, and distribution of food.

Perishable Agricultural Commodities Act (PACA, 1930)**:** require traceable records of all pertinent information regarding transactions of perishable commodities to be kept for two years.

6.0 Concluding Observations

The primary objective of this paper is to build awareness and provide input into policy and program development for traceability as a core capacity for Ontario's agriculture and food industry. The paper identifies and considers policy issues relevant to impact of agri-food traceability on public health and economic development and trade, within the context of the 2011 federal-provincial governments' commitment to mandatory livestock traceability.

General observations

- Traceability is vital to the success of Ontario's agriculture and food industry. Food safety, animal health management and traceability combine to improve Ontario's approach to public health, food recall and disease control.
- Traceability systems help protect animal health, public health and food safety. During an emergency, traceability systems can reduce response time significantly. Traceability systems can also reduce the economic, social and environmental impacts of other types of emergencies, such as a food safety issue or a natural disaster.
- Traceability is demonstrably a key tool in risk management in both industry and government.
- Traceability systems are increasingly a requirement for international trade.
- Increases in the recorded incidence of food borne illness and the recent history of high-profile outbreaks of illness that have been linked to food have created both political and economic demands for more effective controls. Outbreaks can be very expensive.
- Contamination of foodstuffs by microorganisms, chemicals, toxins and allergens can occur at any stage of the process from food production to preparation. In addition, food contamination may occur through environmental pollution.
- The recent development of novel foods, such as genetically modified foods, adds to these concerns. Internationally, new regulations on food authenticity, traceability and nutritional labeling are under consideration. In Europe, new regulations are already being developed, thanks

to a history of weak control over problems associated with food, animal feed, and animal diseases. Europe is also experiencing a crusade to restrict the production and use of foods and feed ingredients derived through biotechnology. People are also demanding that these foods and food ingredients be labeled. Similar concerns have been voiced in Canada and elsewhere.

- Maintaining the safety of Canada's food supply is a shared responsibility among government, industry and consumers. Large retailers putting pressure on suppliers to have a traceability system (McDonalds, Wal-Mart, etc.). However, debate is rising on implementation issues. Should we use voluntary or compulsory methods? Who should pay? These questions often reflect ideological viewpoints.

- The challenge for traceability is the balance of costs and benefits throughout the agriculture and food chain. Usually benefits will outweigh the costs when tallied for an entire chain; but not necessarily at each level. Without addressing this, individual firms may well refuse to implement a traceability system that would deliver a net benefit to the chain. A good value chain will work with all members to ensure success. Value chains need good leadership! What is the role for government? What is the role for industry?

- Cooperation and participation along the value chain is essential. The two Japanese case studies showed that for a traceability system to be operational, cooperation among stakeholders in the supply chain was essential. There was a need to first establish a body responsible for gaining agreement and consensus within the supply chain. An association of traders, producers, or processors of a specific food product can often play this coordinating role for all the small stakeholders in all stages of the supply chain. For establishing this coordinating body, public sector involvement was essential. Once established, the public sector role was diminished and the governing body could take on the role of maintaining the system, supported by member fees.

- Public funding for traceability in agri-food value chains is crucial, especially for smaller business stakeholders. The experience in Japan shows that large companies have the resources and motivation to invest in their own internal traceability systems to increase their efficiency and reliability in the market. However, for building systems that involve multiple stages of the supply chain and include smaller suppliers, public funding is crucial. In Japan’s case, local and regional governments have often provided the initial support for establishing and testing the systems and producer associations have often provided the coordination among the businesses.

- One key lesson is that the amount of resources needed to support adequate consultation among stakeholders is often underestimated. This can lead to a lack of consensus among traceability system stakeholders.

- Outreach and education is essential. Traceability systems are most effective when all the supply chain participates in a system. The outreach and promotion of the traceability system must be part of the system’s maintenance. Promotion not only attracts more participants, which ultimately increases the number of traceable supply chains, it also educates consumers on the reasons for the sometimes higher prices as a result of the investments.

Public Policy Observations and Issues

- Governments are well placed to work with industry groups to coordinate a traceability system and can offer regulatory and non-regulatory incentives to assist in reaching full compliance of the system as well as facilitate dialogue between food chain stakeholders.
- The agriculture and food industry and Canadian governments share a common desire to protect public health by reducing the risk of consuming a contaminated product or contracting a zoonotic disease.
- Governments want to limit the extent that public funds need to be used to assist a seriously damaged industry or sector recover after an emergency such as an infectious disease outbreak.
- Public funding for traceability in agri-food value chains is crucial, especially for smaller stakeholders, including the primary production sector.

7.0 Policy Recommendations

- Governments know they must invest in traceability systems to protect public health and maintain consumer confidence. The challenge is where is the best place to invest? While site or business specific investments are needed, they are not sufficient for a functional provincial system that fits into a national framework. Provincial governments need to invest in provincial scale infrastructure.
- The agriculture and food traceability and public health initiatives and visions should have an appropriate "political champion," perhaps out of the Premier's Office. Departments that should participate include: Agriculture, Food and Rural Affairs; Health and Long-Term Care; and Economic Development and Trade.
- The governments and industry stakeholders involved in implementing the vision should define the role of governments, industry and society (from an information, regulatory, and incentive-based perspective) for an integrated agriculture and food traceability and public health policy.
- Participating agencies should develop and appropriately fund a research strategy and structure to support an integrated agriculture and food traceability and public health policy. Ontario can take a leadership role in establishing such a centre of excellence.
- Participating governments and stakeholders should make monitoring and data management central to any agriculture and food traceability and health policy. More attention needs to be paid to the development of an integrated strategy. This built-in evaluation component is necessary in order to develop a useful, evidence-based approach, as opposed to piecemeal and "after the fact" analyses and ad hoc programs.

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9.0 APPENDIX A Brief History of Traceability in Canada and Ontario[8]

Livestock traceability initiatives began in Canada in 1990 with the creation of the National

Advisory Board on Animal Identification, which was later transformed into the Livestock Identification Working Group. In 1998, the Canadian Cattle Identification Agency (CCIA) was created to coordinate the cattle sector's identification initiatives. Federal funding supported the building of that system; industry commitment continues to support its maintenance and operation. In 2001, Québec became the first province to formally legislate its commitment to traceability with the creation of Agri-Traçabilité Québec (ATQ), a not-for-profit industry-government partnership with a mandate to lead provincial agricultural traceability initiatives and systems. Québec created a comprehensive regulatory framework for animal identification, premises identification and animal movement recording first for cattle (2002), followed by sheep (2004).

The creation of CCIA and ATQ were prescient events for Canada's agri-food industry. At the time, the crises overseas in the U.K. and other EU countries drove changes. European and U.K. industries were devastated by the economic, political and consumer confidence issues emanating from BSE and Foot and Mouth Disease. The value of uniquely identified and readily traceable animals was made very clear – and shortfalls in the existing system were visible globally. The value of traceability systems in Canada would soon start to be understood. The Canadian government, under the authority of the Health of Animals Act, introduced regulations for national cattle and bison identification in 2001 and for sheep in 2004.

In 2003, the Agricultural Policy Framework (APF) signalled the importance of traceability to federal and provincial governments and solidified program funding to continue to advance traceability for national agriculture and agri-food organizations. In 2003, Can-Trace and in 2005, the Canadian Livestock Identification Agency (CLIA) were created. Both were the first multisectoral / multi-commodity initiatives designed to lead development of common national standards.

In 2005, the federal, provincial and territorial (FPT) governments formally recognized the unique opportunity to use traceability information systems for many applications, the benefits derived from traceability both for public and private good, and the importance of a coordinated, industry/government approach by creating a FPT Traceability Task Team (TTT).

In 2002, the Ontario On-Farm Food Safety Initiative began and in 2003 a strategic steering group recommended a strategy to achieve a shared vision, including a traceability component, which was intended to proactively strengthen on an on-going basis the on-farm component of the Ontario Food Safety System. The joint industry/government strategy that was recommended was to establish two oversight bodies, comprised of leaders from commodity groups, industry and government. The intent was to provide direction to project teams and facilitate the development of on-farm food safety and traceability initiatives. One recommendation was to create a coalition for on-farm food safety.

[8] *Towards a National Agriculture and Food Traceability System*, Agriculture and Agri-food Canada, 2006

The other was to create a Traceability Task Force that would: (1) identify Ontario agri-food premises within a national framework, and (2) develop a provincial traceability node for crops and livestock. The Traceability Task Force engaged both government and industry leaders through the course of 2004 and 2005. The result of that effort was the Ontario Traceability Task Force report in October 2005 that recommended the creation of an Ontario Agri-food Premises Registry (OAPR) and a provincial 'node' with an operating mandate and authority to lead traceability initiatives for the province.

In early March 2006, OnTrace Agri-food Traceability was incorporated, and a few weeks later, the Ontario Government provided a one-time grant of $10 million for an Ontario premises registry system to assist the province's agri-food industry to strengthen emergency management and capitalize on market opportunities.