

An organic sector macroenvironmental scan Organic Agriculture Centre of Canada

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Introduction

The concept of organic farming

The first organic farmers envisioned a minimal input system that used recycled materials and was in-sync with nature. The goal was to promote a balanced and healthy ecological production system. As organic production became more popular and a market developed, a need for standardization developed in order to ensure that produce sold as “organic” conformed to specific production principles. This has led to the current situation in which the organic sector struggles to define, in measureable terms where possible, what this ecological system represents, while recognizing that the production system must:

- Be realistic and practical in order to make it viable in a commercial context
- Not push the cost of food beyond the reach of the consumer

In order to meet these needs, the organic sector made compromises. Organic agriculture does not represent the ultimate system in terms of ecological production. The organic sector, however, attempts to strike a balance between what is desirable and what is practical. Consider a production spectrum with conventional agriculture at one end and the ultimate ecological production system at the other.

Conventional agriculture → Zero-tillage practices → Low input farming → Organic production → Ecological production

The progression from conventional agriculture to the ultimate ecological production system moves from the farmer’s adoption of zero-tillage practices to the incorporation of low input practices and then on to organic production.

There is no distinct delineation between conventional and organic agriculture. In some cases, the only difference between organic and conventional production is the certification process. Organic production is slowly transitioning into a regulated system that requires extensive documentation and third party certification. However, organically grown products are not always certified. For example, in cases where there is an existing relationship between the producer and the consumer and the market is of sufficient size, the business relationship between the organic producer and the consumer is built on trust and proceeds without the benefit of certification.

What is organic agriculture?

Organic agriculture is based on principles that articulate its contribution to the world and embody a vision to improve agriculture globally.¹ These overarching principles guide good stewardship of animals, plants, soils and water in the production, preparation and distribution of organic food and other organic products. The principles relate to the way in which people interact with the environment, work together and create a future for humanity.

Four ethical principles form the basis for organic agriculture:²

- **Principle of health** – Organic Agriculture should sustain and enhance the health of soil, plant, animal, human and planet as one, and are indivisible.
- **Principle of ecology** – Organic Agriculture should be based on living ecological systems and cycles, work with them, emulate them and help sustain them.
- **Principle of fairness** – Organic Agriculture should build on relationships that ensure fairness with regard to the common environment and life opportunities.
- **Principle of care** – Organic Agriculture should be managed in a precautionary and responsible manner to protect the health and well-being of current and future generations and the environment.

What is Canadian organic agriculture?

Organic food is often described in terms of what it is not, rather than what it is. Organic food is produced without the use of synthetic pesticides such as fungicides, insecticides, rodenticides, defoliant, desiccants or wood preservatives; synthetic fertilizers; sewage sludge; synthetic veterinary drugs such as antibiotics and parasiticides; or synthetic growth regulators such as hormones.³ Organic products are processed without the use of irradiation; synthetic processing substances, aids or ingredients; or food additives such as sulphates, nitrates and nitrites. In addition, organic products are not exposed to equipment, packaging materials, storage containers or bins that contain a synthetic fungicide, preservative or fumigant and organic products are never derived from genetically modified organisms.

Organic production is a system designed to work in concert with natural or ecological processes. For all of the activities that are not permitted, there are also guidelines, grounded in ecological principles that detail what must be done in terms of good stewardship. Ecologically sound crop rotations and the maintenance of soil quality are just two examples of good stewardship. A “permitted substances” list, rather than a restricted products list also supports organic production.

Organic production works as a closed ecological system that emphasizes the optimization of resources such as light, nutrients and water; the recycling of materials to maintain a balanced ecosystem and the minimization of losses from the natural system. Organic producers maintain this closed system by optimizing soil quality and by promoting functional, genetic and structural biodiversity in naturally occurring and domesticated animals, microorganisms and plants. The organic production system also provides additional consideration for animal welfare, the viability of farms, as well as the interaction between agriculture and society. A rigorous record keeping system, as well as a verification system for production maintains the integrity of the organic system and tracks the identity of the product through to sale.⁴

Organic standards present a balance. These standards will be regulated and the subjective nature of the standards will be removed. Canada has had a national organic standard since 1999 and the organic sector has worked with the Canadian General Standards Board to update the regulations.⁵ Canadian organic production is governed by the Organic Production Systems General Principles and Management Standards which details acceptable organic agricultural practices and the Organic Production Systems Permitted Substances Lists which lists substances that organic producers can use to produce organic products.

In December 2006, the Canadian Food Inspection Agency (CFIA) started accrediting new organic certification bodies based on the recommendation of existing accreditation bodies.⁶ Certification bodies ensure that organic farms or processing facilities comply with the organic standard. Trained independent inspectors visit farms and processing facilities annually to document compliance. The new organic standard, now enshrined in law, also permits the creation of a new federally managed organic office.

The definition of organic is less transparent when organic production is described as a “holistic system of production with a principle goal to develop productive enterprises that are suitable and harmonious with the environment”⁷ or “an ecological production management system that promotes and enhances biodiversity, biological cycles, and soil biological activity.”⁸ The terms “holistic” and “harmonious” are subject to interpretation and clear, unambiguous measurements that quantify enhanced biodiversity, biological cycles and soil biological activity have been elusive.

Organic agriculture has also been described as a system that minimizes the use of off-farm inputs and its practitioners are dedicated to the restoration, maintenance and enhancement of ecological harmony.”⁹ While these elements of agricultural production make organic farming unique, farmers’ definitions of restoration, maintenance and enhancement of ecological harmony may not always be consistent. Nevertheless, the public’s perception of the organic sector, in general, is that it is pristine and in harmony with nature.

Being held in high regard, however, is also a challenge for the organic sector because, for a select group of consumers, the current definition of organic is passé.¹⁰ This increasingly sophisticated segment of the organic market is pressing the sector for additional information that goes beyond the regulated definition of organic in Canada and in other global jurisdictions. In order to address this issue, it will be necessary to consider the evolution of the organic consumer in Canada as well as the development of Canadian food markets. The organic market in Canada has been a late bloomer and has only come into its own over the last few years. In Europe, on the other hand, organic production and consumer attitudes towards organic food are quite advanced relative to Canada, and are supported, in part, through government policy. From its roots, organic production has been inherently local in every region of the world, even though it was not defined as such. Initially, the organic sector grew as consumers, for a number of reasons, began replacing conventionally produced foods with their organic equivalents. Demand for organic food products has slowly pushed the organic food sector towards large-scale production, increased automation and, at times, the sector has reached the point of full-scale industrialization. This may be due to the globalization of the food supply. The food supply system is supported by subsidies and an efficient and effective transportation system that has produced a functioning international market for organic food.

In Canada, the agricultural economy tends to be restricted to the production of commodities. It tends not to be a processor of commodities and tends not to add value to primary production. With a tradition for the transfer of processed goods from the US and other regions of the world to Canada, Canadians have been exposed to a wide selection of food products from around the world. This includes a wide range of organic as well as conventional food products.

The organic sector continues to evolve. Some consumers of organic food products are moving “beyond organic.” These consumers are interested in establishing a greater connection with food producers and the regions in which their food is grown. In some cases, this means that the organic consumer prefers to consume locally grown food rather than organic food that has been transported over greater distances. However, the concept of local has not been integrated into the organic standard, in part, to allow for the development of the sector without restricting the products and/or ingredients that consumers were used to purchasing. The goal is to have a complete spectrum of organic products that could replace all conventionally grown agricultural products. Consideration was not given to the distance food products travelled. As the organic movement continues to evolve and new issues and trends appear, increasingly sophisticated consumers continue to pose increasingly challenging questions such as:¹¹

- ***Is the organic food product grown on a family farm or on an “industrial” farm?*** One must remember that many family farms can be quite large. For example, the average farm size in Saskatchewan is 1,152 acres – and many of these are run by family corporations.¹² Since almost seven percent of all farms in Canada report that they grow organic products,¹³ some organic farming operations could be quite large, yet would also be family owned and operated.
- ***Is the food grown locally?*** This issue is challenging. Do consumers wish to support local producers or are they concerned about the number of “food miles” that have been traversed to get the product to their tables – or are both issues equally important? The Institute of Grocery Distribution (IGD) in the United Kingdom (UK) reports that the number of UK consumers concerned about food miles has almost doubled over five years.¹⁴ About 16 percent of Britons indicate that the distance food travels is one of their top five issues with food production.
- ***Have the farm animals been treated “humanely?”*** Canada does not regulate the term “humane” and the definition of humane is subject to interpretation. Consider an example from the organic egg industry. Vancouver, the host city for the 2010 Winter Olympics, chose to remove the eggs from caged hens from all city food service facilities. City council and the mayor also recommended that all city residents choose certified organic free-range eggs.¹⁵ However, not all free-range eggs are organic and not all organic eggs are produced by free-range chickens. Hens raised in battery cages produce about 98 percent of Canadian eggs.¹⁶ While Certified Organic Association of British Columbia (COABC) and Pro-cert certified organic egg production systems are “higher welfare” production systems and hens raised under these guidelines can behave more naturally, they are not free-range. And while free-range chickens have some access to the outdoors, Canada has no regulations covering free-range chickens and the US, while it regulates free-range chickens, does not regulate the production of eggs from free-range chickens. Where the US regulates the term “free-range,” there are no requirements on the level of access that a free-range chicken has to the outside environment.
- ***Is organic meat and milk produced from cloned animals?*** The US Food and Drug Administration (FDA) has declared cloned livestock as safe to eat.¹⁷ The European Food Safety Authority (EFSA) has also determined that meat and milk from cloned animals is not deficient in nutrients and there is “no evidence of any abnormal effects” in the offspring of clones. The US Center for Food Safety (CFS), on the other hand, calls the USDA study “flawed” and notes that there were inadequate checks on possible side-effects from the consumption of meat and milk from cloned animals.¹⁸ The CFS states that the USDA selectively reported its data to “fit predetermined conclusions” and relied too much on unpublished data from two cloning corporations. The consumer group also alleges that animal cloning raises animal cruelty issues and the USDA should also examine ethical issues related to the use of cloning technology. The issue of meat and milk from cloned animals could also become contentious in the organic sector – and could leave consumers confused as to the status of food products derived from cloned animals.

- **Is the food “fair trade” food?** While organic traditionally implies compliance with environmental guidelines, “fair trade” products tend to incorporate some aspect of social consciousness. In more altruistic terms, organic food offers peace of mind for personal health, while fair trade presents a vision of hope for the future.

While the organic sector has been growing at a rate of almost 20 percent per year, it only encompassed about 2.5 percent of all food sales in Canada by 2005.¹⁹ The number of consumers posing more specific questions about where organic food comes from and how it is produced is an even smaller subset of the total. Nevertheless, food retailers are responding to these questions, despite the small size of the market and the small size of the consumer base.

Other issues that may need to be addressed by the organic sector include the relationship between organic farming and “low input” farming. Is organic farming low input if producers apply the same level of nutrients as conventional farmers, but use livestock manure or green manure instead of synthetic fertilizers? Can a product be considered organic if it displaces an indigenous crop in the developing world that was once grown to support a farm family? Is there a relationship between organic farming and “slow food”?

Clearly, feeding the world is a complex issue – and it is unlikely that the organic sector has the capacity address all of the issues within the context of organic production. Nevertheless, organic research specialists need to understand food sector issues in order to design solutions to the challenges faced by organic producers. The organic research community has chosen to develop a better understanding of the issues facing its producers through the use of macro-environmental scan or a STEEP analysis. A STEEP analysis looks at **S**ocial, **T**echnological, **E**conomic, **E**nvironmental and **P**olitical-legal-regulatory trends that need to be considered before developing a research strategy. This may help the organic sector “see” what the future could look like and to pose the questions that need to be asked about how the industry could integrate itself into the future macro-environment. A STEEP analysis identifies positive as well as negative trends – and may not always present an organization in the most positive light. Strong, dynamic organizations focussed on creating a successful and sustainable future, however, see a need to assess the positive as well as the negative in order to make the best decisions on behalf of their members and stakeholders.

The organic sector will use the trends identified in the STEEP analysis in conjunction with a SWOT analysis, which has also been completed by SVC as part of this project. In a SWOT analysis, **S**trengths and **W**eaknesses address *internal* organizational factors while **O**pportunities and **T**hreats address factors that are external to the organic sector. This SWOT analysis will focus on the potential for the organic sector to take advantage of macroenvironmental opportunities by investing in Canadian research and extension projects. Existing strengths within the research community will allow the Canadian organic sector to capitalize on opportunities quickly. The research community will also have to assess its weaknesses and determine the extent to which it wishes to invest in areas in which it is weak. The results of this assessment will depend on the specific opportunity and the relative competitive position of the Canadian organic sector compared to that of competing nations. The question to be answered is, “Should the organic sector invest in research in order to compete, or are competitors so strongly entrenched in a market that it would be difficult to catch up in a cost effective manner?” This SWOT audit will allow the organic sector to scrutinize its strategic objectives and then to create a clear picture of the research issues that the sector must address to achieve its objectives. Organic sector research stakeholders will use the STEEP and SWOT analyses in combination with a research priority planning process in order to set research goals for organic agriculture in areas as diverse as animal welfare, crop production, ecology and the environment, marketing, policy and social interests.

SVC has drawn on a large array of resources in preparing the STEEP analysis. Anne Macey’s *Certified organic production in Canada 2005*,²⁰ *Retail sales of certified organic food products in Canada in 2006*²¹ and *Organic agriculture in Canada*²² provided a wealth of information. A *national strategic plan for the Canadian organic food and farming sector*,²³ authored in 2002 by R. MacRae, R. Martin, A. Macey, R. Beauchemin and R. Christianson was particularly valuable in providing a historical context on a number of issues and continues to provide insightful direction for the organic sector. British Columbia’s organic sector is at the forefront in the area of provincial strategic plans. The *British Columbia organic sector initiative strategic plan, 2002/03 - 2004/05*²⁴ proved to be particularly useful in compiling the Canadian organic SWOT analysis. Important technical information was gleaned from *Improving sustainability in organic and low input food production systems* from the Proceedings of the 3rd International Congress of the European Integrated Project Quality Low Input Food (QLIF) edited by U. Niggli, C. Leifert, T. Alföldi, L. Lück and H. Willer.²⁵

Executive summary

SVC has summarized all social, technical, environmental, economic and political-legal regulatory trends in point form.

Social trends

- The organic sector appears to be devoting more time and effort convincing consumers that the consumption of organic food and the adoption of an organic lifestyle have merit. On the other side of the debate are those who support the production of agricultural products in a manner that is not consistent with the principles of organic production and use production practices that are not accepted by organic producers. This conflict appears to have evolved into a “battle for the hearts and minds” of consumers.
- This debate may be creating a situation in which the public is increasingly confused by the claims and counter-claims made by both organic supporters and their detractors.
- There is growing interest in a second “green revolution” designed to eliminate global food shortages. Many have interpreted the term green revolution as a rapid transformation of farming in developing countries with high-yield crops grown with high levels of inputs. The United Nations, however, has suggested that moving to organic agriculture could help alleviate hunger and improve the environment as part of a second green revolution.
- Many are developing an interest in lowering the distance “from farm to plate” to reduce both environmental and carbon footprints.
- Genetically modified organisms (GMO) containing unique traits are increasingly providing new options for lowering levels of human disease and suffering as well as improving livestock and crop health and quality.
- Affluent, well educated, health conscious consumers are driving demand for organic food products – and the size of this market is increasing because of demographic and income shifts.
- The rapid growth in the consumption of organic foods has its roots in consumer concern over pesticides. Given that organic agriculture is based on the four principles of health, ecology, fairness and care, the public is largely unaware of most of what organic agriculture stands for.
- The public perceives organic food to be safer than conventionally produced food products. Organic food companies see sales increase when mainstream food markets suffer because of tainted food scandals or contaminated products in the food chain. This issue is not unique to Canada. Hong Kong consumers are also more interested in organic goods after a series of Chinese food scandals.
- Canadian farmers’ support for organic production is growing. This “social contract” underpins market growth and encourages increases in production capacity and improvements in distribution efficiency.
- Governments are increasingly wary of groups that are opposed to Genetically Engineered (GE) food because of the potential to disrupt public confidence in food and the economy.
- Public figures are speaking out in greater numbers against those who advocate for environmental causes.
- A select group of consumers want to move beyond the current scope of organic. This increasingly sophisticated segment of the organic market is pressing the sector for additional information that goes beyond the regulated definition of organic in Canada as well as in other global jurisdictions.

Technological trends

- Innovation in the organic sector tends to be driven from an individual rather than an industry-wide level.
- The smaller size of organic farms creates technical issues for organic farmers when farm equipment is tending to get larger. There are exceptions, however, as manufacturers such as Kubota that have focussed on smaller scale equipment.
- For organic livestock operations, there is a need for smaller slaughter facilities and mobile abattoirs. A mobile abattoir not only meets organic producers’ needs, but also provides the consumer with access to high quality, locally available meat products.

- While organic operations tend to be small, higher volumes of organic production will push organic producers to expand production capacity. Support for the conversion of conventional farms to certified organic farms will also help increase organic production capacity, but the farms that are targeted for conversion may tend to be larger than typical organic farms. While organic farms tend to be small, the need for higher levels of organic production may create a trend towards larger organic food producing operations.
- Industry funding for technical advances are not specifically targeted towards the production of organic commodities and do not necessarily consider the development of the organic value chain.
- Canadian initiatives in organic research pale in comparison to what is available for research for organic agriculture in the European Union (EU) – and investment in organic research in the EU continues to rise.
- Organic food production will be increasingly critical in feeding the world's hungry, according to the United Nations (UN) Food and Agriculture Organization (FAO).
- One of the factors that may keep the organic sector from improving its production capacity may be the effort required to keep GMOs out of organic production systems and the organic value chain. This issue will continue to be a problem for the organic sector and will likely get worse as the number of transnational corporations developing and registering superior Genetically Modified (GM) germplasm in Canada and the United States (US) increases.
- The organic sector is increasingly able to develop innovative and creative solutions to common agricultural problems. In some cases these solutions are also applicable to conventional farming operations.
- Environmental and ecological problems such as loss of biodiversity, pollution and soil erosion are increasing in conventional farming operations but are less of an issue in organic systems.

Economic trends

- Organic production is one of the fastest growing sectors of the global food industry and represents a massive export opportunity for organic farmers.
- Organic food is one of the fastest growing product categories in the food industry.
- The global organic land base has expanded rapidly and continues to grow.
- Organic producers continue to be unable to meet demand for organic food products.
- Growth in consumption of organic food will likely depend on increasing the number of occasional buyers and by converting occasional purchasers of organic products into regular buyers. Occasional buyers, because they freely substitute organic products for products designated “low input,” “free range,” “local” or “integrated production” need to be convinced that only food products designated as organic products are held to the highest standards. Once convinced that only food products labelled as organic will suffice, occasional buyers will become regular buyers of organic food products.
- The creation of a national organic logo increases the number of producers transitioning to organic production and increases the number of processors of organic goods.
- Competition in the global organic wheat market will increase as eastern European countries enter the sphere of the EU.
- Global retail food chains are concentrating ownership. The trend to consolidation is being driven by the need for earnings growth, the desire to maintain high stock valuation and the ability to improve returns by increasing the scale of the operation. This increases food chain purchasing power and lowers the cost of purchase of information technology systems. The threat to organic producers from retail consolidation is the increase in the buying power of the transnational owners of many of the world’s organic food processors.
- Innovative distribution systems, such as vending machines, are being introduced for organic food products in a number of jurisdictions.
- There is increasing resistance to big business within the organic community from those who fear larger operations have the capacity to muscle out smaller family farms.
- Consumers are reducing spending on food purchases as the economy worsens. If the current recession continues, consumer spending on food will continue to decline. Growth in the organic food sector is expected to level off.
- Rising food prices are expected to increase the level of acceptance of the use of GM crops for food production.
- Sales of organic pet foods are increasing as people become more aware of what they are feeding their pets.

- Insufficient price premiums for organic grain producers are leading to a reduction in organic grain acreage as farmers convert back to conventional crop production in some jurisdictions.

The United States of America

- Dollar sales of organic food in the EU and the United States (US) are similar, at about US\$13B and US\$10B, respectively. However, the US achieves these sales with almost no financial assistance and no direct subsidies to organic producers, whereas the EU subsidizes its organic sector by over \$US35M annually. The EU also supports conversion to organic production, helps fund organic research needs and sets targets for organic farmland whereas the US does not.
- Growth in the US organic market is driven by:
 - ✓ A clearly defined, government standardized meaning of organic that works in conjunction with an effective certification system
 - ✓ Consumers who believe that certified organic food products contribute to health and wellness, encourage environmental responsibility and create a better work environment for farm labourers
 - ✓ The widespread availability of certified organic products in traditional retail outlets.

The European Union

- Growth in organic markets is higher in the southern, central and eastern European countries. These countries have smaller organic food markets compared with other European countries and growth figures for organic food products are similar to those in North America.

Southeast Asia

- Consumers of organic food products in Asia tend to be those with higher disposable incomes.
- China is the fastest-growing organic food product market in Asia at 30 percent.
- Growth in the Japanese organic market is driven by:
 - ✓ A tradition of close ties to the natural world
 - ✓ The central role of food in Japanese culture
 - ✓ The need to import food. Since the global food supply contains more organic food than in previous years, Japanese consumption of organic food increases (by default) as food imports increase.

Canada

- Supermarket growth in organic food sales was highest in Alberta at 44 percent, followed by the Maritime provinces and British Columbia at 34 percent, Ontario at 24 percent and Québec at 21 percent, respectively.
- Organic food sales were forecast to increase by up to five fold between 2006 and 2010.
- Organic food retail operations continue to develop new models for food delivery to customers.
- Organic livestock production is one of the fastest growing organic sectors.
- Producers are expanding production and are beginning to sell their products through brokers and wholesalers.
- Canadian organic operations face challenges similar to those that confront conventional farms, including a shortage of processing infrastructure, lack of labour, high land prices, urban encroachment, a shrinking land base suitable for farming, an aging farm cohort and lack of access to pest control products available to competitors in other jurisdictions.
- The number of organic food processor and handlers continues to increase, however, the level of infrastructure in the organic sector is inadequate.

Environmental trends

- Organic farming practices are reducing the volume of subsurface drainage water discharges.
- Organic operations are lowering the rate of nitrate loss from agricultural systems, and in some instances, allowing farmers to reduce fertilizer requirements without compromising yield.
- Organic practices are improving nutrient uptake efficiency and increasing water infiltration due to improved soil quality and more diverse land use patterns.

- There is a trend towards a lower surplus of nutrients on organic dairy farms and lower nutrient loads that can reduce the impact the organic operation on off-farm air and water quality.
- Canada has a varied land base and a cooler climate, which lowers the incidence and severity of infestation from pests and diseases in many crops – providing the country with a stronger image as an environmentally friendly, fresh and pristine country that produces natural and safe products.
- Despite the environmental benefits associated with organic food production, the organic sector has been challenged on its environmental record – particularly when it comes to calculating the high environmental cost of transporting organic food products long distances.

Political, legal and regulatory trends

- Human obligations regarding the care of animals are becoming entrenched in regulations. Animals have the right to freedom from hunger and thirst, which includes access to a source to fresh water and an appropriate diet; freedom from discomfort, which includes a comfortable environment that consists of shelter and a resting area; freedom from pain, injury and disease by preventing problems from occurring and through fast diagnosis and timely treatment when problems arise; freedom from fear and distress, which includes ensuring proper living conditions and appropriate handling; and freedom to express normal behaviours, which means the provision of sufficient space, housing and the company of other members of the animal's own species.
- There is a trend towards lack of organic certification that will continue without organic product legislation. A number of "organic" producers are not interested in becoming certified organic producers. Some are operating successfully without certification, have a steady clientele that includes local restaurants and are satisfying the demand for local, flavourful, organically grown food. Others choose to sell their products with limited and specific claims such as environmentally friendly or pesticide free. In addition, not all organic producers see certification as their top priority. Other producers incorporate organic "principles" into their farms even though their business models do not include organic certification.
- Lack of compliance with organic cultivation regulations is becoming more of an issue, particularly with organic food products imported from developing nations.
- Countries banning GMOs are increasingly under international pressure to remove what are seen as non-tariff trade barriers and face lawsuits that have been brought forward by the US, Canada and Argentina to the World Trade Organization (WTO).
- EU approvals for GM crops are increasing.
- Manufactured nanoparticles are an emerging issue with consumers and may push a new group of consumers to the consumption of organic food products.
- Contamination of organic crops is occurring; and it is proving to be more and more difficult to keep GM contaminants contained, even when these GM crops do not have full regulatory approval.
- Transnational companies are starting to protect themselves by taking legal measures to ensure that farmers using their genetic events are aware of export restrictions. Since the organic sector has declared itself GM-free, this can make it difficult for organic producers to claim compensation from larger transnational companies when their organic crops become contaminated with GM material.
- New industry standards for US biotechnology-based crop companies have been announced which include third-party auditing in order to help boost consumer confidence that biotech crop development is governed by strict safety standards.

Macroenvironmental scan – Social issues

The organic sector devotes a great deal of time and effort to convincing consumers that the consumption of organic food and the adoption of an organic lifestyle have merit. On the other side of the debate are those who support the production of agricultural products in a manner that is not consistent with the principles of organic production and those who use production practices that would not be accepted by organic producers. This conflict appears to have evolved into what could be termed a “battle for the hearts and minds” of consumers.

This conflict may be counter-productive over the long term because it tends to distract industry players and reduces their ability to focus on strategic issues that contribute to industry growth and stability. “Pro-organic” supporters appear to expend considerable effort debating issues that contribute little to moving the sector towards any particular goal. Some of this effort tends to be directed towards refuting claims made by what have been termed “anti-organic chemical missionaries.”²⁶ This debate can have a negative effect by creating a situation in which the public is increasingly confused by the claims and counter-claims made by both organic supporters and their detractors – and the public can be left questioning the credibility of those on both sides of the debate. The section “Hearts and minds” will consider eight topics and will question whether there is value in the organic industry pursuing these issues. All of the subjects chosen for this section have been reported in a major Canadian organic publication, the Canadian Organic Growers (COG) Newsletter.

Hearts and minds

1. Genetically modified foods are unsafe and present a food safety risk

The organic food industry does not allow genetically modified (GM) foods and often cites food safety as one of the reasons for its opposition to the use of GM technology. However, many political jurisdictions, including Canada and the United States (US), have determined, after an examination of the scientific evidence, that the consumption of GM foods is safe and allow the sale of GM foods in their respective countries. In addition, European Union (EU) courts have ruled that arguments that invoke the Precautionary Principle do not have sufficient scientific substance.²⁷ Austria, one of the EU member countries most opposed to GM crops, recently lifted its ban on the importation and processing of GM corn.²⁸ Since many consumers do not wish to consume GM foods and many consider GM foods to be harmful,²⁹ it may be sufficient to offer a GM-free option for those consumers without raising the issue of food safety.

Three Canadian students petitioned Health Canada to label food products that contain genetically modified organisms (GMO) so that consumers would be better informed about what they were eating and could avoid the “safety risks of Genetically Engineered (GE) foods.”³⁰ In Canada, food labelling is a joint responsibility, shared by Health Canada and the Canadian Food Inspection Agency (CFIA) and falls under the Food and Drugs Act. The CFIA is responsible for developing labelling policies and regulations – and before any GM food can be sold in Canada, it must go through a seven to 10 year process to test its safety before it is approved. Bill C-287, which would have required the labelling of Canadian foods containing GMOs, was defeated in the House of Commons by a vote of 126 to 91 on October 17, 2001³¹ – seven years before the students petitioned their campus food services. Health Canada has determined that Canadian food products that contain ingredients derived from GM materials are safe and require no special labeling. There is a Canadian standard for “Voluntary Labelling and Advertising of Foods that are and are not Products of Genetic Engineering” – and Canada adopted this as a National Standard in April 2004.

While the students are commended for their passion for a cause about which they feel strongly, the method chosen to illicit change may not have been the most effective because they did not petition the agency responsible for labelling, the CFIA. The group also petitioned their university food service supplier to provide at least one organic meal in all campus cafeterias – but failed to advocate for the potential benefits to be derived from the consumption of organic foods. Unfortunately, the credibility of the organic sector can be affected when well-intentioned groups promote its causes without a full understanding of the issues.

A report on GM crops referred to a United States Department of Agriculture (USDA) observation that 61 percent of corn and 89 percent of soybean varieties planted in the US in 2006 were GM varieties.³² Mr. Ronnie Cummins, national director of the Organic Consumers Association, commented on this report and mentioned the incorporation of human genes into rice – implying that this event should be seen in a negative light. What Mr. Cummins failed to mention was that the USDA had approved trials for a genetically modified rice strain that contained proteins that could be used as an anti-diarrheal medication.³³ According to the United Nations (UN), diarrhoea is the third ranked cause of

death in children under five years of age and accounts for 17 per cent of all childhood deaths in the world.³⁴ This rice-based technology had the potential to alleviate human suffering on a very large scale and the statements made by Mr. Cummins could leave the organic sector open to criticism for being alarmist and/or lacking in credibility.

2. Genetically modified crops are not safe for the environment

GM canola has been reported to produce wild mustard resistant to the herbicide glyphosate (Roundup®).³⁵ According to the reporter, these hybrid weeds are persistent and a concern, “despite millions being spent on propaganda to calm the nerves of irrational consumers and other overwrought folks worried about the environment . . . who fear there is something potentially dangerous about genetic engineering.” What the reporter failed to mention was that weeds resistant to herbicides first began to appear in non-GM crops and occurred long before the introduction of GM crops anywhere in the world. Wild mustard has been resistant to photosystem II inhibitor herbicides in Ontario since 1983 and Manitoba since 1994,³⁶ to acetolactate synthase (ALS) inhibitor herbicides in Manitoba since 1992, Alberta since 1993, Australia since 1996, North Dakota since 1999 and Turkey since 2001; and to synthetic auxin herbicides in Manitoba since 1990.

Herbicide resistance in weeds is not uncommon and will continue to occur naturally in both GM and non-GM crops as plant populations evolve in response to selection pressure from herbicides. In this instance, there was an opportunity to educate, by informing supporters of organic production that selection pressure is always operating in nature and that organic systems provide a benefit by exerting selection pressure on weed populations in different ways than in conventional agricultural systems that use herbicides. Whether or not natural selection is a threat to the environment is not made clear in this report. Neither is it clear why selection for herbicide resistance in weeds is an important issue for the organic sector when organic producers do not use herbicides. Unfortunately, the organic sector has little influence over individual reporters and may have been able to do little to prevent the dissemination of confusing information that did not promote the benefits of organic agriculture. Nevertheless, this was an opportunity to present the value of organic production methods in preventing an increase in the incidence of troublesome weed biotypes, and that opportunity was lost.

3. Pesticides are unsafe and present a food safety risk

The popular press have reported that the link between pesticides and Parkinson's disease is stronger than ever.³⁷ There were three elements to this story: In one study, farm workers using paraquat herbicide had two to three times the risk of developing Parkinson's; a second study indicated that animals exposed to paraquat accumulated alpha-synuclein, a protein linked to Parkinson's; and another study suggested a connection between a build-up of alpha-synuclein and the killing of brain cells affected with Parkinson's. What was not mentioned was that the primary researchers said that exposure to paraquat might not be enough to cause the disease, but may increase the probability that Parkinson's disease could develop. They also added that inflammation also could be a factor in the development of Parkinson's and that multiple concussions causing inflammation in the brain could raise the risk as well. The researchers noted as well that teachers and health care workers have a higher-than-average risk of developing Parkinson's disease and suggested that the frequent exposure to viruses by these two high risk groups may be a contributing factor. The researchers then went on to speculate that exposure to pesticides while suffering from brain inflammation could raise the risk of Parkinson's disease years later. None of these clarifying issues were reported in the article. The only point that was made was that there might be a link between pesticides and Parkinson's disease.

Women living near California farm fields treated with organochlorine insecticides have been reported to be more likely to have children with autism.³⁸ While the COG Newsletter reported a link between pesticides and autism,³⁹ the director of the California Department of Public Health reported that very preliminary data suggested that there may be an association and that there was no causal relationship between the exposure of pregnant women to pesticides and the incidence of autism in their children.⁴⁰ What was also omitted in the COG Newsletter report was that these women, compared to the average US worker, had lower levels of access to workers' compensation, unemployment insurance and health insurance.⁴¹ Their families tended to live in poverty and many received food stamps. Many were unemployed at some time during the year and only about half of those who were unemployed applied for unemployment benefits. A better approach may have been to point out the relationship between organic operations, and, for example, the fair treatment of its employees, or employee access to health care, rather than focusing on preliminary results linking autism to pesticides.

In another story, a farm pesticide applicator apparently exposed California schoolchildren to farm chemicals linked to sickness, brain damage and birth defects.⁴² The report also noted that a teenager's family suspected that pesticides caused her death. What is more important is that there are no US laws that prohibit spraying near schools, and where states do have legally mandated pesticide buffer zones around schools, the laws or regulations are not enforced. In addition, the pesticide applicator was unlicensed and no one reported the incident, so county inspectors took no samples to determine whether or not the pesticide had even drifted into the playground. While the COG Newsletter reported that the farm chemicals were linked to adverse effects, the editors failed to mention that University of California, Berkeley epidemiologist Dr. Brenda Eskenazi said that the effects of small repeated exposure of pesticides on children were not clear. With regard to the teenage girl whose family suspected that pesticides caused her death, health authorities never confirmed that 15-year old Chrissy Garavito's death had any link to pesticides.

What all of these stories illustrate is that there was no clear-cut relationship between pesticides and human health in any case and that the cause of human disease is often poorly understood. A balanced approach to reporting these types of stories may be preferable and, rather than focusing solely on one factor, many factors may need to be considered. A more balanced approach to these types of issues may be required in order to encourage members of the public to first approach experts in the organic sector for credible information on a wide range of food issues. In addition, there may be some onus on the part of the editors and the publishers of the COG Newsletter to investigate the claims made in the popular press and on the internet in order to better inform and educate its readers.

4. Pesticides are the cause of Colony Collapse Disorder (CCD) in honeybees

The COG Newsletter reported that environmental toxins could be reducing honeybee populations in New Brunswick, Ontario and the northeastern US.⁴³ The story also notes that researchers at the University of Illinois (U of I) may have linked bee losses with pesticide use. In the original account by the CBritish Columbia, Dr. May Berenbaum, head of the Department of Entomology, U of I, notes that chemicals may affect the bees and not allow them to remember their way home.⁴⁴ Dr. Berenbaum goes on to suggest that there is evidence that neonicotinoids are linked to declining bee populations in France. According to the USDA, France banned its only neonicotinoid insecticide, imidacloprid, in 2005.⁴⁵ While some field studies indicated that the insecticide could harm honeybees, other studies showed no effect on honeybees. In the three years since the ban of imidacloprid in France, there has been no recovery in honeybee populations.

The issue is even more complicated with evidence that CCD may not be a new disorder. Wilson and Manapace reported on Disappearing Disease (DD) of honeybees in 1979, based on surveys conducted by US State Bee Inspectors in 1975.⁴⁶ At the time, beekeepers with the highest incidence and severity of DD were honey producers in northern regions purchasing packaged bees, queens or both from southern states of the US.

The USDA has concluded that CCD could be caused any combination of factors including:⁴⁷

- Varroa mite
- New or emerging honeybee diseases such as *Nosema spp.* which is related to *Microsporidian giardia*
- Pesticide poisoning from crop applied pesticides and/or in-hive insect or mite control products
- An immune-suppressing stress caused by one or more of the above factors
- Stresses such as poor nutrition due to overcrowding, the pollination of crops with low nutritional value or a shortage of pollen or nectar
- Drought
- Migratory stress caused by moving honeybees long distances for pollination services. This stress could be caused by the confinement of honeybees during transport, increased contact among colonies or the increased the transmission of pathogens.
- Stress compromising honeybee immune systems, making them more susceptible to disease

Dr. Rob Currie, a bee specialist at the University of Manitoba suggested that organic bees may be less susceptible to CCD for several possible reasons. Organic bees tend to be less stressed than conventionally managed honeybees because they tend to be moved less for commercial pollination, tend to be managed more intensively and are not exposed to pesticides to the same degree as compared to conventionally raised honeybees.⁴⁸ Dr. Currie also pointed out that organic bees are contracting CCD and mentioned that Dr. Jerry Bromenshank of the University of Montana has reported cases of CCD in organic honeybee colonies in the US. Clearly, CCD is a complex disease that is

currently poorly understood. It may have developed many years before it became a widespread problem. This suggests that it may be more helpful for the organic sector to present a complete account of the numerous factors that are suspected to be involved in this devastating disease rather than focusing solely on the link with pesticides.

5. High yields through high input farming destroy indigenous crops and create loss of peasant livelihood in developing nations

The Bill and Melinda Gates Foundation have collaborated with the Rockefeller Foundation and have committed US\$150 million (M) to a “green revolution” in the interest of eliminating food shortages in Africa.⁴⁹ Many interpret the term green revolution as the rapid transformation of farming in developing countries with high-yield crops grown with high levels of inputs. African scientists and farmers have raised concerns that such a green revolution will destroy indigenous crops, curtail the livelihood of peasant farmers and may not even be feasible since non-indigenous crops have high moisture requirements and Africa is seeing an increase in desertification. There is fear that peasant farmers will be excluded from this process. The fear of this green revolution, however, is largely unfounded. While some may disagree with the approach taken to address the food shortages in Africa, it is important to not lose sight of the goal of this initiative – to feed people who do not have access to sufficient quantities of food.

6. Organic agriculture will help contribute to food security in developing countries

In a presentation at a UN conference, agricultural researchers suggested that moving to organic agriculture could help alleviate hunger and improve the environment.⁵⁰ Many have dismissed organic agriculture as an option in discussions about feeding the hungry because crop yields can drop as much 50 percent in the conversion from conventional to organic production – even though these decreases even out over time. Danish researchers, however, contend that European and North American farmers could convert half of the agricultural land to organic production by 2020 without affecting the food security of sub-Saharan Africa. The researchers acknowledge that total food production would fall, but land improvement and other benefits could mitigate against the rise in world food prices. It is not clear, however, how the production of lower volumes of more expensive food will help feed the hungry or how land improvements will mitigate food losses on a global scale. This is not to say that organic agriculture does not have place in contributing to food security in developing countries, but the benefits of organic production could be better articulated and the benefits of organic production to sub-Saharan African food security may need to be articulated with more clarity and in more detail.

7. Migratory birds are being poisoned by pesticides in southern regions

Another issue raised in the popular press includes the poisoning of migratory birds by pesticides in the southern regions of North America and in Central and South America.⁵¹ In fact, the scientific community has yet to determine the cause of the decline in the populations of some migratory birds.

8. Non-organic livestock production is cruel

Some have suggested that non-organic livestock production is cruel.⁵² This assertion could pull the organic sector into another prolonged debate with those who argue that livestock production, organic or otherwise, is always cruel.

An important question for the organic sector may be, “how does bringing these issues before the public and engaging in these debates improve the position of organic producers and the funders and researchers who support them?” Would redirecting the time and energy spent engaging in these types of debates be better spent promoting the industry in a manner that would have a broader appeal to the general public? Would such a change in strategy persuade a greater percentage of the general public to see value in the purchase of organic products and help the industry grow?

The battle for hearts and minds – a summary and a challenge

Many in the organic sector are concerned about the public perception that the consumption of organic food is only a health issue. Given that organic agriculture is based on the four principles of health, ecology, fairness and care, the public is largely unaware of three-fourths of what organic agriculture stands for. When the regulatory system embeds the principles of organic agriculture within its framework, the nuances of the four principles of organic production may be lost. Conventional (non-organic) agriculture also has distinct sets of industry practices and standards.⁵³ What lies between these two extremes is a growing list of products that have been termed “natural,” “naturally raised,” “cage free,” “free run” and “free range.” All of these products have characteristics common to

both organic and conventional agricultural standards. The range of organic and organic-like standards may leave a high level of uncertainty in the mind of the consumer as to what it is that he or she is actually purchasing.

Dr. Ann Clark, Associate Professor, University of Guelph states that nutrition, in addition to freedom from pesticides and GMOs, drives the consumption of organic products.⁵⁴ It may not be surprising, then, that supporters of the organic sector put so much emphasis on negative information associated with the use of pesticides or GMOs. This directs the organic message towards those who fear pesticides and GMOs. But is this a good strategy? Are those who do not wish to consume foods treated with pesticides or foods grown from GMOs already the most dedicated purchasers of organic food products? If this is the case, then the organic sector may be targeting those with a preference for organic food products and this strategy may not persuade consumers who have never or have rarely purchased organic food products to try something new. Resolving this dilemma may depend on where the potential organic customer lives. In the US, few citizens are concerned about biotechnology.⁵⁵ An older Gallup poll indicated that 80 percent of respondents felt that conventional food purchased in a supermarket was safe and only about 25 percent felt that food containing GMOs was a health hazard.⁵⁶ A large majority of US consumers trusted that the Federal Drug Administration (FDA) would protect them. In Britain, however, over 66 percent of those surveyed worried about eating food containing GMOs and only one percent believed that GMOs benefited society.⁵⁷ In France, over 50 percent of those surveyed had serious concerns about GMOs.⁵⁸ In Asia and Oceania, public opinion on GMOs was similar to that in Europe.⁵⁹ Canadian attitudes towards GMOs fell between those of continental Europe and the US.⁶⁰ By focussing on the GMO issue in its public communications, the organic sector in North America is only reaching the 25 percent of the public who fear GMOs.

By targeting those who do not wish to consume GMOs or food produced using pesticides, the organic sector is focussing on only one of four organic principles, thereby limiting market penetration to about one quarter of Canadian and US citizens. The rest of the population is not that concerned about pesticides and/or GMOs and choose to purchase conventional food products. The challenge may be to capture the interest of consumers who currently do not buy organic food products but may be persuaded to purchase them in the future. If the organic sector redirected its efforts and drew attention to the organic commitment to ecology, fairness and care, more consumers might see value in the purchase of organic products. The organic sector would then be appealing to a broader range of consumer interests, which should lead to sustainable increases in sales of organic food products.

Who is buying organic and why do they choose to purchase organic food products?

Worldwide, consumers are interested in organic food because of health issues⁶¹ and because the consumption of organic food products is perceived to be better for the environment.^{62, 63} About seven percent of US organic food consumers also link personal health with environmental health and to these consumers, organic food purchases support an integrated set of values.⁶⁴ Consumers also link food consumption to family health⁶⁵ and concern for their children is an important consideration among those purchasing organic food products.⁶⁶ Affluent, well educated, health conscious consumers are driving demand for organic food products – and the size of this market is increasing because of demographic and income shifts.⁶⁷ Organic consumers, overall, are looking for competitively priced fresh food that looks and tastes good and is convenient to use. Others, however, may not interpret the term organic consistently,⁶⁸ may not even understand what organic farming practices are and may not appreciate the quality attributes of organic food products. At the far end of the spectrum, some Canadian consumers are not even sure what organic means.⁶⁹

Those who support organic markets include a core group of regular purchasers of organic food and a second segment that purchases organic food occasionally.⁷⁰ Some consumers support organic farming and food processing and choose organic food products because they do not want others to see their food choices as controversial. Overall, the public is increasingly supportive of the environmental goals of the organic sector and believe these goals contribute to personal health and the environment.

Consumer attitudes towards organic food can vary depending on the product. For fresh food or products that have not been processed heavily, organic food offers freshness and purity. Organic food tends to be fresher because these products usually come through short distribution channels.⁷¹ For more heavily processed products, organic evokes an aura of safety compared to current “industrial” food processing.

Consumer integration of organic products into their lifestyles is growing in some product categories but is flat in others.⁷² Eighty-eight percent of consumers report purchasing the same amount of or more environmentally-friendly

food compared to six months earlier. About 60 percent would like to spend 20 percent more for “sustainable” food products and only 17 percent of consumers are buying fewer natural and organic foods.⁷³ However, what is not apparent is whether those who purchase organic products regularly consider organic products as regular shopping items or as luxury goods.⁷⁴

The rapid growth in the consumption of organic foods has its roots in consumer concern over pesticides. From the late 1980s to the early 1990s, consumer apprehension about pesticide residues in food increased significantly – with 76 percent of Canadians being somewhat to very concerned.⁷⁵ Over half of Canadian households purchased organic food in 2006 because of concern over the use of pesticides and fertilizers.⁷⁶ Awareness of certified organic food among consumers doubled between the late 1980s and the early 1990s.⁷⁷

The public perceives organic food to be safer than conventionally produced food products. Organic food companies see sales increase when mainstream food markets suffer because of tainted food scandals or contaminated products in the food chain.⁷⁸ Consumers are looking for alternatives to mass-produced goods with safety issues at a time when confidence in Canada's food supply is “moderate and precarious.”⁷⁹ Consumers are even less confident in the safety of imported food, which they view as a “major threat.” This issue is not unique to Canada. Hong Kong consumers were also more interested in organic goods after a series of Chinese food scandals.⁸⁰

In a 2002 poll of 1,500 Canadians, 85 percent say they were concerned about the effect of chemical food additives on their health.⁸¹ While 14 percent were not concerned about food additives, 50 percent were very concerned and 35 percent were somewhat concerned. Ninety-one percent of women were concerned about the potential effect of food additives on their health, as were 91 percent of those between the ages of 45 and 54, 89 percent of those who lived in Ontario and 90 percent of those living in British Columbia. Men, however, tended to be unconcerned about the potential health effects of food additives (20 percent) along with those between the ages of 18 and 24 (21 percent), francophones (26 percent), Québécois (24 percent) and manual workers (20 percent). Fifty-five percent of those surveyed ate organic products; with one percent eating organic products exclusively and 17 percent eating organic products often. Thirty-seven percent of those surveyed consumed organic products rarely.

The Organic Ethnic Purchase Index, a measure of how likely individuals in different ethnic groups are to purchase organic products suggests that compared to Caucasian Americans, Asian Americans and Latino Americans are more likely to purchase organic products.⁸² The Core Organic Consumer Index, a measure of the likelihood that members of different ethnic groups are core organic users, suggests that Asian Americans and Latino Americans tend to be much more likely to be core consumers of organic food and beverage products than Caucasian Americans.

The organic community and social contracts

The organic community consists of consumers and producers with shared principles.⁸³ Not only is consumer support for organic food products increasing, but Canadian farmers' support for organic production is growing as well.⁸⁴ This “social contract” underpins market growth and encourages production capacity and distribution efficiency.⁸⁵ The result is that there are more organic farms and greater availability of organic food in stores. Some argue that the organic community also creates social benefits for individuals and society. Choosing to live an organic lifestyle is all about choosing to “feel better about (ones) choices (and choosing not to be) just another depersonalized consumer in the world's mammoth industrialized food production chain, a system that devalues labour . . . and enriches multinational agriculture conglomerates”⁸⁶ and choosing to “(leave) behind clean soil, air and water on which future generations can thrive.”⁸⁷

Criticism of the organic sector

The organic sector benefits from a good reputation that has developed because of what it stands for:⁸⁸

- Organic products meet rigorous standards
- Products with organic certification offer assurance that products have been grown and handled according to exacting standards
- Organic farms produce food sustainably while respecting our water and other natural resources
- Organic farming practices build healthy soil while working in harmony with nature
- Organic agricultural practices respect the balance required to maintain healthy ecosystems
- Organic operations protect wildlife, wetlands, and other natural areas

- Organic producers lead in many areas with innovative research, largely at their own expense
- Organic production systems preserve natural diversity and promote the collection and preservation of rare seeds and unusual plant varieties
- Organic farming promotes the creation of dynamic, rural communities

However, the reputation of the organic sector is not entirely positive. Internal federal government documents suggest that groups that are opposed to Genetically Engineered (GE) food are a threat to Canadian food security, and may be thought of as threats in the same way those terrorists are considered threats to the nation.⁸⁹ Senior bureaucrats have noted that “propaganda from various groups (has) the ultimate goal . . . (of disrupting) public confidence and the economy.” Some have interpreted this to mean that the federal government may be considering targeting groups opposed to GE food. While this claim may be as outrageous as the one made by officials of the federal government, it is an indication of how quickly the rhetoric can heat up. As an example, Mr. Andy Wells, the mayor of St. John's, Newfoundland and Labrador, has spoken out against Dr. David Suzuki and Mr. Al Gore and has declared both to be “junk scientists.”⁹⁰

Rhetoric aside, 60 percent of Canadians do not trust or do not know if they trust the term organic as it pertains to organic food sold on store shelves.⁹¹ In addition, the level of customer trust in organic food products among those who rarely purchase organic products is only 49. Those between the ages of 45 and 64 and Québécois have the least confidence in organically labelled products with 41 percent and 51 percent, respectively, lacking trust in organic products. Others have argued that the organic sector prevents the food supply chain from connecting with its roots, risks human health by standing on principle and sells products that may not be healthy.

The food supply chain connection to its roots

Some have argued that the increasing popularity of organic food is masking what some see as a more important issue – that of improving overall food quality for all consumers.⁹² As the argument goes, rather than striving to improve overall food quality for the benefit of all, those who can afford organic food benefit from the availability of the highest quality food products to the detriment of those who are less well off financially. This is said to be creating a two-tier food system where only the rich can afford to purchase significant quantities of more expensive organic food. What is needed, some argue, is a food supply chain that puts all consumers back in touch with food by revisiting its roots.

The risk of standing on principle

GMO technology has the potential to save some plant species from diseases and other pests where it may not be possible to protect plants against these pests using organically acceptable techniques.⁹³ In Hawaii, both scientists and native Hawaiians share the goal of saving the ancient taro plant. Scientists believe the only way to preserve the plant is to insert disease resistance genes from other crops such as rice or grapes into taro. Some Hawaiians fear the basic structure of the plant may be altered and have advocated for a state-wide moratorium on the genetic modification of taro for a decade through the introduction of a bill. State lawmakers have stalled the bill, leaving the future of taro uncertain. Many are concerned that without the use genetic technology, the taro plant may be lost.

Micronutrient deficiencies in developing countries increase susceptibility to disease and mortality, particularly in children. For those who cannot afford a varied diet, nutrient-dense staple crops may help overcome vitamin A, iodine, iron or zinc deficiencies. For example, biofortified⁹⁴ sweet potatoes accumulate β -carotene (provitamin A). While these sweet potato biotypes occur naturally, this trait is not available in rice.⁹⁵ Rice produces β -carotene in green tissue, but not in the seed endosperm. As a consequence, rice-based societies have a high incidence of blindness, susceptibility to disease and premature death in children. *Golden Rice* is a GMO that contains two genes that lead to the production and accumulation of β -carotene in rice endosperm. The World Health Organization (WHO) of the United Nations (UN) notes that *Golden Rice* could help prevent 250,000 to 500,000 cases of blindness in children each year and prevent 40 percent of children under the age of five in the developing world from suffering from compromised immune systems.

Golden Rice has generated a lot of debate and many do not agree that this product will provide any substantial benefit. Greenpeace notes that *Golden Rice* provides so little vitamin A that adults and children would have to consume over 4.5 Kg and 3 Kg dry rice per day, respectively, to meet recommended allowances.⁹⁶ The Organic Consumers Association,⁹⁷ Friends Of the Earth⁹⁸ and the Pesticide Action Network Asia and Pacific,⁹⁹ among

others, have also opposed the introduction of *Golden Rice*. The Social Issue Research Centre has now entered this debate in an attempt “to provide a balanced, calm and thoughtful perspective on social issues, promoting open and rational debates based on evidence rather than ideology”¹⁰⁰ – and the battle for hearts and minds continues.

Organic products are not necessarily “good for you”

The WHO has issued a warning against the use of non-cigarette tobacco products because of widespread use among youth.¹⁰¹ These products are often sold in health food stores, leading consumers to mistakenly believe they are less of a health hazard than conventional tobacco products.

Macroenvironmental scan – Technological issues

Research scientists in organic agriculture have the opportunity to add or adapt new technologies to producers' operations. In addition, the research community can innovate and problem solve for the benefit of all members of the value chain. Consider the use of research funds to innovate in the area of field crops, for example. Organic producers, through surveys, have suggested a number of projects that could be initiated. One measure for prioritizing projects would be to choose those that would add the most to gross margin at the farm gate. Gross margin is a producer's total sales revenue minus the cost of goods sold, divided by total sales revenue expressed as a percentage.¹⁰² This figure represents the percentage of sales revenue retained after accounting for the cost of producing the organic product. Companies that maximize gross margin have more money available to service other costs and obligations.

While the research community has solicited input from its farmer stakeholders, the onus is still on the research community to consider these needs in the context of the macroenvironment. It is also important to note that it could take five to ten years to commercialize an innovation or to get the results of the research adopted by organic producers and in use on organic farms. Therefore, the research community needs to look forward in order to efficiently direct their research programs. To accomplish this, researchers will need to answer four questions:

- What are the trends?
- What kinds of organic products will consumers want in five to 10 years time?
- What will producers require in terms of research innovation to meet these future consumer needs?
- Which research projects will contribute the most to gross margins at the farm gate once organic producers have adopted the technology and/or innovations?

Before initiating research studies, the organic community should determine whether there is already sufficient information available, in a database or in research publications that they could summarize in an extension bulletin. A well-developed research network within the organic research community would facilitate this exercise.

Nanotechnology, a science focussed on the imaging, measuring, modelling and manipulation of matter less than one nanometre in diameter¹⁰³, has not yet been accepted or barred from the organic realm and will be excluded from this discussion. Genomics and Marker Assisted Selection (MAS) could provide a means of accelerating classical plant breeding and these technologies could supersede the genetic modification that has led to the production of GM crops.¹⁰⁴ The organic sector may support the use of MAS technology in organic production. However, any discussion of MAS technology will be excluded from this report as well.

Characteristics of organic farms

The characteristics of organic farms need to be considered in the context of technological trends. Organic farming operations tend to be smaller and generally more intensively managed at the field level and in terms of record keeping than conventional farms. Comparative advantages for smaller scale organic operations include the adaptation of micromarketing technologies like bar codes. These technologies are easily integrated into organic production because it is quite simple to track the identity of individual farms. One needs to recognize that automated tracking systems that determine where specific products are being consumed, when and by whom would be simpler to develop and implement for organic, as opposed to conventional operations.

There can be dissension among organic producers in terms of acceptance of new ways of managing production. Organic producers can tend towards growing food "the difficult, old-fashioned way" or producers may use less up-to-date, non-technical means of producing food products. This does not mean, however, that the organic sector cannot harness innovative technologies to provide a competitive advantage over conventional farming operations. What needs to be recognized, though, is that innovation in the organic sector tends to be driven from the individual level rather than an industry-wide level.

The smaller size of organic farms creates technical issues for organic farmers when farm equipment is tending to get larger. There are exceptions, however, as manufacturers such as Kubota that have focussed on smaller scale equipment. For livestock operations, there is a need for smaller slaughter facilities and mobile abattoirs. A mobile

abattoir not only meets organic producers' needs, but also provides the consumer with access to high quality, locally available meat products.¹⁰⁵

While organic operations tend to be small, higher volumes of organic production will push organic farmers to expand production capacity.¹⁰⁶ Support for the conversion of conventional farms to certified organic farms will also help increase organic production capacity,¹⁰⁷ but the farms that are targeted for conversion may tend to be larger than typical organic farms. While organic farms tend to be small, the need for higher levels of organic production may create a trend towards larger organic food producing operations.

Funding

Industry funding for technical advances are not specifically targeted towards the production of organic commodities and do not necessarily consider the development of the organic value chain. Canada has some funding initiatives that support research in the organic sector. The British Columbia Organic Sector Initiative (OSI) Fund tends to target funding for short-term, outcome-based work and each funded project needs to have a sustainability component. OSI will fund projects that include on-farm research, pilot projects, and extension and exchange activities, among others.¹⁰⁸ Agriculture and AgriFood Canada's (AAFC) Advancing Canadian Agriculture and Agri-Food Program (ACAAF) will provide the Atlantic Canada Organic Regional Network (ACORN), in conjunction with the Organic Agriculture Centre of Canada (OAC) with up to \$90,000 over three years to establish a Maritime Organic Grains Network.¹⁰⁹

Canadian initiatives in organic research pale in comparison to what is available for research for organic agriculture in the EU. As an example, the EU Quality Low Input Food (QLIF) project supports a €1 billion (B) organic food industry.¹¹⁰ The goal of the QLIF project is to develop better quality organic produce that is safer and less expensive than what is currently available. This project includes 31 partners from 15 countries and the scope of the project encompasses the entire production chain, from farm to fork, and also considers consumer attitudes and expectations regarding organic products. QLIF is funded through the EU's Sixth Framework Programme (FP6).

Improving production capability

The organic sector will need to improve production capacity nationally in order to meet the growing demand for organic food products. In June 2001 the OAC was launched in Canada with a mandate to support organic farmers through the provision of extension information and the development of new research programs and courses.¹¹¹ In British Columbia, the mandate of the OSI is to ensure the supply of organic food for British Columbia's growing organic markets.¹¹² OSI sees working in conjunction with the Agri-Food Futures Fund (AFFF) as key to improving the production and handling of organic food products. This cooperative venture will allow British Columbia's organic sector to exploit the growing market demand for organic products and become self-reliant. Growth in organic production inputs is strong,¹¹³ suggesting that the organic farmers should not see their production capacity limited due to input shortfalls.

Organic food production will also be critical in feeding the world's hungry according to the UN's FAO.¹¹⁴ In support of this idea, a Michigan report concluded that organic systems produce over 80 percent more food compared with traditional or conventional farms in developing countries. The report was based on an evaluation of 293 case studies.

Keeping genetically modified contaminants out of the organic sector

One of the factors that may keep the organic sector from improving its production capacity will be the effort required to keep GMOs out of organic production systems and the organic value chain. In Canada, organic producers must deal with contamination mostly from GM canola, corn and soybean. Other GM crops are registered in Canada but are not widely grown. In the US, the purity of organic and natural food products is increasingly at risk of contamination by GMOs as the acreage of GM alfalfa, corn, cotton, soybeans and other crops expands.¹¹⁵ Organic industry leaders are trying to introduce testing requirements and certification standards in an effort to reduce the contamination of organic products.

This issue will continue to be a problem for the organic sector with a number of transnational corporations continuing to develop and register superior GM germplasm in Canada and the US. Monsanto Canada has recently announced that three new Roundup Ready® canola hybrids conform to its Yield Ready® standard. These include DeKalb's 72-55 RR, Pioneer's 45H28 and Proven Seed's 9553.¹¹⁶ Monsanto Company is introducing a new GM

soybean that, in addition to resistance to Roundup® (glyphosate) herbicide, will provide growers with yields that are seven to 11 percent higher than those of older cultivars. The new soybean, branded Roundup RReady2Yield® is expected to be available in limited US markets in 2009.

Organic solutions to agricultural production issues

One attribute of the organic sector is its ability to develop innovative and creative solutions to common agricultural problems. Michigan State University in conjunction with AIMar Orchards and Cidery is testing the effectiveness of the release of hogs into an organic apple orchard for the control of plum curculio (*Conotrachelus nenuphar*), a highly destructive apple insect.¹¹⁷ Hogs forage in the orchard and consume immature fallen apples which contain beetle larvae. A successful initial trial has led to the initiation of an additional two year trial. Hogs have also been used to control weeds and other orchard floor vegetation in organic orchards.¹¹⁸

Extension to organic producers

Improved production methodology extension information will be required in order to increase organic production.¹¹⁹ The OSI has a mandate to ensure that the British Columbia organic sector has the information necessary to enable it to supply growing consumer demand for organic food. Some would argue, however, that there is an apparent lack of communication between organic farmers and that these producers need help communicating with each other in order to share their successes and failures.

This type of extension will be important because many organic farmers see organic production as intellectually challenging (which it is) and need support to help understand the complexities of organic systems. Crop protection in organic systems has been a challenge that affects the cost of production as well as organic food safety and quality.¹²⁰ A complex approach to crop protection is required which includes the use of a wide variety of preventative crop protection techniques in conjunction with the integration of companion planting, biological control agents, elicitors and plant extracts. Livestock production is similarly complex and requires detailed knowledge of preventative management measures for maintaining livestock health and controlling livestock disease.¹²¹ Research into calf rearing methods, homeopathic treatments and targeted antibiosis can be time-consuming and expensive – and even after the research has been completed, scientists must have a means of passing this knowledge on to producers in an effective and timely manner.

Leveraging resources outside of the realm of organic agriculture

There are some fundamental differences between the goals of organic agricultural research and those of “conventional” agricultural research. Lockeretz emphasizes that organic research focuses on preventive solutions to the adverse environmental situations and the “side effects” inherent in modern agricultural systems.¹²² Organic research aims to create problem-free production systems, as opposed to conventional research where the focus is on dealing with issues that arise because of the production system and then trying to solve the problem by applying technological solutions. Despite the differences, there is some overlap and it may be possible to leverage some resources from outside of the organic research community.

Organic agricultural research and extension specialists may be able to glean useful information from conventionally oriented research and apply it in the field of organic agriculture. In other instances, diverse members of the agricultural research continuum may be able to cooperate on issues of mutual interest.

Some have argued that the ways in which research scientists conduct organic and conventional research are not that different – the key is to accomplish something tangible.¹²³ What does not matter is whether the research is conducted in a farmer’s field or on a research station; whether it is designed by the researcher or by a participatory team of lay personnel; or whether it is grounded in an archaic ‘Cartesian’ or ‘mechanistic’ worldview rather than a new ‘epistemology’ that is more in keeping with the “new age.” In 2002, Lockeretz offered ways in which agricultural research scientists working in organic disciplines could increase the value of their research. He pointed out that agricultural research scientists working in organic disciplines have a lot to learn from their counterparts conducting research in conventional agricultural systems.

DuPont advocates the conservation of crop diversity as a means of safeguarding the world’s food supply.¹²⁴ A company expert on plant genetic diversity states that “biotechnology will help us develop solutions to challenges that we have yet to imagine, but the potential will be limited without access to historic genetic resources.” The

company has donated \$1M to the Global Crop Diversity Trust, an international organization with a mandate to secure long-term funding that supports world-wide gene banks and crop genetics collections. An interest in preserving gene banks and crop genetics could be an example of a goal common to supporters of both organic and conventional agriculture.

Raoul Adamchak and Pamela Ronald, University of California, Davis, recently completed *Tomorrow's Table: Organic Farming, Genetics and the Future of Food*.¹²⁵ In this report, the authors argue that genetic engineering could provide a means for the organic sector to boost food production in an environmentally friendly manner. As the argument goes, genetic engineering could improve seeds used by organic farmers by introducing traits such as disease or insect resistance, in addition to resistance to environmental stresses such as flooding, extremes of temperature or salinity – traits that are difficult to introgress into plants using conventional plant breeding techniques. This technology offers benefits such as the potential to reduce the need for farm inputs such as fertilizers and pesticides. Adamchak and Ronald contend that the current debate around the use of agricultural biotechnology or genetic engineering and the production of organic food products should not be so polarizing. They argue that genetic engineering could safely improve organic production, provided scientists first evaluate the nutritional, ecological and social consequences of each trait. The down side of not adopting these technologies is the high risk of remaining a small player in global food production and the placement of severe limitations on the potential for ecologically-oriented farming.

Transgenic technology has also reduced the high incidence of throat cancer, liver disease and neural tube defects in fetuses in southern Africa and Latin America as insect tolerant crops such as *Bacillus thuringiensis* (Bt) tolerant corn reduced the production of fungal toxins such as fumonisins on insect-damaged corn.¹²⁶ These fumonisins can also kill horses and hogs.¹²⁷ In many ways, the marriage of the field of genetic engineering with organic production may have some merit; however, the current lack of acceptance of this technology by the organic community makes the probability of integrating these two fields of study very low.

Documented technical benefits of “organic”

Commonly accepted benefits of organic production include environmental benefits, increased nutrient content in organically produced foods compared to those produced using conventional agricultural methods, improvement in human health, lower cost of production, increased profitability and the ability to transfer organic farming techniques to developing countries.

Environmental

Environmental and ecological problems such as loss of biodiversity, pollution and soil erosion that occur in conventional farming operations are less of an issue in organic systems.¹²⁸ Organic cropping systems can also build soil organic matter more effectively than no-tillage cropping systems and the long-term use of organic matter as fertilizer not only increases the efficiency of organic production over time, it also suppresses seed-borne and foliar diseases. It is also possible to incorporate alternative energy sources into organic production in a way that allows the producer to gain value by contributing to the environment in a positive manner.

There appears to be variability in many crop cultivars from which plant breeders could obtain better material for use in organic production systems. As an example, some wheat varieties respond better to improvements in fertility management than others.¹²⁹ In addition, there can be varietal responses to low input conditions.

Nutrient content

It has been difficult to determine whether organic food products have a better nutritional profile than those that are produced conventionally.¹³⁰ In some studies, organic products have been shown to have better nutritional profiles than non-organic products. Organic crops have tended to have higher levels of glucosinolates and vitamin C (cabbage), phenolic compounds (cabbage and potato), phytic acid (wheat) and volatile metabolites (potato) in some studies.¹³¹ In general, the current literature suggests that the vitamin C content may be higher and nitrate levels may be lower in organic produce relative to conventional produce, but nothing has been proven definitively.¹³² Organic cultivation has also influenced fruit quality and antioxidant capacity.¹³³ Highbush organic blueberries from commercial operations had significantly higher levels of sugars, malic acid, total phenolics, anthocyanins and antioxidant activity than those from conventional commercial operations. Organic blueberries also produced fruit with higher levels of delphinidin 3-arabinoside, delphinidin 3-galactoside, delphinidin 3-glucoside, malvidin 3-

arabinoxide, myricetin 3-arabinoxide, petunidin 3-galactoside, petunidin 3-glucoside and quercetin 3-glucoside than conventional blueberries.

In other studies, high input conventional crops have been noted to have higher levels of alkaloids (potato), carotenoids (cabbage, lettuce and potato), protein (wheat) and vitamin E (wheat) than organic crops.¹³⁴ Some studies have produced mixed results. Organic commodities, in some cases, do have significantly higher levels of nutrients than non-organic commodities, but the results are conflicting. For example, milk from both the low-input organic and non-organic systems had significantly higher concentrations of nutritionally desirable fatty acids and antioxidants compared with high-input organic systems.¹³⁵ Poorly managed low input systems where either pesticides or mineral fertilizers have not been applied can produce wheat with high mycotoxin loads and high levels of other undesirable compounds.

In the most complete examination of nutrient levels in organic and non-organic plant-based foods, Benbrook *et al.* examined 11 nutrients in 236 valid matched pairs from a range of studies.¹³⁶ Organic foods were nutritionally superior 61 percent of the time, conventional foods contained more nutrients 37 percent of the time and two percent of the time, there were no differences. About three-quarters of the time, organic samples contained higher concentrations of polyphenols and antioxidants. In addition, the level or nutrients in organic samples exceeded the level of nutrients measured in non-organic samples, by over 30 percent more than five times as often. For five nutrients, quercetin, total antioxidant capacity, total phenolics, vitamin C and vitamin E, total organic nutrient levels exceeded those of the conventional samples by eleven percent or more. The authors concluded that the differences documented justified the conclusion that organic plant-based foods are, on average, more nutritious than conventional plant-based foods.

As noted in the previous examples, organic production can lead to increased nutrient levels, especially those of organic acids and polyphenolic compounds; however, some studies show few differences in nutrient levels between organic and conventionally produced food. There are two hypotheses that attempt to explain these conflicting results:¹³⁷

- Fertilization affects plant metabolism. Synthetic fertilizers applied in conventional agriculture have high levels of available nitrogen that can speed up plant growth. This creates a situation in which plant resources are apportioned for growth and the production of plant secondary metabolites such as organic acids, polyphenolic compounds and amino acids decreases.
- Plants in stressful environments have to withstand attack from insects and plant pathogens. This occurs in organic production systems which limit the use of pesticides and may increase plant stress – causing the plant to allocate greater resources towards the production of chemical defence compounds such as polyphenolics.

Human health

Most consumers of organic food have chosen organic products to avoid pesticide residues. The Environmental Working Group (EWG), a US-based environmental organization has listed 45 fruits and vegetables according to level of pesticide contamination.¹³⁸ The “cleanest 12” include pineapples, mangoes and avocados – with onions being the most pristine. The “dirty dozen” include apples, bell peppers, celery, cherries, grapes imported from Chile, nectarines, pears, potatoes, raspberries, spinach and strawberries – with peaches being the most contaminated fruit. Canadian organic producers grow many of the dirty dozen, including apples, cherries, lettuce, nectarines, peaches, pears, potatoes, spinach and strawberries, in many regions of Canada.¹³⁹ The Pesticide Action Network (PAN) UK’s worst ten foods for residues includes some foods from the EWG list such as apples, grapes, pears, potatoes and strawberries, but adds bread, cucumbers, flour, green beans and tomatoes to the list.¹⁴⁰ Not all support the conclusions of the EWG or the PAN studies. Dr. J. Shwarcz, Director, Office for Science and Society, McGill University, in particular, has criticized the EWG study and has called it “meaningless.”

Some consumers choose organic meat products because the animals used to produce these products have not been treated with antibiotics. The use of antibiotics in livestock production, however, also poses a risk to those who work with livestock. Because of the use of prophylactic antimicrobials in poultry feed, European poultry workers are now 32 times more likely to carry *Escherichia coli* resistant to the antibiotic gentamicin than the general population.¹⁴¹

NATURALLY OCCURRING TOXINS

While higher levels of polyphenolic and other compounds in organic food is a positive nutritional attribute, increases in the levels of secondary plant metabolites may be a health issue.¹⁴² For example, glycoalkaloids occur naturally in potatoes and tomatoes to protect against insect damage. Glycoalkaloids, however, can inhibit cholinesterase enzymes in humans. Celery synthesizes high amounts of linear furanocoumarins when under attack from fungi or when grown in acidic fogs (acidic pollution). These compounds cause contact dermatitis in humans and are potential carcinogens.

Mycotoxins such as aflatoxins, fumonisins and tricothecenes are also a concern in organic food products when fungicides are not used to control plant pathogens.¹⁴³ Aflatoxins, which are not produced at high levels when fungicides are used to inhibit fungal growth, can be a problem in organic corn and peanuts and are known carcinogens, mutagens and teratogens in humans. Fumonisin can cause human oesophageal cancer and can cause cancer and liver damage in rats, leukoencephalomalacia in horses and pulmonary oedema in hogs. Tricothecenes contaminate various grains and the *Fusarium* Head Blight (FHB) toxin deoxynivalenol can compromise mammalian immune-systems and cause gastrointestinal toxicity.

Naturally produced plant toxins can also be produced after the application of pesticides.¹⁴⁴ The mycotoxin nivalenol increases after winter wheat is treated with fungicides to control FHB, suggesting that the fungus may be responding to the stress brought on by the fungicide application by synthesizing high levels of mycotoxins. Herbicide applications have also increased the level of a number of defensive plant metabolites in broad beans, celery, cotton, peas and pinto beans. In all cases, scientists believe plant stress may increase naturally occurring toxins in foods. A number of biological, chemical and mechanical practices used in both organic and conventional agriculture can raise the level of naturally occurring plant toxins.

THE USE OF MANURE IN ORGANIC PRODUCTION SYSTEMS

Manure is used more frequently on organic than on conventional farms – which could increase the risk of bacterial contamination of fruits and vegetables. Diverse microbial communities, however, can also help diminish the threat of pathogens in organic produce.

A similar reduction in risk from pathogens occurs with livestock raised on organic farms. Compared with hogs raised indoors, those raised in organic systems or in outdoor livestock management systems, while more likely to come into contact with *Salmonella*, are more likely to develop immunity, reducing pathogen shedding on the farm and in the abattoir.¹⁴⁵ While enteric pathogenic loads can be higher in organic systems that use livestock manure compared with farming systems that do not use manure, the use of composted manure generally reduces pathogen loads in the farming system.¹⁴⁶ In all farming systems, however, contamination from enteric pathogens occurs at some point. Pathogens appear to be no more of an issue in organic than in conventional systems – in spite of the rhetoric that would suggest otherwise.¹⁴⁷

Cost of production and profitability

The cost of production and the levels of profitability of organic systems can equal those of conventional agricultural systems. A summary of the first eight years of a study comparing organic production to conventional production at Glenlea, Manitoba revealed that organic systems use less energy, emit less greenhouse gas, and have lower costs of production and higher net returns for the producer, despite a lower level of productivity.¹⁴⁸

A study from the University of Wisconsin-Madison and AGSTAT consultants suggests that organic production can be as fruitful as conventional production for some crops.¹⁴⁹ For example, organic alfalfa yield equalled or exceeded conventional production while maintaining sufficient quality to produce an equal quantity of milk as that produced using conventional methods. In addition, organically produced corn, soybean and winter wheat yields were 90 percent of those of conventionally produced crops. The researcher team have proposed that their findings may be widely applicable to the prairie soils of the upper Midwest US. They attributed the lower productivity of organic systems primarily to reduced weed control – but advances in weed control in organic systems could close the productivity gap in wetter years. The team concluded that whether the productivity levels in organic systems are equal to those of conventional systems may be a dynamic question that requires constant re-evaluation.

The technological link between farming techniques in the developing world and organic agriculture

Organic agricultural practices offer solutions to some of Africa's agricultural problems.¹⁵⁰ The livelihood of Africans living in the more impoverished regions of rural Africa are threatened by the depletion of natural resources – and many African countries continue to export commodities rather than develop value-added enterprises. Organic agriculture may be a sustainable option that is complementary to the lifestyle of rural Africa because of its low levels of external-input technology, its promotion of environmental conservation and its input/output efficiency. Currently, there are pockets of organic farms in Africa, but in general, the continent lacks an integrated method of attacking soil regeneration and crop protection issues.

Special management needs in organic systems

Organic systems require specialized management – and a considerable volume of research will be needed to help understand these complex farming systems. Research studies from western Canada as well as other countries indicate that phosphorus (P), an essential plant nutrient, is often deficient or low under organic cropping systems.¹⁵¹ In an effort to understand where P-deficient organically farmed soil occurs compared to conventional cropping systems, P was extracted from soil samples from four distinct fractions. A University of Manitoba (U of M) study revealed that the sizes of the first three P fractions, which are the fractions available to plants, differed between organic and conventional systems, while the fourth fraction, a highly unavailable form of P, was not affected.

The authors stressed the importance of studying the rate of P movement from unavailable to available fractions in order to determine which forms of P were being depleted over the longer term. The implication for organic producers is that moderately available pools of P may sustain the pool of available P for some time, but if the nutrients are not replenished, P depletion is inevitable. Organic producers have several management options for recycling P back into the system and for ensuring that crops make the best use of existing P. Options include the use of livestock manure or green manure and the management of mycorrhizal fungi in organic systems.

Macroenvironmental scan – Economic issues

The global organic food sector

Certified organic food was valued at \$US25B in 2006.¹⁵² At 2007 levels of growth, the organic food and beverage market was forecast to exceed US\$86B by 2009.¹⁵³ Organic production is one of the fastest growing sectors of the global food industry and represents a massive export opportunity for organic farmers.¹⁵⁴ Worldwide, almost 31M ha are certified according to organic standards on 600,000 organic farms.¹⁵⁵ While certified organic production occurs in about 120 countries, 96 percent of the organic food market is in Europe and North America.¹⁵⁶ Australia (11.8 M ha), Argentina (3.1 M ha), China (2.3 M ha) and the US (1.6 M ha) have the largest tracts of land certified for organic production.¹⁵⁷ What is also noteworthy is that between 1999 and 2007, the US organic land base has grown by over 400,000 ha, Italy's has increase by over 110,000 ha and Poland's by over 85,000 ha.

Dollar sales of organic food in the EU and the US are similar, at about US\$13B and US\$10B, respectively.¹⁵⁸ What is different is that the EU has more organic farmland and smaller farms than the US and while the US provides almost no assistance and no direct subsidies, the EU subsidizes its organic sector by over \$US35M annually. The EU also supports conversion to organic production, helps fund organic research needs and sets targets for organic farmland. The US and the EU represent 95 percent of the US\$25B in global retail organic food sales with per capita retail sales being almost equal at US\$34 and US\$36 in the EU the US, respectively.

The European Union

EU markets are segmented into two groups: regular buyers and occasional buyers.¹⁵⁹ Growth in consumption of organic food will likely depend on increasing the number of occasional buyers and by converting occasional purchasers of organic products into regular buyers. Occasional buyers, because they freely substitute organic products for products designated "low input," "free range," "local" or "integrated production" need to be convinced that only food products designated as organic products are held to the highest standards. Once convinced that only food products labelled as organic will suffice, occasional buyers will become regular buyers of organic food products.

In 1999, the number of organic farms in Europe was forecast to reach 10 percent of all western European agricultural land by 2005,¹⁶⁰ but some countries, such as Austria and Italy had already exceeding this target by 15 percent and 25 percent, respectively. Denmark's organic system was already well developed by 1998, in part due to a sophisticated government support system for domestic organic production.¹⁶¹ At the time, 25 to 30 percent of the milk consumed in Denmark was produced organically. Denmark's early start in the promotion of organic food products is reflected in its annual retail growth in EU organic food sales being less than two percent, compared to a retail growth rate of 11 percent in the United Kingdom (UK).¹⁶²

The German organic market is the largest in Europe, followed by the United Kingdom, France and Italy.¹⁶³ The highest level of organic penetration into food markets is in Austria, Denmark, Finland, Germany and Switzerland. Growth in organic markets, however, is higher in the southern, central and eastern European countries. These countries have smaller markets and growth figures for organic food products are similar to those in North America.

Denmark is a country with strong demand for organic food – and the people of Copenhagen purchase more organic food than any other city in the world. What is notable is that while 10 to 12 percent of Danish food purchases are organic, 45 percent of the food purchased by restaurants and cafeterias is organic.¹⁶⁴ The Canadian organic sector could benefit by following the Danish model and forging stronger relationships with restaurants.

Italy was named organic "Country of the Year" in 2007.¹⁶⁵ Between 2004 and 2006, Italy reported positive trends in the organic industry in terms of sales, export and turnover. In comparison to 2004, organic product sales in the domestic market rose by 197 percent by 2006. The average turnover for distributors and processing units jumped from 27 percent in 2005 to 89 percent in 2006. Italian exports of organic products, primarily to other EU countries, increased by 487 percent between 2004 and 2006.

In Poland, the Carrefour Group promotes organic food in supermarkets through the installation of dedicated organic stands.¹⁶⁶ This marketing strategy is designed so that the higher prices charged for organic products are less noticeable to the consumer. These dedicated stands ensure that organic and conventional produce are not displayed side by side on the same shelf.

In 2007, Poland had almost 12,000 organic farms representing about 286,000 ha – almost two percent of the country's agricultural land.¹⁶⁷ Poland's target for its organic sector is 25,000 organic farms producing food on 500,000 ha of organic land by 2013. Most of this growth will come about because of the EU's financial incentives to convert to organic farming. The value of organic products in Poland in 2007 was estimated to be €50M and was expected to increase to €500 within a decade.¹⁶⁸

There is strong demand for organic produce in the UK, where two-thirds of consumers ensure that at least a portion of their produce is pesticide-free.¹⁶⁹ The UK organic sector increased sales by 30 percent in 2006 to £1.6B. As the demand for organic produce outstrips domestic supply, large retail chains may have to increase imports to satisfy demand. In 2004, retail chains purchased 66 percent of their organic primary produce from within the UK, excluding items such as citrus fruit, which cannot be grown locally. Demand for organic crops continued into 2007 because of increased greater demand for organic livestock feed.¹⁷⁰ At the same time, the volume of organic grocery lines is projected to increase by 50 percent.

The United States

Growth in the US organic market is driven by:¹⁷¹

- A clearly defined, government standardized meaning of organic that works in conjunction with an effective certification system
- Consumers who believe that certified organic food products contribute to health and wellness, encourage environmental responsibility and create a better work environment for farm labourers
- The widespread availability of certified organic products in traditional retail outlets

Asia and the Pacific

Consumers of organic food products in Asia tend to be those with higher disposable incomes.¹⁷² Japan, the most affluent country in Asia, has the largest market for certified organic food products. The Japanese organic market was valued at between \$3.7B and \$4.5B in 2000 by Canadian authorities and was projected to grow by 15 percent annually. At the time, Canadian officials believed that Japan could present significant Canadian export opportunities in all product categories.¹⁷³ Kuhlmann and Everett-Jones estimated the Japanese organic market at only AU\$3B in 2000 but noted that the market was not valued correctly because the definition of organic foods included a number of uncertified organic products with low levels of chemical inputs.¹⁷⁴ Tightening the definition of organic food in 2001 reduced the measured size of the Japanese organic market to \$250M by 2001. The government of Canada valued the organic food market in Japan at \$600M in 2005 when it represented 0.5 percent of the total food market.¹⁷⁵ The estimated growth rate will be 15 to 20 percent annually over the next several years. Market expansion in the Japanese organic sector is currently due to the increase in the number of organic products obtaining official recognition and not to growing consumer demand. Nevertheless, Japan is expected to account for about 80 percent of Asian organic market revenues.

Growth in the Japanese organic market is driven by:¹⁷⁶

- A tradition of close ties to the natural world
- The central role of food in Japanese culture
- The need to import food. Since the global food supply contains more organic food than in previous years, Japanese consumption of organic food increases (by default) as food imports increase.
- Health conscious consumers who are troubled by global food safety issues

China is the fastest-growing organic food product market in Asia at 30 percent.¹⁷⁷ China primarily grows and exports organic food products¹⁷⁸ that comply with a national standard.¹⁷⁹

New Zealand's organic domestic sales were estimated to exceed NZ\$100M in 2007 and the country produces about half of the organic food sold.¹⁸⁰ New Zealand exports about NZ\$95M worth of organic food products and export sales are growing at an annual rate of 10 percent. In 2003, the New Zealand government's organic sector strategy proposed a target of NZ\$1B in annual sales by 2013.

Latin America

Latin America principally exports organic food products to Europe and North America since domestic regional organic markets tend to be quite small.¹⁸¹ Argentina produces a mix of export crops that are very similar to those grown in Canada – making Argentina a strong competitor in conventional and organic food products. The production of organic livestock occupies almost all of the 2.8M ha managed organically. About 90 percent of organic food products produced in Argentina are destined for export markets in the EU and the US. The Mexican organic food sector is growing as it responds to demand for organic products in the US, the EU, Canada and Japan.¹⁸²

The Canadian organic food sector

The Canadian organic food market is years behind those in the EU and the US.¹⁸³ A 2007 Certified Organics Report notes that of \$46B in 2006 national grocery sales, \$412 million or about 0.9 percent was organic.¹⁸⁴ This represented an increase of 31 per cent over 2005. Between 2005 and 2006, sales of pre-packaged organic products grew by 31 percent and growth in fresh organic products was 22 percent.¹⁸⁵ Supermarket growth was highest in Alberta at 44 percent, followed by the Maritime provinces and British Columbia at 34 percent, Ontario at 24 percent and Québec at 21 percent, respectively.

Organic Agriculture Centre of Canada (OACC) research suggests that total retail sales of certified organic products through all market channels could be over \$1B.¹⁸⁶ The organic sector would like to increase its market share to 10 percent of the Canadian retail market by 2010.¹⁸⁷ This could represent an increase in sales of organic food products from about \$1B in 2006 to \$4.6B by 2010 – a five fold increase in national sales.

The creation of the US organic logo by the USDA boosted the number of producers transitioning to organic production and increased the number of processors of organic goods.¹⁸⁸ The COG are hoping for a similar boost with the launch of the new “Canada Organic” label. The COG hope to capitalize on increased demand for organic products domestically and internationally and would like to increase exports to Canada’s largest market for organic products, the US. COG, however, are concerned that the Canadian organic sector is lagging behind its full potential, despite a 20 percent annual growth.

A market research report found over 51 percent of Canadian households purchased an organic product during the past year¹⁸⁹ and for over more than a decade, the organic sector has experienced annual double digit growth in retail sales.¹⁹⁰ While the Canadian organic sector has a history of being supported by strong consumer demand, Canadian organic producers have not been able to meet this demand.¹⁹¹ The US has similar problems. For example, the maker of a high-energy bar in California could not obtain a sufficient local supply of organic almonds and had to import organic almonds from Spain.¹⁹² Similar shortages have occurred with organic apricots, blueberries, cashews, hazelnuts, oats and rice. While the proportion of organic products makes up a small percentage of total food sales, consumer demand continues to outpace supply – suggesting that there is great potential for future growth.

Canadian organic production

Macey reported that Canada had 3,218 certified organic farms in 2005 – down 452 from the 3,670 reported in 2004. Experts have attributed the decline to a loss of 116 maple syrup producers in Quebec and a loss of certified producers in Alberta and Saskatchewan.¹⁹³ In 2007, the Canadian organic sector reported 3,618 certified organic producers, with 241 in the process of converting to organic production.¹⁹⁴ By 2008, certified organic operations represented about 1.5 percent of all Canadian farms, with organic fruit and vegetable operations accounting for about 2.3 percent of the Canadian total.¹⁹⁵

In 2005, almost 531,000 ha were producing organic products in Canada.¹⁹⁶ An additional 50,000 ha of land were in transition to organic production. Almost 2,100 ha were producing organic vegetables, organic culinary and medicinal herbs were grown on almost 900 ha, organic fruit and nut trees accounted for just over 1,500 ha and over 230,000 ha were seeded to organic grains and oilseeds.¹⁹⁷ Most organic vegetable production was in British Columbia, Québec and Ontario. Saskatchewan produced the most organic grains and oilseeds, followed by Alberta, Ontario and Manitoba. By 2007, Canada had 530,919 ha of land producing organic crops.¹⁹⁸

In terms of organic livestock, the number of beef animals increased by 30 percent between 2004 and 2005, sheep increased by 19 percent, layers by 20 percent and broilers by 56 percent.¹⁹⁹ Organic production of livestock accounts for less than one percent of all livestock in Canada; however, organic livestock is one of the fastest growing sectors.²⁰⁰

The speed of growth in the organic livestock is an issue because livestock production has been increasing faster than the supply of organic feed.²⁰¹ In response, some organic co-operatives have been forced to produce feed within the co-op. Organic Valley, for example, has introduced a floor price for the number of acres that feed producers wish to commit to. This program spreads the risk of production equitably between the feed and livestock producers. In 2005, organic egg farmers produced just over 2.8M organic eggs – about one-half percent of all the eggs in Canada.

In 2008, Canada had more than 800 certified organic processors and handlers.²⁰² Total annual retail sales produced revenue of \$1B. About 40 percent of these sales occurred through mainstream supermarkets and fresh vegetable sales accounted for about 25 percent of all supermarket-based organic food sales. Despite the size of the Canadian organic sector, up-to-date and comprehensive publicly available marketing information for sector participants is lacking²⁰³ – outside of a number of reports produced by Anne Macey on a regular basis.^{204, 205, 206} The Canadian federal government began tracking both imported and exported organic food product data in 2007, and was the first country to do so in the world.²⁰⁷ Initially 41 organic agricultural commodities were included, and there are plans to increase the size of the list. The purpose of the tracking system is to assist the organic industry in determining market potential. The volume of information available on Canadian organic markets is sparse compared to that available through the United States Department of Agriculture (USDA) Economic Research Service (ERS) Briefing Rooms.²⁰⁸

CANADIAN ORGANIC PRODUCTION SEGMENTATION BY REGION

Organic farming businesses in Canada reflect the range of bioregional diversity – which is no different than that observed in conventional agricultural operations.²⁰⁹ As an example, most of the organic tree fruit is produced in British Columbia, most of the organic dairy producers are located in Ontario and Québec²¹⁰ and organic grain and oilseed production tends to be located in the Prairie provinces.

Ontario and Québec have the largest number of organic dairy producers.²¹¹ Between 2003 and 2004, the provinces with the greatest gains in the number of processors were Ontario and Manitoba, with increases of 48 percent. In 2005-2006, Ontario, Québec and British Columbia had 118 organic dairy farms producing more than 40.8M litres (L) of milk.²¹² Québec had the largest increase in the number of certified organic processors and handlers between 2004 and 2005.²¹³ The organic farms located on the Prairies primarily produce grains and pulses.²¹⁴ The province of Saskatchewan has almost one-third of Canada's organic producers.

British Columbia has the most extensive and detailed profile of its organic sector of all the regions of Canada. The province had about 5,800 ha dedicated to organic production in 2002.²¹⁵ The sector is made up of diversified farming operations and market gardens, although this profile is evolving. In 2002, over 500 primary producers, 43 processors and eight handlers obtained certification under the British Columbia Organic Program. Between 2004 and 2005, the province's expansion of its certified organic processing and handling segments was the largest in the country and British Columbia had the highest level of organic market growth in the country over many years. The farm gate value of British Columbia's organic products increased from \$8M to over \$24M between 1994 and 2002 and reached an annual growth rate of about 20 percent. Fruit trees and then vegetables provided the greatest farm gate value. British Columbia's organic producers sell their goods locally, nationally and internationally to markets in the EU, the US and Asia. While the market share of British Columbia's organic produce is increasing, provincial production accounts for only about half of the provincial market for organic goods. The remainder is imported primarily from the US and Mexico.

The British Columbia organic sector consists mainly of mixed horticultural and market garden production that is direct marketed through farmers' markets, direct box deliveries and community supported agricultural systems.²¹⁶ However, producers are moving towards production expansion and are beginning to sell their products through brokers and wholesalers for British Columbian as well as export markets. British Columbian organic commodities include cut flowers, dairy, forages, grains, grapes, livestock such as beef, sheep and poultry for eggs and meat, ornamentals, sprouts, tree and small fruits and vegetables. Processed products include baby food, baked goods, breakfast products such as cereals, jams and jellies, chutneys, dairy products, essential oils, juices, tofu, pasta and pasta sauces and wine and beer.

The participants in the British Columbia organic sector include growers, processors, wholesalers, retailers, and certifiers.²¹⁷ The British Columbian certification program includes over 500 producers, 43 processors and eight handlers. The certification system consists of 15 certification bodies in addition to one regional certification body

and five out-of-province certification bodies. There are also a number of producers that are not certified, but farm according to organic principles and have developed a clientele. These producers keep in contact with the certified group informally. However, about 95 percent of the organic sector has membership in the member agencies of the Certified Organic Associations of British Columbia (COABC).

WHEAT

The Canadian Wheat Board (CWB) has taken over the sale of organic wheat into high-value Japanese and European markets.²¹⁸ The CWB obtains the organic grain through an agreement with the Canadian Organic Certification Co-operative to supply the product. Prior to this agreement, farmers were required to either market their grain on their own or sell it to an accredited CWB exporter. Producers seed almost 76,000 ha of organic wheat, Canada's largest organic crop.²¹⁹ Based on Canadian producers seeding 10.3M ha of wheat in Canada in 2008,²²⁰ organic wheat represents just over 0.7 percent of Canadian wheat production. This is in comparison to the US where wheat acreage from the late 1990s to 2000 ranged from 36,437 to 444,600 ha (90,000 to 180,000 acres) – and organic wheat represented less than one-half percent of the total, or about 9,000 acres.²²¹ This suggests that Canada grows over eight times more organic wheat than the US. Nevertheless, the US considers its organic wheat market important because:

- The market for organic products in the US grew by over 20 percent annually through the 1990s
- General Mills has developed organic breakfast cereal and flour products
- The EU is a large market for organic products
- EU consumers are consumers willing to pay more for organic foods
- Organic wheat premiums are between 35 and 50 percent – even though some of this premium offsets constraints on production and the increased cost of handling

Even with 20 percent growth, the US still feels that organic wheat will remain a niche market.²²² The US sees increased competition in organic wheat as eastern European countries enter the sphere of the EU. The Japanese market is seen as preferable to the EU because of Japanese consumers' preference for "natural" products.

The transition to organic production and other challenges

In 2005, the Canadian organic sector reported that almost 48,000 ha on 241 farms were in the process of converting to organic production.²²³ The transition process can be a challenge. Some producers convert to organic production as a means of increasing profitability.²²⁴ However, most are not always aware of the volume of paperwork that can be generated in organic operations and are not familiar with the time-consuming nature of the organic certification process. Producers are also encouraged to do some research and make sure there are markets available for their intended organic crops and that the crops are the right fit for their operation. Organic land must comply with organic standards for 36 months before the first certified organic crop can be harvested.²²⁵ Cash flow is often an issue because yield can be unstable during transition and the producer may not be able to extract premiums from the market for products that are not yet "certified organic" – though producers sometimes receive small premiums for their transitional organic products.²²⁶ In some jurisdictions, organic farms in transition need to prepare farm plans for crop rotation, design and nutrient and waste management.

Canadian organic operations face challenges similar to those that confront conventional farms including a shortage of processing infrastructure, lack of labour, high land prices, urban encroachment, a shrinking land base suitable for farming, an aging farm cohort and lack of access to pest control products available to competitors.²²⁷ Most farmers have the bulk of the value in their operations tied up in land holdings, which do not generate income in proportion to the underlying value.²²⁸ Nevertheless, attractive financial returns are being realized by some farmers that specialize in niche markets. These markets and their returns are attracting conventional producers to transition to organic production in provinces like British Columbia. Canadian producers are not alone in realizing a better return with organic production. Some producers in the US have had a similar experience. A conventional dairy in Vermont, struggling to remain profitable, switched over to the production of organic milk and improved its margins.²²⁹ The lure of improved profitability has led to almost 10 percent of the dairies in Vermont converting over to organic production. This specific example would not necessarily apply to Canada since milk is subject to supply management.²³⁰

Organic producers often work on small plots of land and produce a diverse range of products. For example, British Columbian organic farmer Mike Romaine owns 11.5 acres of land, has planted 300 trees on his farm and grows a

diverse assortment of trees such as walnuts, chestnuts, jujubes, cherries and persimmons.²³¹ These types of organic producers are often in competition for land with developers who envision commercial housing development on these same small parcels of land. The cost of land for organic production is often prohibitively expensive, especially in orchard and vine-growing regions, if it is even available at all. In addition, the small size of many of these organic operations creates a situation in which profitability can be low due to economies of scale.

Small markets that lack uniform standards can hinder growth in sales. Syndicat des producteurs de viands biologiques du Québec reports that a lack of uniformity in everything from the quality and cut of meat to packaging standards is a problem in the organic meat industry.²³² Lack of awareness of the health advantages of organic meat has also been identified as a problem that has contributed to a slow growth in annual sales of only three percent. Government assistance programs that will help develop standardized production methods and provide some common marketing tools will be required to strengthen the Québec organic meat industry.

Canadian imports and exports of organic food products

Canada exports a range of certified organic products – from unprocessed commodities such as bulk grains to high-value pre-packaged convenience goods.²³³ Most exported organic goods go to the EU, the US and Japan – with organic wheat representing the largest export category. Canada also exports large volumes of other commodities such as barley, corn, flax, hemp, lentils, oats, peas, soybeans, spelt wheat and sunflowers, among other grains.

In 2006, Canada exported about \$65M worth of organic products, or less than 0.2 percent of the worldwide total estimated at US\$28B.²³⁴ Grain makes up the largest portion of the market, with wheat being the largest export crop. Canadian organic wheat exports alone are worth \$14M and represent about 22 percent of the value all organic food products exported from Canada.

In 2006, between 70 and 80 per cent of the organic food products consumed in Canada were imported because Canada does not grow popular organic commodities such as bananas and citrus fruits.²³⁵ Most organic food products sold in Canada are imported from California, in spite of a 60 percent increase in the number of certified organic producers in Canada.²³⁶ It follows that the price consumers pay for organic food in Canada is based on the price of imported organic food products.²³⁷

Regional shortages of organic products, due to insufficient local supply, are a problem in Canada.²³⁸ For example, Atlantic Canada must bring in over 80 percent of its organic grain from other regions, even though organic grain is both grown and milled locally.

The organic supply chain

In the EU, weak points in the organic supply chain include high logistical and transport costs, high input costs and low expenditures on research and development (R&D).²³⁹ Since organic food is a niche market at less than one percent of the total market, there is little benefit in increasing operational scale. Cost reduction strategies are limited to improving cooperation within the supply chain. To some extent, improved supply chain cooperation could include some vertical integration within retail organic operations. As an example, US-based Whole Market Foods Inc. plans major investments in a network of animal-compassionate, small-scale farms.²⁴⁰ Whole Market Foods also plans to develop local markets by purchasing more locally produced food, loan money to small farmers, use of parking lots as local farmers markets and educate consumers about the merits of locally-produced food. These initiatives should strengthen the supply chain and increase cooperation among supply chain participants.

Between 1999 and 2002, the number of processor and handlers in Canada increased by 15 percent to 323.²⁴¹ This included all categories of handlers, such as on- and off-farm processing, distributors, retailers and brokers. Anne Macey has compiled these numbers as well and showed an increase in the number of processors and handlers from 281 in 1999 to 552 by 2002 and then 817 by 2005.²⁴² This discrepancy between the two sets of figures may be due to processors and handlers being certified by more than one agency. The grain-related processing category, which includes seed cleaning, mills, cereals and bakeries, is the largest category.²⁴³ Although there is some processing linked to most categories, the relative number of companies and associated trade volumes are low.

In Canada, between 2003 and 2004, the number of certified organic processors and handlers increased by 48 percent.²⁴⁴ Ontario and Manitoba experienced the greatest gains. Between 2004 and 2005, the number of certified

organic processors and handlers increased by 47 percent – with British Columbia and Québec experiencing the greatest increases. Despite the growth in organic processing and specialty markets, the level of infrastructure in the organic sector in Canada is inadequate.²⁴⁵

Industry consolidation

Global retail food chains concentrated ownership between 1997 and 2001 as annual sales of the 20 largest food retailers increased to over US\$850B.²⁴⁶ The greatest concentration occurred in the EU with Sweden leading as the country with highest level of concentration. Ninety-five percent of Swedish food sales were attributed to its three largest retailers at the time. The trend to consolidation was being driven by:

- The need for earnings growth
- The desire to maintain high stock valuation
- The ability to improve returns by increasing the scale of the operation, thereby increasing purchasing power
- The lower cost of information technology systems

Today, the US food system is highly concentrated – and is becoming even more so. For example, the top four US beef packers, Tyson Foods Inc., Cargill Inc., Swift & Company and National Beef Packing Company controlled 72 percent of the packing market in 1990.²⁴⁷ By 2005, these four companies controlled 83 percent of the market. In the pork sector, the top four pork packers controlled 64 percent of the market – up from 37 percent in 1987. Smithfield Foods Company is the largest pork packer in the US with sales of US\$11B.²⁴⁸ In soybean crushing, the top three companies include Archer Daniels Midland Company, Bunge Ltd. and Cargill, which control 71 percent of the market. In the global retail grocery market, Wal-Mart Stores Inc. grossed US\$244B in 2004. France's Groupe Carrefour, the world's second largest grocery retailer grossed US\$64.7B. In the US Wal-Mart grossed US\$66.4B while second place Kroger grossed US\$46B in retail grocery sales. Many of the large food retail operations are also vertically integrated and many control farms, processors, wholesale operations as well as financial institutions.

Consolidation in the Canadian food retail market is following that of the US and the EU. Two companies controlled over half of all sales and four companies control almost 80 percent of the entire Canadian market in 2005.²⁴⁹ Loblaw Companies Limited with over \$26.2B in sales controls over 38 percent of the market, Sobeys Inc. with over \$11B in sales controls over 16 percent of the market, Metro Inc. controls of 15 percent of the market with over \$10B in sales and Canada Safeway controls almost eight percent of the market with \$5.3B in sales. Metro Inc. has become the most common supermarket name in Canada, with 376 stores.²⁵⁰

THE ORGANIC RETAIL FOOD SECTOR

The cooperative movement in the US pioneered natural and organic foods and cooperatives and buying clubs had over 50 percent of the organic food market during the 1970s and 1980s.²⁵¹ These co-operatives continued to play a major role as late as 1999 when 300 retail food co-operatives generated sales of US\$700M – which was down four to five percent from earlier years. The Canadian natural food industry did not evolve through cooperatives to the same extent as in the US and Canada had very few natural food cooperatives. The Alliance of Natural Food Co-ops of Canada, founded in 1987, had only two of the five founding members still operating by 1999 due to private business consolidation.

Retail organic food consolidation in the US and Canada is following similar trends to that observed in conventional food retail markets. Most acquisitions in the US organic sector occurred between December 1997, when the draft USDA standard for organic products was released, and October 2002, when it was implemented.²⁵² Cadbury Schweppes plc, Cargill, The Coca Cola Company, ConAgra Foods Inc., The Dean Foods Company, General Mills Inc., H.J. Heinz Company, The Hershey Company, Kellogg Company, Kraft Foods Inc., Mars Inc. and PepsiCo Inc. have all purchased organic brands or have set up strategic alliances with organic food processors. Few of these major transnational companies identify their ownership on organic product labels. In a 2007 acquisition, ConAgra bought Alexia Foods Inc., a supplier of all natural and organic appetizers and artisan breads.²⁵³ Alexia Foods is also the leading natural frozen potato brand in the US.

In 2000, organic food was the fastest growing product category in the food industry, with a compounded growth rate of 20 to 25 percent each year in Canada, the EU, Japan and the US.²⁵⁴ Organic retail sales grew from US\$1B in 1990 to \$7.8B by 2000. At the time, over half of organic food sales occurred in conventional supermarkets and about a

third of all US shoppers bought organic food products.²⁵⁵ At the time, the organic/natural food chains, Wild Oats Inc. and Whole Foods Markets Inc., with more than 200 outlets between them, collectively generated US\$1B in annual sales.²⁵⁶ The US organic market share of the total food market was expected to quadruple, from two percent in 2000, to eight percent by 2010.²⁵⁷ By 2007, Whole Foods Market had purchased its smaller rival, Wild Oats, but in 2009, the US Federal Trade Commission (FTC) filed a request to stop the integration of Wild Oats into Whole Foods Market in an ongoing legal battle.²⁵⁸

By 2004 in Canada, US-based SunOpta Food Group had acquired Pro Organics, Wild West Organic Harvest Co-operative Association, Simply Organic Company Ltd., Supreme Foods Ltd. and a number of other food companies.²⁵⁹ SunOpta generated \$306M in gross revenue in 2004 and is now Canada's largest distributor of organic food products.²⁶⁰ Conventional supermarket chains such as Sobeys Inc., Independent Grocers Alliance Inc. (IGA) and Loblaw have been slowly introducing their own lines of organic products or have been buying out smaller health food companies.²⁶¹ In 2008, Planet Organic Market Ltd., Canada's largest natural products retail chain, bought New Leaf Community Markets, based in Santa Cruz, California.²⁶² Sales for Plant Organic for the quarter ending September 2008 were \$30M compared to \$25.7M in 2007, an increase of almost 17 percent.²⁶³

Large Canadian retail chains such as Loblaw, have embraced local produce as part of their latest marketing platform.²⁶⁴ New television commercials include executive chairman Galen Weston walking through farmers' fields and orchards. Loblaw is targeting 10 percent growth in sales of local produce. Currently, 25 percent of the produce on Loblaw's shelves is local. Consumers are asking for locally produced food products, possibly in response to the bestselling book, *The 100-Mile Diet*.²⁶⁵ With consumers equating organic with local production, this may be an opportunity for the organic sector to increase its presence in large retail food outlets.

The threat to organic producers from retail consolidation is the buying power of the transnational owners of many of the world's organic food processors.²⁶⁶ By 2005, the farm gate price of organic products in Québec began dropping while retail organic prices continued to rise – suggesting that money that used to enter the food production system was being consolidated in the food distribution system. On positive side, the ability to purchase in bulk lowers the price of organic food, which, in turn, makes organic food more accessible for the consumer.²⁶⁷ It also means more land is required to meet the greater demand, and as a result, more land is being converted to organic production. However, there is added risk for small organic producers who could face bankruptcy if they fail to meet the demands of these large supermarket chains. These changes have led organic farmers to look into creating new distribution channels such as Farmers Direct, which was created to cut out organic food brokers and traders by dealing directly with the organic food retailer. Other suppliers of organic food products have developed a variety of distribution models that seem to be working.

Many organic suppliers are apprehensive about selling to Wal-Mart, a company with a reputation for cut-throat margins for suppliers.²⁶⁸ Wal-Mart is attempting to expand into organics and apply the same strategy they have used successfully in other retail areas.²⁶⁹ The company is trying to drive down the prices for organic products to within 10 percent of conventional foods in its US stores and may soon try the same approach in Canada.

Experts predict that organic producers will likely not meet Wal-Mart's terms, and will not have to because demand for organic food products is outstripping supply.²⁷⁰ While the organic sector welcomes the boost in sales that would be gained through everyday low prices at Wal-Mart, many feel that organic food is unique and that the conventional strategy that Wal-Mart employs does not take this distinctiveness into consideration in its marketing and retailing strategies. Since the higher price of organic food products is due to structural issues, there is some resistance to conforming to the Wal-Mart way of doing business. Nevertheless, some socially conscious companies are taking a look at doing business with Wal-Mart because the company is showing signs of improving its record and Wal-Mart offers a large, new consumer base.²⁷¹ For example, Laiterie Lamothe et Freres Ltee, a Québec dairy processor, already sells organic milk to large Québec retailers, was recently approached by Wal-Mart Canada. Laiterie Lamothe et Freres was interested in doing business with Wal-Mart because of its large customer base, although the company does fear Wal-Mart's reputation.

Some organic growers, like the members of the Quinte Organic Farmers Co-operative, are viewing their competitors as allies and are working together to establish reliable markets for produce.²⁷² In this strategy, maximizing profits is not necessarily the goal. Quinte's members would like to remain independent and not grow to the point that they need to hire marketing staff. Members of the co-operative also would like to maintain balanced, high-quality lifestyles.

The retail model developed by Eat Healthy Foods in Regina, SK began as a way for the business owner to generate funds, in part for the benefit of environmental groups.²⁷³ Many of the items for sale in the establishment are locally produced fruits, vegetables, dairy, meat and bakery goods. The lack of pesticide use in the production of organic foods and taste of the produce is what attracts most of the clients to Eat Healthy Foods in Regina.

Other organic food retail operations are developing new models for food delivery to customers. Urban Harvest Organic Delivery in Kelowna, British Columbia, is a service company that delivers organic produce to the door of an average of 425 residential customers a week.²⁷⁴ The company received a best non-farm organic delivery system award from the Certified Organic Association of British Columbia. Rather than deliver produce to its customers' doors, Ferme Cooperative Tourne-Sol, provides vegetable baskets weekly or biweekly to its customers at two Saturday markets. Ferme Cooperative Tourne-Sol grows 70 different types of vegetables on its five acres of land.²⁷⁵

Innovative distribution systems for organic food products have been introduced in other jurisdictions that may be viable in Canada. In Italy, vending machines supplied with fresh, seasonal organic fruits and vegetables and cheese and crackers are providing healthier snacks in Roman schools and offices.²⁷⁶ The agricultural company Biosi manages the machines. The produce is harvested, selected, processed and distributed daily to the vending machines and each harvested item is packaged in transparent cellophane and contains the date and location of harvest.

There has been resistance to big business within the organic community from those who fear larger operations have the capacity to muscle out smaller family farms.²⁷⁷ For example, the US-based Organic Consumers Association organized a boycott of Horizon Organic Dairy, the country's largest organic milk brand. In addition, lobbying efforts by organic farmers and consumer groups are attempting to get the USDA to mandate that milk with the USDA Organic seal must be supplied from cows that have significant access to pasture. Smaller producers feel that this mandate would have the effect of levelling the dairy playing field and provide them with the protection they feel is necessary.

What are consumers willing to pay for organic food?

Consumer food choices at the macro level are driven by three well-established global mega-trends – convenience, health and pleasure.²⁷⁸ However, there may be a fourth emerging trend – that of responsibility. Consumers' desire to be more responsible in their day-to-day life may benefit the organic sector. Others, however, are suggesting that healthy eating is becoming less of an issue.²⁷⁹ At the same time, price is becoming more important in terms of food purchases and food discounters are gaining market share. The question that needs to be answered, then, is how much of a premium is the consumer willing to pay for organic food products?

The number of consumers willing to pay a premium for organic food decreases as the price premium increases.²⁸⁰ The premium the consumer is willing to pay, though, increases as the number of combinations of preferred attributes associated with the food product rises. Demand for food products also tends to depend more on the price differential between organic and conventionally grown products, than on the price itself. In general, however, demand for organic food products is elastic (sensitive) in terms of prices. On the other hand, demand for organic food products is relatively inelastic (not as sensitive) in terms of consumer income. In other words, as income goes up, consumers do not purchase more organic food products and changes in consumers' income have little influence on demand. This suggests that there is a committed core of organic food devotees that will purchase organic food products, regardless of their income level or the price of the food product.

An older Environics International (EI) survey categorized 18 percent of Canadians as regular or heavy buyers of organic food and 22 percent as light buyers.²⁸¹ The remainder had either never purchased organic food or had only done so once or twice. The EI survey suggested that about 40 percent of Canadians could be described as at least somewhat committed to the regular purchase of organic food products, but only about 18 percent were very committed to purchasing organic food.

Of those who purchase organic foods in the US, 70 percent choose to avoid pesticides, 68 percent were looking for freshness, 67 percent for healthy, nutritious products and 55 percent were looking to avoid GM foods.²⁸² In this consumer profile, organic food purchasers were willing to pay a premium of 10 to 40 percent for organic products – and typically, organic products cost from 10 to 40 percent more than the equivalent conventionally produced products.²⁸³ Dieticians and home economists have documented that organic fruits and vegetables cost consumers

about 40 percent more than traditional produce, but most agree that traditional produce is safe and nutritious and are reluctant to recommend organic produce over traditional produce because of the price premium.²⁸⁴

In Canada, just over half of the population would be willing to pay more for organic food products.²⁸⁵ Twenty-nine percent would not pay any more organic food than for conventional food and 19 percent of those surveyed had no opinion. On average, those who were willing to pay more for organic food products would pay an additional 10 percent more. Women and Québécois were most willing to pay higher prices for organic food at 13 and 12 percent, respectively, compared with fewer than 10 percent of men and just over six percent of those who lived on the Prairies.

A low proportion of Swedish consumers purchase organic food.²⁸⁶ In an effort to promote ecological agricultural production, the Swedish government conducted a consumer study of organic and traditional bread. Despite a stated preference by the majority of consumers for the taste of the organic bread and an opinion that the consumption of organic bread ought to increase, about half of the consumers said they were not prepared to purchase organic products if the cost were appreciably higher than that of conventional food products.

Diet changes during recessions and potential repercussions in the organic sector

One of the first areas where consumers reduce spending in economically hard times is in the area of food purchases – and this was noted in 2008.^{287, 288, 289} Experts predict that if the current recession continues, consumer spending on food will continue to decline.²⁹⁰ The TABS Group reported that fewer than 40 percent of US adults had purchased any major organic category product in the last half of 2008.²⁹¹ Growth in the organic food sector is expected to level off, despite an average annual growth in sales of 18 percent, because organic products tend to be more expensive than conventional food products.²⁹² While the Organic Trade Association forecasts increases in organic food sales through 2009, The Hartman Group established that growth in organic food consumption started levelling off in 2006 and expects the trend to continue into 2009. An Information Resources survey conducted in May 2008 noted that 52 percent of those surveyed decreased their volume of organic food purchases because of cost issues. Whole Foods Market has maintained that its affluent patrons tend not to cut back on purchases of organic food products in more difficult economic times, but profits are falling. Whole Foods Market stock price fell 20 percent in 2008.²⁹³ Credit Suisse Group AG predicts that Whole Foods Market stock price will continue to decline.

Organic food products took up more retail shelf space than ever in 2008, but with grocery prices increasing seven percent in the US over 2007, many consumers were cutting back on their purchases of organic food products.²⁹⁴ This phenomenon was not limited to organic products. Consumers were also choosing not to purchase more expensive premium food brands. Mintel International Group (MIG) forecasts that sales growth of organic products, which have increased 142 percent over five years to US\$5.2B, will drop off as US families struggle financially. Part of this drop in sales will be due to “natural” products outcompeting certified organic products based on price. The move away from organic food products is also expected to be subtle, as those who used to purchase only organic products move to non-organic brands of prepared foods, but continue to purchase organic produce. The most devoted consumers of natural and certified organic food products are adjusting by eating less food, but only about 20 percent of organic consumers fall into this “hard-core” group.²⁹⁵

MIG also postulates that although many agree that pesticides and synthetic fertilizers can harm the environment, many shoppers still have questions about the health benefits of organic foods.²⁹⁶ MIG suggests that some consumers may be leaning towards the belief that the organic food products represent a “lifestyle choice that may be unnecessary” based on a 2008 study published in the Journal of the Science of Food that suggests that organic apples, carrots, kale, peas and potatoes contained no more nutrients than their conventionally grown counterparts.

Some expect that rising food prices could increase the acceptance of the use of GM crops for food production.²⁹⁷ In 2007, South Korea purchased GM corn for the first time for human food use because of the rising price of non-GM corn and declining supplies of all types of corn. Those in the food and farm sectors are pushing for similar changes on a global basis. While this shift in policy may open up new markets for GM foods, it also has the potential to reduce demand for organic products.

Natural Valley Farms of Neudorf Saskatchewan went into receivership in late 2008.²⁹⁸ The company began as a producer-owned slaughter and beef processing plant that filled a niche in the “natural” (hormone and antibiotic-free) beef market and later diversified into specialty production of horse meat destined for Europe and Asia. The company

struggled to become competitive with the major feeders and larger slaughter plants. Despite specializing in two niche markets, Natural Valley Farms failed to avoid receivership, illustrating the struggle facing the organic sector in general. It would appear that the marketplace is not always prepared to pay a sufficient premium for products and it may be very difficult for small operations to remain competitive in an industry that requires members of the value chain to manage high volumes of product in order to compete successfully.

In some countries, organic food consumption is limited due to the higher cost of organic food products. Consumption of organic food in the Czech Republic is growing, reflected in the increase in spending from CZK150M in 2002 to CZK350M in 2005.²⁹⁹ Relative to conventional produce, however, organic food represents only 0.18 percent of overall food consumption. The Pro-Bio Association of Organic Farmers attributes consumer resistance to the high cost of organic food as a factor contributing to limited industry growth. The organization thinks the industry will fail to meet its objective of having ten percent of farmland under organic production by 2010 – which would represent an increase of about four percent over 2005.

To maintain consumer commitment to organic food products, the organic sector may need to identify areas in which it has comparative and competitive advantages over the mainstream food sector. Consumers purchase organic food products because they are grown, handled and processed according to organic standards; however, are there other intrinsic qualities in organic food products that consumers may be willing to pay for? In other words, is the organic sector capturing all of the value in the organic food package?

Consumers are increasingly interested in tracking the origins of their food from field to table. This interest in food is no longer limited to “hippies and tree-huggers” – it is now a value that is being embraced by the mainstream consumer.³⁰⁰ Consumers are also looking for “food with a history” in the form of heirloom varieties of plants. Some organic producers are taking advantage of this trend by growing different types of fruit trees, a variety of heirloom vegetables and interesting assortments of culinary herbs.³⁰¹ The bulk of this produce is sold to restaurants that see value in knowing where food products originate and how it is produced. The organic sector may need to find a way to capture this value in its products. Conventional food distribution networks have a limited capacity to compete against the organic sector in tracking food products through distribution channels.

Humans are not the only consumers of organic food products. With the recent recall of almost 100 brands of pet food, people are becoming increasingly aware of what they are feeding their pets.³⁰² Annual sales in the organic and natural pet foods markets in the US increased to US\$400M in 2007. This is just a fraction of the US\$14B US pet food market; however, the growth rate of the organic pet food market is three times that of the non-organic pet food market.

Other issues associated with escalating prices for organic products

The higher price of organic grains is an issue for those raising organic livestock.³⁰³ Demand for organic products is driving prices higher; however, insufficient price premiums for organic grain producers is leading to a reduction in organic grain acreage as farmers convert back to conventional crop production in the north western US.

A decline in the number of organic farmers then creates instability in organic food markets, raising prices of organic food products and reducing the number of organic products available in retail grocery stores.³⁰⁴ This is a concern because higher prices for organic food reduce the size of the industry at a time when the sector’s strategy is to expand. Rising prices have come just as many consumers are trying organic food products for the first time. In an attempt to keep customers, organic retail operations are trying to hold prices steady.

Macroenvironmental scan – Environmental issues

Organic food production improves soil structure, uses water more efficiently and maintains environmental biodiversity.³⁰⁵ In addition, organic agriculture does not employ chemical fertilizers and pesticides, which benefits biotic communities outside of the confines of the organic farm. Organic farming practices can also reduce soil erosion and allow crops to withstand torrential rains.³⁰⁶ These effects have been attributed to the creation of more stable humus in organic farming operations. In addition, even though organic farming systems rely on tillage to a greater extent than conventional systems, soil carbon (C) and nitrogen (N) concentrations tend to be higher in organic systems than in conventional and no-tillage systems.³⁰⁷ Organic land also tends to have more available N than conventional and no-tillage systems.

Organic and sustainable agricultural practices have reduced the volume of subsurface drainage water discharges by as much as 41 percent.³⁰⁸ The corn-soybean farms in this study have also lowered the rate of nitrate loss from the system by about 60 percent. This provided a benefit to farmers who were able to reduce their fertilizer requirements by 50 percent without compromising yield. Scientists speculated that the organic and sustainable practices improved the efficiency of nutrient uptake as well as water infiltration and use due to improved soil quality and more diverse land use patterns. The benefit realized was greatest under average to above average rainfall.

Livestock operations can also provide environmental benefits that conventional operations cannot. For example, organic dairy farms tend to allocate more land to pasture and hay production than conventional dairy farms and devote smaller areas to the production of cash crops than conventional farms.³⁰⁹ Because organic dairy operations focus on lowering feed import costs, organic dairy livestock density is also lower than on conventional farms. The outcome is a lower surplus of nutrients on organic dairy farms and lower nutrient loads that can reduce the impact the organic operation on off-farm air and water quality.

Canada has a number of comparative advantages in organic food production. The country has a varied land base and a cooler climate, which lowers the incidence and severity of infestation from pests and diseases in many crops.³¹⁰ Canada is also thought of as environmentally friendly, fresh and pristine country that produces natural and safe food products.³¹¹ Despite the environmental benefits associated with organic food production, the organic sector has been challenged on its environmental record. Carbon footprint calculations have been used to show that organic produce is more beneficial for the environment than conventional produce. However, the Tesco supermarket chain assessed the carbon footprint of organic and conventional potatoes and concluded that both production methods were equal.³¹² The UK Soil Association disputed the findings on the grounds that the carbon stored in the soil was not included in the calculation. Tesco did acknowledge on its new carbon footprint labels that the amount of carbon that is stored or released by soil under different farming practices was not included in their calculation.

In a recent study conducted at the University of Alberta, greenhouse gas emissions were compared to determine if organic food transported substantial distances mitigated the environmental benefits of producing the food organically.³¹³ For 20 tonnes (t) of organic produce, the environmental cost of greenhouse gas emitted for transportation was comparable to that of bringing 20 t of conventional produce to market. The high environmental cost of transporting organic food was due to the use of trucks for shipping rather than more energy-efficient rail and water transport and because organic products had to be transported greater distances than conventional food products. The study authors recommended that shoppers buying locally produced food and suggested that government environmental policy should consider reducing emissions from the transportation of food.

Macroenvironmental scan – Political/legal/regulatory issues

Canadian agricultural production

A commission report has proposed controversial and sweeping reforms in Québec's \$14.4B agri-food industry.³¹⁴ The report was released just weeks after a government-appointed panel also recommended overhauling Québec's subsidized agricultural commodities system for products such as milk, eggs, pork and fowl. Agriculture Minister Laurent Lessard said he would be studying the report over a two year period. While some academics such as Laval University economist Guy Debeurilleul, an agri-food specialist, stated that the report "offers a lucid statement, an audacious vision and a realistic strategy for the future of agriculture in Québec", other groups, like the Union des producteurs agricoles (UPA), which represent over 90 percent of Québec's 44,000 farmers, suggested the report presents a poor analysis and states that the recommendations are not feasible. Annick Van Campenhoute, of Conseil des industries bioalimentaires, an industry and government group, said that none of the 49 recommendations in the report included government support for R&D or training programs – and without such programs, it would be difficult to follow food-related world trends.

One of the proposals in the report is to end the UPA's virtual monopoly in agriculture and push toward "food sovereignty" by increasing the proportion of Québec-grown produce in retail outlets. The report seeks to promote a shift toward premium goods such as organic food products. Smaller groups like the organic producers and artisanal cheese makers see some merit in the report and think its recommendations warrant serious consideration. University economist Debeurilleul said the current system is a handicap over the longer term and inhibits diversity and innovation in food production. He cited the example of the quota-free dairy industry in Wisconsin that produces over 800 specialty cheeses – far more than the number produced in Québec.

The Canadian regulatory burden for agricultural producers

Agriculture producers and food processors are faced with a multitude of regulations from all levels of government.³¹⁵ The Government of British Columbia has been concerned that small business owners, which includes farmers, are overburdened by regulations that take time and money away from their businesses. Since 2001, the Government of British Columbia has reduced the regulatory burden on small business substantially. In 2007, the government created regulatory reform under the auspices of the Small Business Lens to minimize the impact of new or modified regulations on small businesses. Farmers and food processors are benefiting from these regulatory reforms as they continue to operate in what is becoming a more streamlined regulatory environment. The Canadian Federation of Small Business has recognized the province of British Columbia as a leader because of these initiatives.

Regulatory cohesion

In 2006, Canada had 30 certifying bodies and 742 processors and handlers.³¹⁶ In addition, there were both regional and national organic farming organizations.³¹⁷ Because of this lack of regulatory cohesion, The Canadian Organic Regulatory Council was created to advise the government on organic regulatory issues.³¹⁸ The goal was to create a Canadian national standard that would be substantially equivalent to those of the country's major trading partners.

After a consultation process that was initiated in 2003,³¹⁹ the new Organic Products Regulations are due to come into force June 30, 2009.³²⁰ The National Standard of Canada for Organic Agriculture will use the "Canada Organic" logo to signify certified food products. This certification meets the revised Canadian standard for organic production and the products must contain a minimum of 95 percent organic ingredients. The purpose of the regulations is to protect consumers against false organic claims and to provide a competitive international advantage for Canadian organic products. Canadian organic regulations will then be similar to those of over 40 other countries.³²¹ The new Canadian standards were designed to facilitate trade with the country's major trading partners, the EU, the US and Japan by making the Canadian standard substantially equivalent to their standards.³²² Compliance monitoring and enforcement activities will be the responsibility of the CFIA.

Animal welfare

The Farm Animal Welfare Council, a UK stakeholder group of producers, scientists, animal welfare organizations and government officials, has developed a set of principles that are now recognized internationally.³²³ Known as the "Five Freedoms", these principles outline human obligations for the care of animals. Animals have the right to:

- Freedom from hunger and thirst, which includes access to a source to fresh water and an appropriate diet
- Freedom from discomfort, which includes a comfortable environment that includes shelter and a resting area
- Freedom from pain, injury and disease by preventing problems from occurring and through fast diagnosis and timely treatment when problems arise
- Freedom from fear and distress, which includes ensuring proper living conditions and appropriate handling
- Freedom to express normal behaviours, which means the provision of sufficient space, housing and the company of other members of the animal's own species

The Canadian Organic Standard (COS) addresses the principles of the Five Freedoms by requiring that an animal have access to sufficient space, food, water and bedding.³²⁴ Pain is minimized by prohibiting unnecessary surgeries such as tail docking in dairy cattle. In addition, the COS further recommends that any surgical procedures be conducted in a way that minimizes the stress and pain of the animal, including the use of anaesthetic drugs. However, it is not mandatory to use pain relief for routine procedures such as castration and dehorning. There is room for further improvement in the existing standards and additional objective and measurable criteria can be added in the future in areas such as air quality, mortality rates or body condition scores.

Government funding and support for new organic initiatives

A number of agencies make funding available for a variety of initiatives in the organic sector. As an example, the federal government contributed \$219,000 to the strategic plan for the British Columbia Association of Farmers' Markets (BCAFM) in 2008 through the Advancing Canadian Agriculture and Agri-Food (ACAAF) program.³²⁵ The goal of strategic plan is to improve the image of British Columbia's farmers' markets and enhance the management skills of market managers, merchants and boards.

A \$258,100 investment in the *Growing Up Organic* project is also being provided to the COG through AAFC's ACAAF Program.³²⁶ The project is designed to encourage organic farmers to develop local markets for organic food products in institutions like child care facilities, hospitals and schools. A second program goal is to encourage the transition of conventional farmers to organic production and to launch new farmers into organic operations. In addition, *Growing Up Organic* will also help develop local organic value chains. AAFC has invested more than \$7.2M in 74 organic projects through ACAAF between 2004 and 2008.

The British Columbia Ministry of Agriculture and Lands awarded a \$100,000 grant to the COABC to aid producers in their efforts to meet the requirements of the National Organic Products Regulation which will be implemented over a two year period.³²⁷ The COABC has been charged with conducting educational and awareness campaigns on the federal regulations so that producers will be in a position to meet the requirements of the "Canada Organic" label. While the costs of establishing the Canada Organic Regime (COR) are covered by government resources until March 2009,³²⁸ the cost to the average organic producer or to the organic sector to comply with these types of comprehensive regulations is substantial – even when the industry and its stakeholders do not incur direct costs and even when grants are awarded to streamline regulatory compliance.

The Calvert government of Saskatchewan created a new position for a legislative secretary for organic farming and appointed MLA Lon Borgerson to the position in 2006.³²⁹ The Saskatchewan Organic Directorate was optimistic that the position would provide the government with valuable information about the organic sector and help create policies that would allow organic farming to realize its potential in the province. By late 2008, however, this position no longer existed in Saskatchewan.

"Organic" operations not certified as organic

A number of "organic" producers are not interested in becoming certified organic producers.³³⁰ Some are operating successfully without certification, have a steady clientele that includes local restaurants and are satisfying the demand for local, flavourful, organically grown food. Others choose to sell their products with limited and specific claims such as environmentally friendly or pesticide free.³³¹ In addition, not all organic producers see certification as their top priority. Other producers incorporate organic "principles" into their farms but their business models do not include organic certification. In Ontario, for example, a 156 year old, 48 ha farm has been transferred to a non-profit organization to be used to promote the idea of the quality and richness of farm life.³³² The farm is open to the public for tours and thousands of visitors pass through the farm each year.

Organic non-compliance issues

Compliance with organic cultivation regulations can be an issue. In 2007, the Food Institute of Oldenburg tested organic and conventional bananas for pesticide residues.³³³ Some residues were found in 28 of the 29 conventionally produced bananas, but none were found in the organic bananas. However, in three of the 11 organic banana samples, substances were found which are not permitted according to organic standards. Non-compliance is not only a concern in developing countries. An investigation by the UK media has discovered apparently fraudulent and/or unlicensed organic meat. The Food Standards Association and the Soil Association are very concerned about this issue and have welcomed these types of investigations.³³⁴ In the same way that conventional foods are monitored for food safety by regulatory agencies, organic production also needs to be monitored to ensure food safety and to make certain that consumers are not being misled.

Global acceptance of Genetically Modified Organisms

Europe is under international pressure and faces a lawsuit from the US, Canada and Argentina at the World Trade Organization (WTO) because of its ban on GMOs.³³⁵ In response, the EU announced this year that its member states must allow genetically engineered crops and prepare regulations to protect health and the environment. However, five countries, Austria, France, Greece, Hungary and Poland,³³⁶ imposed different types of bans and other countries were using their votes in the European Council of Ministers to prevent the entry of GM crops.³³⁷ For example, in 1999 and again in 2000, Austria invoked Article 16 of Directive 90/220/EEC, also known as the “safeguard clause” to ban GM corn events MON810 and T25.³³⁸ In January 2008, after failing to meet the WTO deadline, the European Commission (EC) was allowed more time to bring its member states into compliance with its trade obligations. The EC had already asked the European Food Safety Authority (EFSA) for rulings on three GM varieties and was given two favourable opinions for two GM corn varieties and one GM potato variety. In December 2008, the EFSA’s Scientific Panel on Genetically Modified Organisms (SPGMO) concluded that there was no new scientific evidence that would invalidate its previous risk assessments of MON810 and T25. At the same time, the SPGMO also approved corn expression cassettes, Cry1A105 and the Cry2Ab2, for insect resistance.³³⁹

In spite of delays in EU approvals for GM crops, over 110,000 ha of GM crops were harvested in seven EU countries in 2007 – a 77 percent increase over 2006. As of May 2008, the only GM crop grown in the EU was a corn cultivar approved in 1998 for animal feed.³⁴⁰ In early 2009, the EC’s environmental unit was prepared to grant a 10-year license for two new GM corn varieties, the first since 1998, but would have to reach consensus under the EU’s weighted country voting system.³⁴¹ The probability of this happening is “highly unlikely” since historically, the EU’s 27 member states have hardly ever agreed on biotechnology issues. Worldwide over 120 GM traits have been registered in 23 crops.³⁴²

Opposition to GM crops in the EU may lead to greater sales for organic food products since organic products, by definition, are GM-free. The presence of manufactured nanoparticles is prohibited by the Soil Association of the UK in any of the products that it certifies as organic.³⁴³ Manufactured nanoparticles are an emerging issue with consumers and may push a new group of consumers towards the consumption of organic food products.

The release of unregistered genetic events into the environment and into export markets

It will be a challenge for the organic sector to keep GM contaminants out of organic crops. Contamination of organic crops is occurring; and it is proving difficult to keep GM contaminants contained, even when these crops do not have full regulatory approval in either Canada or the US.

A contamination scandal in the US with a GM rice trait developed by Bayer Crop Sciences arose when rice line LLRICE601 was found to have contaminated commercial long-grain rice in July of 2006.³⁴⁴ Despite the announcement by the USDA that their scientific review indicated that there were no human health, food safety or environmental concerns, Bayer and the US rice export market were targeted by rice importing nations. This type of accidental contamination of conventional crops by GM crops is of great concern to exporters as well as owners of the genetic events.³⁴⁵ Two years later, even though the USDA approved the Agisure RW trait for resistance to root worm as safe for use in food and animal feed, Syngenta took the precaution of requiring farmers to sign an agreement that states the grain delivery will be to non-export facilities only. These types of agreements are prudent given that the export volumes for US corn in 2008 were 2.425B bushels (bu).³⁴⁶ At an average value of US\$4.00/bu,³⁴⁷ US corn exports were worth about almost US\$10B.

Companies are protecting themselves by taking legal measures to ensure that farmers using their genetic events are aware of export restrictions. Since the organic sector has declared itself GM-free, this can make it difficult for organic producers to claim compensation from larger transnational companies when their crops become contaminated with GM material. In a recent Canadian case, two organic farmers based in Saskatchewan sued Monsanto Canada and Bayer CropScience, seeking compensation for the loss of their organic canola crop due to contamination of their fields by cross-pollination from GM canola varieties. In the first decision against the two producers, the legal system denied the two farmers class-action status.³⁴⁸ The farmers then lost an appeal to the Saskatchewan Court of Appeal and have since appealed to the Supreme Court of Canada.

In another case, a US judge ruled the government acted illegally when it had approved a GM alfalfa owned by Monsanto.³⁴⁹ When lawyers for Monsanto sought to have the preliminary ban on the sale and planting of the alfalfa lifted, the judge was reluctant to lift the ban without a government impact study. The judge told Monsanto that it was up to the government, specifically the USDA, not the court, to determine whether or not the alfalfa would be a potential threat to the environment. He challenged the Monsanto lawyers to cite case law that established a precedent for him to remove the ban. In Canada, the Manitoba Forage Council (MFC) has asked the CFIA to enforce a moratorium on all Canadian trials of GM alfalfa and to order that all stands of the crop be destroyed at 20 locations across Canada.³⁵⁰ The CFIA's response to the MFC request will depend on the results of the USDA's environmental impact study.

New industry standards for US biotechnology-based crop companies have been announced which include third-party auditing in order to help boost consumer confidence that biotech crop development is governed by strict safety standards.³⁵¹ The biotechnology sector has had to address unfavourable court rulings and incidents of contamination of crops have led to public concerns about lax government oversight. Some, however, argue that this initiative has been designed to polish the image of the biotechnology sector rather than improve crop safety.

Plant with Novel Trait

Organic food products do not include GMOs. In the EU, the term GMO is used to describe the technique used to produce a seed.³⁵² In Canada, the CFIA uses the term Plant with Novel Trait (PNT) to describe and regulate the characteristics of seeds. The manner in which the seed is produced is not regulated in Canada³⁵³ so both GM and non-GM crops may be PNTs. The Canadian organic sector needs to be aware of the differences between GMOs and PNTs. For example, a plant with no foreign DNA would not be a GMO according to the EU definition. In Canada, however, genetic engineering could be used to insert DNA from a donor plant of a one species into a different plant of the same species to create a new variety. This new variety would not be regulated under Canada's PNT regulations; however, this variety would be a GMO according to European Parliament Directive 2001/18/EC because GE techniques would have been used to create the variety.³⁵⁴ These differences between the Canadian regulatory system and those of its trading partners must be understood in the Canadian organic sector as new genetic tools become available in Canada.

The CFIA has recently launched a biotechnology pilot project.³⁵⁵ Notices of submission are now posted on the CFIA web site and detail the product, the data the department receives from product developers that have requested safety assessments for PNTs for unconfined release and the safety assessments of novel feeds or novel foods that have been derived from PNTs. The purpose of the posting is to elicit public comment.

Labeling

Health Canada, under the Food and Drugs Act, is responsible for provisions that include food safety, nutrition and public health. Foods derived from biotechnology, including GM or GE foods are classified as "novel foods."³⁵⁶ These novel foods are regulated under Division 28 of Part B of the Food and Drugs Regulations (Novel Foods). It takes seven to 10 years to test the safety of new GM foods that manufacturers or importers wish to sell in Canada. Manufacturers and importers must first submit data for a pre-market safety assessment. Upon successful review, a decision document outlining the novel food is posted on Health Canada's web page.

Food labelling is a joint responsibility, shared by Health Canada and the CFIA, and falls under the Food and Drugs Act. The CFIA is responsible for developing food labelling policies and regulations. A standard for voluntary labelling of GE food entitled, *Voluntary Labelling and Advertising of Foods that are and are Not Products of*

Genetic Engineering was created in response to non-health and safety labelling concerns. In 2004, this was adapted by the Standards Council of Canada.

The Standing Committee on Health initiated a study on what the options were with regard to meeting consumer information needs about GM foods in 2002.³⁵⁷ In 2003, the committee decided not to pursue the issue further after the voluntary standard for the labelling of GM foods was developed. The voluntary standard became a National Standard in 2004. In addition, two studies, entitled *Labelling of genetically modified foods and its impact on farms* and *Improving the Regulation of Genetically Modified Foods and Other Novel Foods in Canada* were completed in 2002.

A number of Canadians are unsatisfied with current food labelling standards, especially with respect to GMOs in food, and believe that Canadian regulations are too lax. Some politicians also feel the current standards could be strengthened and have introduced private members bills in attempts to introduce more stringent labelling requirements. A private members bill, C-510, introduced by Paul Dewar, "...requires the Minister of Health to make regulations within nine months after the day on which this enactment comes into force with respect to the labelling of any meat product or poultry product that has been produced using hormones, antibiotics or rendered slaughterhouse waste with respect to any food product that has been produced using pesticides or genetically modified organisms."³⁵⁸ The first reading of this bill was February 15, 2008.

Alex Atamanenko introduced bill C-456 an "...enactment (that) amends the Food and Drugs Act to provide that the Minister of Health is responsible for establishing that a food or one or more of its components are genetically modified."³⁵⁹ Once this has been established, the Minister is required to have the name of the food published in the Canada Gazette. The Minister must also prepare a list of all such foods and have a copy sent at no cost to any person who requests it. This food or food products containing this food cannot then be sold in a package unless a label containing the following notice is affixed to the package: "This product or one or more of its components have been genetically modified." In addition, this food and food products containing this food cannot be sold without a package unless a sign in the prescribed form containing the following notice is posted near the food: "Genetically modified." The first reading of the bill was October 16, 2007.

Since 1910, 229 private members' public bills have been passed by the parliament of Canada. On average, over the past 98 years, just over two private members' public bills have been passed annually.³⁶⁰ Given the small number of private members bills that are passed, it is unlikely that any of the private members bills relating to GMOs and/or food labelling would pass.

Malaysia is also trying to introduce a law making the labelling of products containing GMOs mandatory.³⁶¹ However, the US opposes such a law and this legislation would become an issue in bilateral Free Trade Agreement negotiations with Malaysia. Malaysian activists are concerned that this would lead to a watering down of the law, rendering it ineffective. It is unlikely that Malaysia would be able to make the labelling of products containing GMOs mandatory if it wanted to enter into a bilateral Free Trade Agreement with the US, a country with one of the highest levels of production of GM crops in the world.

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