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Report 5

A Qualitative Assessment of the Benefits and Costs of On-Farm Food Safety and Environmental Farm Plans in the Grain Sector

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On-Farm Food Safety and Environmental Farm Plans:
Identifying and Classifying Benefits and Costs

Canada

A Qualitative Assessment of the Benefits and Costs of On-Farm Food Safety and Environmental Farm Plans in the Grain Sector

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Foreword

As consumers become more sophisticated and discerning in their food purchases, Canadian agriculture and agri-food production is changing to meet the challenge. Supply chains have been formed that specifically address food safety, food quality, and environmental concerns. Even the farm gate is reassessing the way it does business. Industry initiatives are looking at the feasibility, and in many instances are already in the process, of implementing on-farm food safety systems/programs (OFFS) and environmental farm plans (EFP). The Agricultural Policy Framework (APF) recognizes the importance of food safety and environmental concerns for the future growth of the agriculture and agri-food sector. For this purpose, Agriculture and Agri-Food Canada (AAFC) has commissioned a series of six reports to develop a conceptual framework to strengthen our understanding of the benefit and cost implications OFFS and EFP will have across the agri-food chain.[1] The conceptual framework provides a systematic approach for organizing and pulling together stakeholders and government ongoing work in determining how best to implement on-farm food safety and environmental planning. The reports also provide preliminary qualitative applications of the conceptual framework to the Canadian pork, beef, grain and dairy sectors.

This fifth report in the series "*On-Farm Food Safety and Environmental Farm Plans: Identifying and Classifying Benefits and Costs*" details the assessment for the Canadian grain sector.

The full list of reports in the series "*On-Farm Food Safety and Environmental Farm Plans: Identifying and Classifying Benefits and Costs*" is as follows:

Report 1: *Overview of the Development and Applications of a Conceptual Framework for Analyzing Benefits and Costs of On-Farm Food Safety and Environmental Farm Plans* by J.E. Hobbs, J-P. Gervais, R. Gray, W.A. Kerr, B. Larue and C. Wasylyniuk

Report 2: *On-Farm Food Safety and Environmental Farm Plans: A Conceptual Framework for Identifying and Classifying Benefits and Costs* by J.E. Hobbs, J-P. Gervais, R. Gray, W.A. Kerr and B. Larue

1. *The bulk of the analysis for this study was completed in March 2003, prior to the discovery of bovine spongiform encephalopathy (BSE) in a single beef cow in Alberta, and the subsequent closure of the U.S. and other countries' borders to all Canadian live ruminant and ruminant meat and meat product exports.*

Report 3: *A Qualitative Assessment of the Benefits and Costs of On-Farm Food Safety and Environmental Farm Plans in the Pork Sector* by B. Larue, J-P. Gervais, J.E. Hobbs, W.A. Kerr, and R. Gray

Report 4: *A Qualitative Assessment of the Benefits and Costs of On-Farm Food Safety and Environmental Farm Plans in the Beef Sector* by W.A. Kerr, C. Wasylyniuk, J.E. Hobbs, J-P. Gervais, R. Gray and B. Larue

Report 5: *A Qualitative Assessment of the Benefits and Costs of On-Farm Food Safety and Environmental Farm Plans in the Grain Sector* by R. Gray, M. Ferguson, B. Martin, J.E. Hobbs, W.A. Kerr, B. Larue and J-P. Gervais

Report 6: *A Qualitative Assessment of the Benefits and Costs of On-Farm Food Safety and Environmental Farm Plans in the Dairy Sector* by J-P. Gervais, B. Larue, J.E. Hobbs, W.A. Kerr and R. Gray

Executive summary

This report deals with the potential benefits and costs that could arise from OFFS and EFP in the Canadian grain sector. The Canadian grain sector has not been associated with any significant food safety problems and has a very good domestic and international reputation for safety and consistent quality. Under the oversight of the Canadian Grain Commission, product inspection combined with the bulk handling system, which provides many points of inspection and tends to dilute potential hazards, have worked together to establish and maintain this very good reputation. But a growing minority of consumers has become concerned about pesticide residues and genetically modified (GM) crops. This has created a rapid increase in the demand for organic grain production, both domestically and internationally.

The environmental hazards associated with grain production, including ground and surface water nitrification, pesticide overuse, on-farm fuel storage leaks and inappropriate pesticide and fertilizer storage have become an issue for some consumers. With the exception of the organic market, these concerns do not seem to be reflected in an increase in demand for grain to be produced with EFP.

Quality assurance systems for grains have been introduced in a number of countries in the world, including Australia, the UK and Sweden. These programs have had limited success. The Australian systems have found it difficult to preserve the identity of grain in the bulk handling system. In the UK grain producers have been unable to realize a premium. The system in Sweden appears to have been the most successful, but much of the attraction to the products seems to be the ability to identify them as local products. It is unclear whether a foreign product would receive the same market reception.

The organic industry provides a very good example of how food safety and environmental stewardship can be used to develop economically viable supply chains. The Certification Bodies ensure that their certified producers, processors and marketers are compliant with the organic standard. Producers wishing to obtain organic certification must follow a strict production protocol, keep detailed production records, and subject their farm to annual inspections by the Certification Body. When organic grain is marketed, it must be kept separate from non-organic grain in the supply chain. Successful organic supply chains allow all the participants to capture some value from the consumers' willingness to pay for organic products. The success and rapid growth of these supply chains illustrate that if there is sufficient willingness to pay the private sector is capable of meeting these needs.

The APF stresses the importance of increasing implementation of health and safety programs throughout the production line. It aims to increase the use of OFFS to eliminate/minimize the presence of food-borne illnesses and augment safety documentation. After a meeting in April 2001 the Canada Grains Council decided to undertake the responsibility of developing an on-farm assurance program for grains. Under the voluntary program, farmers will record and document many of their production activities. There are a total of ten good production practices and documentation procedures that must be followed, with an emphasis on grain transportation, on-farm storage, chemical storage and handling, and equipment maintenance and calibration.

The introduction of a national voluntary OFFS for grain production will have many implications for the Canadian grain industry. As reported in Summary Table 6 in this report, direct program costs are those personally incurred by the producer for enrolling in the program, and will be easy to quantify once the exact details of the OFFS are finalized. Compliance costs may include cleaning up farmyards, establishing designated storage areas for pesticides, upgrading bin storage facilities, and updating pesticide-spraying equipment and management time. An increase in on-farm food safety management time could interfere with off-farm employment and agronomic management activities. There will also be a need to keep assured grain separate from non-assured grain which will increase costs in the bulk handling system.

There is little evidence that initiating the OFFS will result in better market access. The Canada Grains Council has identified the U.S., Japan, and the EU as the markets demanding high levels of food safety (Canada Grains Council, 2002). Japan already considers Canada to be a world leader in food safety. In the EU, market access is far more closely tied to GM grain production. Canada has lost its access to EU markets for canola, but remains a premium supplier of wheat. Again, the organic supply chains tend to be an exception and some have potential for growth in the EU, Japan and the U.S.

While the costs of OFFS for grains are apparent, the benefits are much harder to find. Similar to the experience in Australia, a voluntary industry-wide OFFS will likely result in a moderate net cost to the industry. An enforced compulsory system is likely to result in significant costs. The development of buyer specific industry driven systems are likely to generate some positive net benefits as only profitable supply chains will develop. Using a regulatory approach to make on-farm grain production safer could be either a net cost or a net benefit depending on what measures were introduced. For instance, some stakeholders believe that regulating the introduction of GM wheat could pay very large dividends.

The proposed OFFS being developed by the Canada Grains Council has most of the components of an EFP. This makes the assessment of the benefits and costs of an EFP very difficult to assess separately for the proposed OFFS. Introducing voluntary EFP will attract those producers already in compliance, and will do little to force the compliance of those in violation of existing regulations. The costs of compliance, as described in Table 8 in this report are generally straightforward to calculate once the EFP requirements are known. If forced compliance results in the loss of farms and accelerated rural depopulation, these social costs would be difficult to measure. The benefits are all nearly impossible to estimate without considerable research because many are less tangible non-market human health and environmental benefits. Because the most significant potential benefits for EFP are public benefits, it is unlikely EFP will become widespread without government providing financial incentives. If government action is required then direct subsidization for abatement or regulation may be more effective that trying to create a market induced EFP.

Chapter 1

Introduction

Food safety, food quality and environmental concerns have become issues in the domestic market and in export markets for many Canadian agri-food products. A large number of industry-led and public sector initiatives are attempting to respond to these rising concerns. While these initiatives can be solely reactive, it is hoped that the changes being put in place can improve the competitive advantage of individual Canadian agri-food industries and the Canadian agri-food industry as a whole. Besides the positive effect on profitability, there may be other benefits that accrue to society from initiatives that enhance food safety and improve the environmental sustainability of agricultural production.

The APF, endorsed by the Government of Canada and most provincial governments, stresses food safety and environmental stewardship as among the top priorities for guaranteeing a strong future for Canadian agriculture. The APF considers the implementation of Hazard Analysis Critical Control Point (HACCP)-like OFFS and the implementation of EFP as vital in ensuring Canada continues to be a world leader in the agri-food industry.

This is the fifth report in a series dealing with the assessment of potential benefits and costs associated with proposed OFFS and EFP initiatives for Canadian agriculture. The objective of this fifth report is to provide a broad preliminary assessment for the Canadian grain sector. With the exception of organic grain products, which have well-developed supply chains based on OFFS and EFP, the Canadian grain sector is in the early stages of development of national OFFS and EFP initiatives. Part of the analysis will therefore review some of the early international and regional experiences with these programs and will discuss the development in the organic grain industry.

This report is structured in seven chapters. The remainder of this chapter outlines the benefit-cost framework developed and used in this research project. Chapter 2 provides background information on the Canadian grain industry. Chapter 3 discusses grain quality programs in other countries. Chapter 4 discusses the organic industry, deriving insights for identity preservation and quality control issues for the conventional grain sector. OFFS in grain is discussed in chapter 5, while EFP are dealt with in chapter 6. Conclusions are presented in chapter 7. A glossary of key technical terms and a list of abbreviations can be found in the appendix.

1.1 *The benefit-cost framework*[2]

Any proposed change in the way a firm, or firms in an industry, operate needs to be assessed before a decision can be made regarding its desirability. It does not matter if this change arises in response to an opportunity identified by the firm's management, from a change in market conditions (such as a recession) or a change in the regulatory environment within which the firm operates. If the proposed change is determined to be detrimental to a firm's profits, then alternatives can be explored or a decision made to exit from the industry. Assessments may be straightforward and as simple as "back of the envelope" calculations. In many cases, however, there may be a large number of factors that enter into the assessment of a proposed change and a more formal structure is needed to organize those factors to ensure completeness and to allow positive and negative factors to be weighed. Often the interaction among factors is complex, making it impossible to arrive at a correct assessment through informal means. One of the most long-standing and thoroughly developed aids to formal decision-making is benefit-cost analysis, and it has been employed in this study.

The benefit-cost approach has a number of advantages for decision-making in complex situations. It can be undertaken with differing degrees of sophistication and rigour. Typically, the use of the benefit-cost framework starts with a relatively simple exercise that catalogues the various expected outcomes that may arise from a proposed change in the way firms or industries operate. Outcomes are sorted into benefits and costs. This catalogue is typically very broad and not all of the listed outcomes may be applicable to each firm or industry. This broad approach is undertaken to ensure completeness.

Once the catalogue is completed, the next stage surveys those who work in the firm(s) to rank the importance of each possible outcome. This allows the important benefits and costs to be identified so that further efforts can be concentrated on the key decision variables. In many cases, once this stage is reached no further analysis is required because the broad outlines of the decision are obvious.

If the result is not clear, the use of the framework can be deepened to increase the transparency of the decision. If necessary, monetary values of key benefits and costs can be obtained. This is often expensive requiring sophisticated estimation techniques and specialised professionals. There is a clear research resources question regarding the value of improving the information pertaining to decision-making relative to the costs of obtaining the information. The important point, however, is that there is a consistent framework for organizing increasingly sophisticated pieces of information.

Since many of the changes in the way firms or industries operate will have outcomes that span considerable periods of time, and costs may incur at different times than benefits are received, more formal benefit-cost procedures can incorporate discounting techniques. If the investment is made to obtain complete quantification of key outcomes, the discounting techniques allow comparison of the monetary benefits and costs over time, and hence, determination of the dollar value of the net benefit. As many assumptions are typically needed to calculate the quantitative benefit and cost estimates, the decision- maker can also measure the sensitivity of the net benefit calculation to these assumptions.

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2. *The conceptual framework presented in this chapter is a summary of Report #2. It is presented here for the convenience of the reader. For additional information on the conceptual model, the reader is referred to the report On-Farm Food Safety and Environmental Farm Plans: A Conceptual Framework for Identifying and Classifying Benefits and Costs (Hobbs et al. 2003).*

This report implements a benefit-cost framework to assess OFFS and EFP. The catalogue of benefits and costs was first developed. Next the experience of industry with already existing on-farm quality control and environmental enhancement systems was used to identify the key benefits and costs. No attempt was made to deepen the analysis through the acquisition or development of quantitative measures, as this would have required far greater resources than were available. The framework provides a template upon which a formal quantitative analysis can be based. Considerable insights, however, can be gleaned from the qualitative analysis presented.

Benefit-cost analysis has one additional advantage as an aid to decision making. Private and societal benefits and costs often diverge (i.e. the costs imposed on society from water polluted by agricultural production do not show up on the financial balance sheet of the farm causing the pollution; nor do the benefits urban dwellers receive from farmers undertaking soil conservation practices that reduce dust storms). Thus, a proposed change in the way firms operate may lead to differences in the desirability of the outcome depending upon whether the private or public view is taken. Benefit-cost analysis allows both private and public benefits and costs to be incorporated into the decision-making framework in a consistent fashion. By comparing the private and public views, it is possible to assess the desirability of public sector intervention.

Some of the costs of OFFS are obvious. There will be start-up (fixed) management costs associated with developing a plan and putting it into operation, including one-time costs associated with changes to facilities (fixed capital costs associated with compliance). There will also be ongoing (variable) management and compliance costs associated with operating the system, extra wage costs or possibly additional personnel, ongoing staff training, computer equipment, updates of record keeping software, etc. Other costs may not be so obvious. If systems are not mandatory, there may be costs associated with segregating products that are produced under the OFFS from those that are not, so that consumers can be assured of the quality of the products they are consuming. Whether products have been produced under OFFS protocols cannot be discerned when food is purchased or even after consumption. As a result; there must be ways of verifying that the products have been produced to this standard. Thus, there will be costs associated with monitoring production processes. There will also be costs associated with dealing with those who cheat or lack the skills to live up to their commitments.

A wide range of potential benefits have also been incorporated into the framework to evaluate OFFS. These benefits tend to be less obvious than the costs and better illustrate the importance of using a formal framework. For example, in times of rising international concerns regarding food safety, having an OFFS in place may enhance access to foreign markets. It may also allow Canadian products to be differentiated from other products in foreign markets and allow Canadian producers to obtain a premium for their product. It may also enhance the reputation of Canadian food internationally, assisting in building a loyal base of international customers.

An OFFS can benefit consumers by reducing the costs they must incur to learn about the safety of the food they purchase. It may also benefit producers by reducing the expenditures they must make to build consumer confidence in their products, or in production through improvements in the use of inputs or an increased output (e.g. through the reduction in product condemnations or recalls). Benefits may also accrue along the supply chain, such as lower losses during transportation and less post-farm monitoring.

One of the major benefits may be the reduced liability cost arising from the ability to trace product through the supply chain when there is a break down in the food safety system. Being able to identify the farm(s) of origin may reduce the number of farms whose products must be recalled and may also increase the speed with which an animal health problem or crop contamination

problem can be dealt with. There may also be benefits that arise from isolating any firms currently free-riding on the food safety system (e.g. a farmer who feels he/she doesn't have to reduce his/her pesticide use because all the other farmers will and no one will notice his/her high pesticide levels if everything is mixed at the grain elevator).

Many of these benefit and cost scenarios can be couched in an insurance framework whereby incurring the costs associated with OFFS acts not to eliminate a future occurrence but rather to reduce the probability that a future occurrence takes place. As some food safety problems can greatly reduce the income of a large number of farmers (e.g. a foot-and-mouth outbreak) each farmer's contribution to increased food safety acts like an insurance premium to reduce the probability of a high cost future event that affects a large number of farmers.

The benefit-cost framework for EFP is similar to that for OFFS. On the cost side there are both fixed and variable costs associated with establishing a plan and implementing it. There are also monitoring and enforcement costs in terms of ensuring that plans are actually being followed and to discipline those who breach their commitments.

If the farm plan indicates that there are unacceptable environmental practices taking place in the farming operation, there may be mitigation costs associated with remedying the problem. These may be capital costs such as the installation of more sophisticated manure handling systems or variable costs such as changes to feed rations to reduce phosphorous in faecal material. As with OFFS, there may be costs associated with segregating products produced under EFP from products not produced under such plans.

Benefits from EFP arise from lowering information costs relating to the environmental friendliness of the processes used to produce food and simultaneously increasing consumer confidence in the food system. There may be benefits from being able to brand Canadian products as environmentally friendly and from reducing the costs of meeting the market access requirements of importing countries. Farmers may benefit from enhanced self-worth and community status from increasing their environmental stewardship. Putting production on an environmentally sustainable basis will increase the quality of life for Canadians and may result in reduced human health impacts from toxic spills, etc. Externalities and liabilities pertaining to air quality and odour (nuisance) problems may be reduced. There could also be positive ecosystem effects such as enhanced wildlife habitat and green house gas reductions.

Again, some of the benefit and cost scenarios can be couched in insurance terms – as cost premiums to reduce the probability of infrequent and catastrophic events. The framework can also be adapted to deal with the long-time horizons that characterize some environmental benefits.

In addition to cataloguing the benefits and costs of HACCP-based OFFS and EFP, the distributional effects of the changes for various actors along the supply chain have been examined. For example, to reap a private sector benefit from the HACCP-based OFFS will require changes to how agricultural products are monitored along the supply chain to the final consumer. The firms that participate in the supply chain will have to incur costs in ensuring that the high food standards are maintained through the supply chain and that consumers are ultimately informed of the benefits they receive. Supply chain participants may also have a chance to share in any increase in revenues that arise from the change. Where appropriate, the factors that influence how these benefits and costs are shared among supply chain participants are identified.

Individual sectors will have differences in benefits and costs depending upon factors such as whether the industry is involved heavily in exporting and whether their products are currently branded. Where appropriate, these differences are pointed out and their effect on the efficacy of OFFS and EFP initiatives are indicated.

Chapter 2

Background – the current Canadian grain industry

In order to assess the potential benefits and costs of OFFS and EFP initiatives, it is important to have an understanding of what types of hazards are potentially present, and how the marketing and regulatory systems currently operating address these concerns. Section 2.1 outlines the primary food safety hazards that can be associated with grain. The efforts of the Canadian Grains Commission (Commission) to eliminate these hazards using the current grain inspection system and other actions are briefly outlined in section 2.2. Section 2.3 outlines the major environmental concerns that can be associated with grain production. The actions currently taken by the government to limit these hazards are described in section 2.4.

2.1 Current grain safety issues

There are a number of safety hazards present in grains that can originate at the production level. Worldwide there have been many deaths related to contaminated grain, though none were associated with Canadian grain. Some of the more classic incidents relate to ergotism and alimentary toxic aleukia (ATA) outbreaks in the former USSR, and Urov disease, Red Mould Disease and toxicosis in India associated with fusarium head blight. Consumption of treated seed may also cause sickness or death (Nowicki, 2002). Some of the more recent safety concerns in the grain industry that the Commission is grappling with are outlined in Table 1.

2.2 The current grain performance-based inspection system

The Commission is a federal government agency operating under the authority of the Canada Grains Act. The Commission is funded by Parliament and supplemented with fees collected for its services. In addition to guaranteeing the grade and consistency of Canadian grain shipments, the Commission is also responsible for certifying the safety of these shipments. The Commission regularly samples parcels at every stage of the supply chain and uses advanced tests to identify parcels that may contain unacceptable levels of toxic substances, pesticide residues, insects, fae-

ces or other foreign materials in the grain. Shipments that contain high levels of toxic substances and pesticide residues are removed from the supply channel (Canadian Grain Commission, 2002).

Table 1: Current grain safety hazards

TYPE OF HAZARD	EXAMPLES	CAUSED BY:
Pathogenic bacteria	Salmonella, E. coli, and listeria monocytogens	Poor storage, rodent or bird faeces, and any contact with manure
Mycotoxins	Mycotoxins can cause a mold to develop on kernels. This mold removes nutrients, fat, protein, and vitamins from the kernel. Linked to birth defects, nervous system problems, and tumours in animals	Occur at high moisture levels both in the bin and in the field. Specific details of mycotoxin development are currently being researched
Chemical	Pesticide residue, seed treatment products mixing with grain	Occur when improper application rates are used, pre-harvest intervals are not followed or producer carelessness with seed treatment products

Source: Canada Grains Council, 2002b.

The current grain safety system has five main functions. The first line of defence against grain contamination is simply preventing and avoiding it by studying the routes of entry of poisonous substances into the grain. This responsibility is taken very seriously where the introduction of new pesticides is involved. The Commission also employs grain inspectors to identify contaminated parcels of grain, and to test any samples identified as potentially contaminated. Routine monitoring and testing is conducted, focusing primarily on vessel loading. Research and development at the Commission is ongoing, and focuses on developing new tests, and identifying and understanding new toxins in grain. The Commission also assists international buyers in providing any safety service analysis or documentation required by purchasers. The Commission is an export-oriented agency, and has very little to do with grain destined for domestic consumption.

The Canadian grain grading system separates grains based on a variety of visual quality attributes. Some of these visual attributes are in fact safety controls. For example, the grading system downgrades grain with high instances of ergot bodies or fusarium damaged kernels, both of which are very toxic. To be graded No. 1, most varieties of wheat can have no more than 0.01% ergot bodies. To be graded as No. 2, the maximum level changes to 0.02%. In this way, the grading system works to eliminate any potential safety hazards that are visually detectable.

The Commission does not routinely become involved in testing every producer delivery or shipment to domestic users of grain. However, when a grain inspector, producer or buyer has some reason to believes that a parcel is contaminated and requests a specific analysis, testing will be done. Any OFFS is unlikely to reduce or change the role of the Commission in providing safety assurances for grain, as grain buyers will continue to require the third party assurances and sample testing that it provides (Nowicki, 2002). Rather, the activities of the Commission may need to be intensified to hold producers personally accountable for the grain they ship.

2.3 *Environmental hazards from grain production*

The environmental hazards associated with grain production, including ground and surface water nitrification, the use of pesticides, on-farm fuel storage leaks, rodents, and inappropriate pesticide and fertilizer storage, are current environmental issues. Of these issues, ground and surface water contamination attracts the most attention, particularly in central and eastern Canada. As with food safety issues, the environmental issues associated with grain production are relatively small compared to the issues in the livestock sector.

2.4 *Current regulation of environmental hazards*

Most environmental problems are regulated at the Provincial and Municipal levels. As a result there is a wide array of regulations across Canada, which more or less reflect the severity of the local problems. One common feature of the regulation across Canada is the lack of enforcement. This begs the question of whether EFP will be monitored and enforced. If they are not, then the EFP may create a negative image for the sector.

Chapter 3

Overview of grain quality systems in other countries

Several countries have already developed grain quality assurance programs. Some of these programs are HACPP-based OFFS, some are EFP initiatives and several combine both of these features into a single program of quality assurance. While the main programs are presented here, it is likely that other countries are also in the process of developing on-farm assurance programs. Major initiatives in Australia, the UK and Sweden are outlined in sections 3.1, 3.2, 3.3, and 3.4 respectively. A brief summary is provided in section 3.5.

3.1 Australia

Australia has a number of competing on-farm assurance programs that have not gained widespread acceptance with Australian grain producers. *Graincare, Great Grain*, and *SQF* are the most prominent Australian HACCP-based programs. The Grains Council of Australia created *Graincare* in 1998, and the program is now operational. There is currently no cost information available for the *Graincare* program. *Great Grain* was developed from the *Quality Wheat CRC* and *Pulse Australia* pilot QA programs, merging the best aspects of both schemes. The industry bodies of Pulse Australia Ltd, the Grain Pool of Western Australia, and the Australian Oilseeds Federation support the program. *Great Grain* is partnered with another program called *SQF 1000*. The Swiss SQF institute is a corporation formed in 2001 that administers *SQF 1000*. According to the Grain Pool of Western Australia, *Great Grain/SQF 1000* training in 2002 will cost producers $2,854.50 AUS. This includes two days of group training, a mock audit, an actual audit, training materials, and follow-up support. Following the first year, producers can expect to pay an annual registration fee of $120 AUS, and annual auditing fees of around $400 AUS (Great Grain, 2002).

The programs themselves, and the firms training and auditing farms for the Australian programs, are privately run. Participating farmers have the ability to pick whichever training firm they want, as most are accredited to audit several of the schemes. There are at least five training and auditing firms with a web presence, though it is likely that additional firms exist. At this time, none of the quality assurance schemes appear to be supported by the Australian govern-

ment. However, the Australian government supports all the programs though a joint commonwealth/state initiative called *Farmbis*. *Farmbis* provides up to a 75% subsidy to reduce the cost for farmers taking training courses and initiating on-farm assurance schemes up to a maximum of $5000 AUS.

Even though there is an assortment of programs to choose from, farmers have not embraced on-farm assurance in Australia. Enrolment of farmers in *Great Grain* and *SQF 1000* training has been growing slowly, and no numbers are available regarding acceptance of the *Graincare* or *ISO* schemes. The problem may lie with Australian bulk buyers and grain handlers, as they have no way of preserving the identity of on-farm assured grain past the farm gate. Currently, the only way to guarantee that on-farm assured grain does not mix with conventional grain is to deliver directly to a mill or feedlot. Australia does not have the ability to operate a tested IPPM system, and this has paralysed Australian on-farm food safety (OCES, 2002).

3.2 *The UK: Scottish Quality Cereals*

Scottish Quality Cereals (SQC) was implemented in Scotland in 1994 after research carried out in 1992 indicated that domestic retailers and processors would be interested in a quality assurance system for Scottish cereal grains. The new Food Safety Act passed in the UK in 1990 also hastened the development of the program. The scheme was implemented to ensure member farms operate with high standards of crop management, especially with regard to fertilizer, pesticides, and on-farm storage. Member farms must be audited on an annual basis to ensure compliance with SQC standards. SQC began after the National Farmers' Union of Scotland established a group of industry leaders who drafted the scheme. This development group was not well represented by farmers and this has caused some degree of tension (Leat et al., 1998).

In order to accelerate the adoption of SQC in its first year, Scottish maltsters offered a £1 per tonne premium for all malting barley grown under contract to SQC specifications. The premium is no longer offered, and Scottish grain buyers have shown little inclination to pay a premium for assured grain (Fearne and Garcia, 1999). Scottish cereal producers rapidly adopted the program and in June 1998, SQC certified grain represented 55% of total Scottish cereal production (Jack et al., 1998). In 2001, SQC certified grain accounted for 8% of all grain marketed in the UK (Adapted From ACCS, 2002). Table 2 outlines subscription costs for the SQC program. The costs of on-farm assessments are included in the subscription fees.

Table 2: SQC subscription costs

CEREAL AREA (HA)	ANNUAL SUBSCRIPTION
up to 29 ha	£95
30-49	£125
50-74	£150
75-99	£185
100-149	£220
150 and over	£250

Source: SQC, 2002.

3.3 The UK: other quality assurance schemes

The *Assured Combinable Crops Scheme* (ACCS) is an independently audited program established and endorsed by the majority of the UK's grain buyers, and the British National Farmers Union (NFU). ACCS was established in 1998 (Fearne and Garcia, 1999), and had 11,600 producers sign on in 2001, accounting for 67% of the total grain producing area in the UK. The SQC and ACCS programs combined accounted for a total production of 14.5 million tonnes of grain in England, Scotland and Wales in the 2000 crop year. This was in excess of 80% of the total grain marketed. Most grain buyers in the UK had indicated a strong preference for assured grain, and many indicated that it would be a requirement of purchase for grain in 2001 (Adapted from ACCS, 2002).

Currently there are two private certification bodies licensed to audit farms for ACCS. There are only a handful of these companies in existence in the UK, and these certification bodies must bid on contracts put out by ACCS. Contracting is utilized because excessive competition may lead to shortcuts in the auditing process, compromising the credibility of the ACCS scheme (Wilson, 2002). The ACCS membership fees are based upon the total area farmed. The following table shows registration costs for the ACCS scheme. Annual farm audits are included as part of the subscription fee.

Table 3: ACCS subscription costs

HECTARES	SUBSCRIPTION
up to and including 29 ha	£95
30-79	£150
80-129	£200
130-179	£250
180-249	£300
250 ha and over	£350

Source: ACCS, 2002.

Fearne and Garcia indicate that there has been considerable resistance and resentment among producers due to the lack of consultation in the development of the program, and because they have not received the benefits they anticipated.

In 1999, the NFU responded to domestic consumer demand for on-farm assurances by developing an easily recognizable symbol attached to food that has been produced to independently inspected standards. This national 'safe' brand has been attached to beef, lamb, pork, chicken, milk, cereals, vegetables, fruits and salads and takes the form of a little red tractor logo. There is usually no price premium collected from food branded with the little red tractor, although some sources have suggested that it is possible to extract premiums in some select situations (NFU, 2002).

The British farm standard is currently attached to over 500 product lines. One of the main reasons for the adoption of the British Farm Standard appears to be for protectionism rather than for health and food safety. British farmers want to increase their competitiveness with foreign producers in Europe, and they believe the British Farm Standard mark could help increase the amount of home-grown and locally reared food sold by British farmers domestically. The NFU (2002) concedes that if a foreign country can prove that its food conforms to the British Farm

Standard due diligence requirements, it will legally be very difficult to resist allowing them to brand their food with the standard. Stephen Rossides, the head of food, health, and science for the NFU is quoted as saying:

> *The development of the Red Tractor by the NFU is an attempt to "brand" farm assurance and raise awareness with consumers about how we produce food and what standards we produce to. But we have also developed the (Little Red) Tractor to make the link with "British" product. Whatever our farmers like to believe, we know that most consumers will not buy British product simply because it is British. But they may do so if one of the propositions of 'British' is that it is formally assured (with) independently verified standards (Rossides, 2002).*

Despite an aggressive promotional campaign by the NFU, consumers have not fully understood and recognized the British farm brand and what it stands for, as the brand has been described as "dying on its feet." The NFU is not sure why consumer uptake has been so slow, but believes more advertising and publicity is needed to make consumers more aware of the brand. The NFU is planning to re-launch the brand, and expects the government to continue partially funding the costly process of establishing an agricultural brand.

3.4 Sweden

A producer-owned company in Sweden developed the *Swedish Seal of Quality*. Lantmännen sells farm inputs and buys grain from farmers. The *Swedish Seal* imposes the same types of documentation requirements as other assurance programs to ensure that crops are grown and handled with good production and safety practices. The *Swedish Seal* differs from other programs because it also imposes strict environmental constraints on producers. For example, the outside borders of fields cannot be sprayed with pesticide so that game birds and other wildlife can find food in the form of insects and weed seeds. Farmers must also leave six-meter wide buffer zones beside any water to provide food and cover for wildlife and increase bio-diversity. Strict guidelines must also be adhered to when applying fertilizer and pesticides (Lantmännen, 2002).

The *Swedish Seal* system contains thorough documentation and checklists for control and audit purposes. On an annual basis, an independent accounting company, *SEMKO-DEKRA Certification AB Ltd*. audits 7% of member farms. Lantmännen's own internal auditors check a further 33% of farms. In 2001, 725 farmers produced 250,000 tonnes of grain for the *Swedish Seal* on 110,000 hectares of Swedish land, and this number is expected to rise (Lantmännen, 2002). The scheme was set up to satisfy market demand for raw product that could be guaranteed as safe and produced in an environmentally responsible manner. The quality mark is available on many different types of farm cereal products like flour, crackers, and bread. Swedish farmers produce grain under direct contract for Lantmännen. It has not been possible to discover the contents of these contracts, therefore, no information on producer costs or the compensation producers receive for producing under the *Swedish Seal* is available. It is safe to assume that producers do incur additional costs, and that Lantmännen adequately compensates them. Otherwise they would have no incentive to enter into the contracts.

3.5 Summary

There are a number of quality assurance systems for grains that are being developed or have been recently implemented. The brief review of four systems suggests limited success, and very limited returns to producers. The exception may be the Swedish system. This system is however, small scale and may rely very heavily on the local market. More work is needed to find examples of quality assurance systems for grains that are based on the export market.

Chapter 4

Quality assurance systems in the organic grain industry

A discussion of existing quality assurance systems is not complete without a description of the systems that have developed within the organic industry. From the material presented in chapter 3, it is clear that there have been limited attempts to introduce grain quality assurance systems internationally, and that these systems have had limited success. The same is not true for the organic industry, which has a much longer history and continues to show substantial growth and economic viability for all supply chain participants. Because the organic industry grew out of concerns for food safety and environmental stewardship, the OFFS and EFP mechanisms that have developed within this industry provide important examples that process-related good attributes can be effectively marketed. Moreover, the existence of the organic grains industry, and the access these markets provide to the consumer, may reduce the financial and social return to developing non-organic OFFS and EFP initiatives.

Section 4.1 provides a brief overview of the development of the organic grain industry. Organic certification systems are described in section 4.2. The final subsection deals with the relationship between national OFFS and EFP initiatives and the existing quality systems within the organic industry.

4.1 The development of the organic industry

The beginning of the organic industry coincided with the introduction of chemical fertilizers and pesticides. Consumers and producers concerned about the safety of these production practices began to form markets for the exchange of organic products just after the Second World War. As producers got together to market these products it became clear that production standards, and a process for verifying the production standards, were required to maintain consumer confidence. This led to the development of organic standards and organic certification processes requiring producers to document their organic production practices and third parties to inspect the operations to ensure compliance with the standards. These initiatives were started with small private or cooperative enterprises with very little government regulatory involvement or financial assistance.

Today, organic food is one of the fastest growing segments in the international food market. The organic movement captures consumer trends toward non-genetically modified, environmentally friendly foods and natural lifestyles. In Canada alone, the organic industry is worth an estimated one billion dollars (year 2000 figures). Retail sales have grown by approximately 20% a year (Sparks 1999), and from 1990 to 1995 organic production increased by 300% (Porter et al. 2001). Growth has been facilitated by recent food scares such as BSE or mad cow disease in beef, and foot and mouth disease in sheep. As a result, the organic industry has moved from a small niche market into the mainstream market.

The issues facing the organic industry in Canada are widely felt in Saskatchewan, as the province is the largest producer of organic food in Canada. Saskatchewan had 495,200 acres of organic cropland in 2000, with approximately 1200 organic producers. The main crops produced are spring wheat, durum, oats, flax, lentils, wild rice and pasture for organic livestock production (SAF 2001).

4.2 Organic certification systems

The organic industry is a significant and a growing part of the agricultural sector in most of the developed world. It is also growing rapidly in many developing countries. Although there are many small differences across countries, the organic markets have a great deal in common. With increasing international trade there is increased pressure to develop common standards within a country, and greater consistency across countries.

Organic grain commands a premium over conventional products in the market place because consumers believe the product is produced without the use of chemical pesticides or fertilizers and that it is non-genetically modified. As with on-farm food safety and environmental stewardship, these product qualities are not easily observed by inspecting the grain. Rather, the consumer has to be convinced that the product was produced using the prescribed organic process and that it was not mixed with any non-organic product in the supply chain. Without these assurances the consumer will not pay the premiums for these products.

In response to the need for consumer assurance the organic industry has developed elaborate systems of standards development, on-farm production requirements, marketing channel requirements, and inspections. Historically these systems were developed and driven by the private supply chains from producer to consumer. More recently, governments have taken a greater interest in organic production and have become somewhat involved in regulating the supply chain.

In a typical organic supply chain there would be a national or private standard that would accompany the right to use a particular organic product label. Third party certification bodies, responsible for ensuring that standards are met, are normally approved by an accreditation body. The certification bodies ensure that their certified producers, processors and marketers are compliant with the organic standard. Producers wishing to obtain organic certification must follow a strict production protocol, keep detailed production records and subject their farm to annual inspections by the certification body. The process includes a multiyear waiting period where the farmer must provide detailed maps of the farm and the production practices employed. The farmer must also take very specific measures to keep organic production separate from any potential contamination from non-organic products. When the organic grain is marketed, it must be kept separate from non-organic grains in the supply chain. This process often involves the use of separate handling and processing facilities and/or the use of containerized movement. These organic supply chains allow all the participants to capture some value from

the consumers' willingness to pay for organics products. The success and rapid growth of these supply chains clearly illustrate that if there is sufficient willingness to pay than the private sector is capable of meeting these needs.

4.3 Quality assurance systems and organic supply chains

The Canadian organic industry faces particular challenges that threaten its expansion. To date, it has been primarily self-developed and self-regulated. There is no national organic standard and in most provinces there are no minimum standards for an organic product. In Canada, there are currently over forty different (albeit closely related) organic standards. This has led to confusion in the marketplace. While there have not been any documented cases of chemically treated food being sold as organic food in Canada, the potential risk of fraudulent activity is enough to hurt the integrity of the industry. The opportunity exists for goods to be intentionally misrepresented to capture premiums. If consumers are uncertain about what they are buying, they may be reluctant to pay a premium to purchase organic goods. Multiple standards also create supply chain problems because grain merchants are often required to keep grain verified by different certification bodies separate. Thus, they are unable to take advantage of economies of scale.

There may be an opportunity for policymakers to layer the efforts of producers to access markets, the government's desire to encourage HACCP and EFP production practices, and the need for an organic national standard. *Rural Industries Research and Development Corporation (Australia)* is already investigating such a possibility. As Geno (2001) suggests in a recent brief entitled "Integrating Organic Certification with Food Safety Certification System", the two concerns are easily intertwined.

> *The organic industry has generally recognized both the requirement of the Codes Alimentarius and Australia food standards through direct reference to these requirements in their certification information to growers and processors. In addition, both [National Association for Sustainable Agriculture Australia] and [Biological Farmers Australia] embrace a philosophy of the use of HACCP plans for total quality management for both processors and growers.*

Geno's 2001 report for the Rural Industries Research and Development Corporation affirms that use of HACCP-based farm safety programs is ideal for organic farms, since:

- a program based on segregation and certification identifies closely with the aims of organic production
- the program is based on flow diagrams, which are easy to use for producers with even limited management skills
- an association with HACCP would offer an image of increased professionalism.

Chapter 5

The benefits and costs of the proposed OFFS program for grain

5.1 The Canada Grains Council's on-farm food safety program proposal

A conference was held in April 2001 consisting of members of the Canada Grains Council (CGC) to discuss the goal of implementing an on-farm food safety and quality assurance program. Following the conference, the CGC decided to undertake the responsibility of developing an on-farm assurance program for grains. The Canadian On-Farm Food Safety (COFFS) program is funding the development of the national OFFS, supported by the CGC's member organizations. COFFS is a producer-industry-government partnership that provides funding for organizations establishing national on-farm food safety initiatives. COFFS is funded by AAFC, and has contributed $287,900 for completion of Phase 2 of the CGC's OFFS (COFFS, 2002). The CGC's OFFS is the first program of its kind to be designed and implemented in Canada. The program is currently in the pilot stage, and will likely undergo a number of changes in the next few years to become as user-friendly as possible for producers. As end-user requirements change in the future, it is likely that the OFFS will adapt and change as well to meet the new demands of grain buyers.

The specific certification details of the program are unclear at this point. There will likely be independent farm audits, although the structure of the program and origin of the auditors has not yet been decided. On-farm audits may occur on an annual basis or simply randomly at some point during the production season. The goal of this on-farm certification is to guarantee the integrity of the program.

The OFFS is primarily concerned with reassuring international markets that Canadian commodities are safe, particularly in comparison with other countries. The program is HACCP-based, and is similar to the *Graincare, SQC*, and *ACCS* programs underway in their respective countries (see chapter 3). Under the program, farmers will record and document many of their production

activities. There are a total of ten good production practices and documentation procedures that must be followed, with an emphasis on grain transportation, on-farm storage, chemical storage and handling and equipment maintenance and calibration. The program does not dictate the specific manner in which producers carry out their production practices; rather the objective is to guide farmers in making the best production choices, and to have them follow-up on what they have done with documentation proving everything was done correctly.

5.2 The potential benefits and costs of the proposed on-farm food safety program

The introduction of the national OFFS for grain production will have many implications for the Canadian grain industry. Direct program costs are those personally incurred by the producer for undertaking the program, and will be easy to quantify once the exact details of the OFFS are finalized. The first direct expense of the program will be membership and certification fees. This money will go towards the administration of the program, and will also be used to pay the salaries of farm auditors. The amount of the membership fee will depend on the calibre and education of the individuals running the OFFS and conducting the on-farm audits.

Farm auditors will likely be required to have an educational background in agriculture to ensure credibility, although it is not clear what the exact requirements will be or how many auditors will be required. Auditors will likely be required to hold either a diploma or a degree in agriculture. The auditors could be employees of the CFIA, the CGC or an independent firm specializing in on-farm certification. Membership fees may either be based on the total area farmed or consist of a flat fee for all farms.

Additional costs will be incurred through compliance and management. Compliance costs may include cleaning up farmyards, establishing designated storage areas for pesticides, upgrading bin storage facilities and updating pesticide-spraying equipment. Producers undertaking the program will also see an increase in management time. There are training records, trucking affidavits and inventory records that must be completed. Elaborate field maps must be constructed, and the farmer will have to take time to tour the farm with auditors. An increase in on-farm food safety management time could interfere with off-farm employment and agronomic management activities.

The OFFS will initially be voluntary for Canadian grain producers. If the CGC is correct in assuming that there will be significant demand for on-farm assured commodities, there will be both assured commodities and non-assured commodities in the supply chain at any given time. There will be a definite need to keep assured grain separate from non-assured grain and/or develop an Identity Preserved Product Management (IPPM) system to accomplish this task. The Canadian Wheat Board (CWB) has stated that:

> *The most challenging area of discussion in the evolution of the wheat quality system is logistics. Providing additional options to customers in terms of new quality types or to farmers in terms of improved agronomic traits will not help increase on-farm revenue if the result is increased logistical costs that negate any potential price or yield gains. The problem is that there are no economies of scale in the grain handling system when increasing the types of quality being handled. In fact, the opposite is true. As the number of wheat classes or types requiring segregations or identity-preserved movement increases, unit logistical costs increase. While it may be relatively easy to accommodate a small percentage of grain movement as special segregations, the more segregation that is added, the more all grain movement will cost* (CWB, 2000).

It should also be noted that an increased number of segregations increases the risk of supply problems, for e.g., being able to supply customers with a certain type and grade of wheat year after year. An advantage of a limited number of wheat types being grown is the ability to assure supplies, unless production problems are severe and widespread.

Although the CGC's OFFS is voluntary, it will likely affect all grain producers with increased transportation costs, unless buyers of this grain agree to offset all costs for the entire grain handling system. 'Supersafe' grains might be considered simply another class or quality type of wheat. As stated by the CWB, an increase in the number of classes reduces the speed and efficiency of the grain transportation system. High throughput terminals have been built to handle large quantities of the same classes of grain. If every grade and variety of grain is divided into traceable and non-traceable classes, this will effectively double the number of segregations grain companies and the transportation infrastructure will be required to handle. The efficiency and speed of the grain handling system may be reduced.

The main justification for initiating the OFFS is the potential for losing key markets if OFFS are not implemented. The CGC has identified the U.S., Japan and the European community as the markets demanding high levels of food safety (Canada Grains Council, 2002). There is no indication that the U.S. is developing its own national traceability program for grains. Were food safety a significant issue in the U.S., it can be presumed that some effort in establishing a traceability program for grains would be underway. Japan already considers Canada to be a world leader in food safety. Several years ago, a high level official in the Japan Food Agency indicated that he thought Canadian grain was the safest in the world (Nowicki, 2002). With this kind of support for Canadian grain, it is difficult to imagine Japanese markets rapidly disappearing if all Canadian grain production does not become on-farm assured.

The benefit-cost classification system, presented in Report 2, was applied to the grain industry as a check list for where benefits and costs could occur. The results are presented in Table 4. The benefits and costs of the proposed program exclude those that already exist within the supply chains of the organic grain industry.

5.3 Policy alternatives for on-farm food safety program implementation

There is a wide range of options for the implementation of OFFS, each of which have a different set of benefits and costs associated with them. The range of options includes:

- voluntary industry-wide OFFS, where a single standard is voluntarily adhered to;
- enforced industry-wide OFFS, where farmers are compelled to adhere to a single standard;
- buyer-specific OFFS, where proprietary systems are created by private interests in the supply chain; and
- regulatory standards, where farmers are compelled to adopt food safety measures though regulation.

Buyer-specific OFFS are usually set up to provide niche markets with a consistent supply of raw product that fits within their specifications. Usually the type of product that the system is set up for has a unique quality that is not available within the regular supply chain. As a consequence, it is of the utmost important that this unique quality is preserved and that the parcel is not allowed to co-mingle with normal grain at any point along the supply chain. Keeping the trait preserved, and having the ability to guarantee that the unique quality of the product is intact is vital in ensuring that the product retains its value.

Table 4: Potential private benefits and costs of an on-farm food safety program in grain production

DEMAND-SIDE BENEFITS	DESCRIPTION
Domestic market:	
Reduce transaction costs for consumers	Canadian grain has a nearly perfect safety record at the consumer level in terms of food borne pathogens or toxic contamination. It will be difficult to capture additional premiums from consumers for non-organic grains
Build consumer confidence	The quality and safety of grain can be determined by product inspection, which occurs at several points in the supply chain. The blending of grain in the bulk handling system serves to dilute otherwise hazardous accidental contamination levels. Grains also tend to be processed and/or well cooked as part of the food preparation process
	Some consumers are concerned about pesticide residues and the presence of genetically modified grains and oilseeds. Both of these concerns are presently dealt with in the rapidly expanding market for organic grain products, which is an industry driven voluntary OFFS. Neither of these perceived "hazards" would be dealt with by the OFFS being developed by the CGC
	If consumers become familiar with HACCP or other food safety labels on other food products, some may prefer similar labels on grain products. This is most likely to occur with organic product lines
International markets:	
Provide differentiation on the international market	Canadian grain has a very good reputation for quality and consistency. The Canadian Grain Commission acts as third party inspector of all export grain. When quality problems have arisen, the CGC has acted quickly to resolve them. The Kernel Visual Distinguishability requirement for grain varieties, combined with low tolerances and rigorous grading has developed a very good reputation among premium international buyers
Reinforce and develop trade networks	If another Canadian branded safety system is introduced, it will have to be introduced carefully so that the current Canadian reputation and brand recognition in grain is not put in jeopardy
Facilitate trade by reducing non-tariff barriers	There are currently few quality/safety related barriers facing Canadian grain. The exception is restrictions on GM grains and products, which may represent a real threat to wheat exports if introduced in Canada

Table 4: Potential private benefits and costs of an on-farm food safety program in grain production (Continued)

SUPPLY-SIDE BENEFITS	DESCRIPTION
Farm level efficiency gains:	
Improve productivity of inputs	Training sessions to implement the OFFS can help some producers in the planning exercise to identify opportunities for cost savings. Mandatory record keeping may help some producers to identify where production improvements are possible, as they record more information about their farm. If soil testing is required, this can increase the efficiency of fertilizer use but will be partially offset by testing costs. Both of these effects are likely to be small
Efficiency gains in the rest of the supply chain:	
Reduce logistical costs	Switching from a performance system to a process standard will increase logistical costs if it requires non-OFFS grain to be segregated through the bulk handling system. Any IP system will reduce the ability to deliver a consistent quality to processors and would increase the probability of a dangerous level of contamination
Ex-post cost reduction following detection of contaminant in food	The grain industry has developed a very good reputation for quality, consistency and safety based on performance standards. The CGC has recently proposed a compulsory sample retention process to further reduce any incentive for free riding and to more effectively trace problems back to their source
Reduce monitoring and enforcement costs	The inspection system will continue to operate as an effective vehicle for food safety in grains for the foreseeable future
Reduce measurement costs: performance versus process standards	It is unlikely the introduction of an OFFS system will reduce the cost of the current performance measures. Grain is currently sampled, inspected and graded at the time of producer delivery by the grain company, and at several other points in the supply chain. These inspection based performance standards are very low cost because, like milk, a large shipment of grain can be easily sampled and reliably tested
Reduce product liability costs	There are currently no apparent non-visible or non-testable hazards that can effectively be addressed through an OFFS. The exceptions are the perceived safety risks from low levels of pesticide residue or the presence of GMOs, which are currently being addressed by the organic industry OFFS

Table 4: Potential private benefits and costs of an on-farm food safety program in grain production (Continued)

SUPPLY-SIDE COSTS	DESCRIPTION
Management and compliance costs	Compliance will require education and training. Many farmers have off-farm jobs, which can increase the opportunity cost of management training OFFS will do very little to change the day-to-day operation of the farm. Farm operators recognize that pesticides and fertilizers are expensive and therefore already have an incentive to conserve on the use of these inputs. Spraying too close to harvest is normally very uneconomical. Farmers also have strong financial incentive to harvest grain in the best condition they can and to take measures to maintain its quality. The annual costs of recording information documenting good production practices and accompanying the inspector during visits will represent a substantial cost per acre Fixed costs may include upgrading or replacing grain storage to eliminate rodents, upgrading or replacing fertilizer storage, upgrading the septic system for the farm household and upgrading or replacing the pesticide spraying and fertilizer application equipment. These are potentially very large costs, which will tend to be highest for smaller farms operating with old capital. This may have implications for the structure of grain farms The requirements proposed as part of CGC's OFFS have much more to do with protection of the environment or an EFP, than they have to do with ensuring the safety of grain. The only potentially tangible benefit these investments would have for the safety of grain will be reduction in rodent droppings in the grain, which is a minute grain safety problem
Sunk investments	The extent that grain farmers will be captive to a particular supply chain will depend upon the degree to which the standards for the various OFFS are the same. If a national standard rather than a firm specific standard is developed, the producers will be able to negotiate with a number of buyers without being captive to a particular supply chain. In the organic industry many producer groups are advocating a national organic standard

Source: Author's estimate.

In the context of the CGC's OFFS, the unique characteristic of the grain produced under the program is that it is produced using environmentally safe, or good production practices. The grain could be termed 'super safe.' But if OFFS certified grain is allowed to mix with non-certified grain, it will automatically lose any value that it may have had. Under a buyer-specific OFFS, the grain would be shipped directly to the end-user without coming into contact or co-mingling with non-OFFS grain.

The ability to gather a sizeable quantity of a specific product, and ship it into export position independently of the regular grain transportation system is costly. Also, producers must take extreme care to avoid co-mingling these products with regular commodities on the farm. The grain must also be transported to specific and often distant terminals. Grain companies must devote exclusive bin space to the unique commodity, and must carefully monitor any activities

associated with the product. In a typical IPPM system, these costs are assumed by the parties purchasing the grain. The buyers of IPPM products can compensate the players in this system because the trait that was preserved with great care and expense holds value that can be passed onto the final consumer. Such is the case for organic grains and the interesting case of Warburtons bakery in the UK.

Buyer specific systems like the Warburtons wheat scheme are specifically designed to extract premiums at every stage of the supply chain. Warburtons produces a superior high-quality loaf of bread for which final consumers pay a $1.10/loaf premium. This large premium gives Warburtons the ability to compensate and reward producers, the CWB and grain companies the additional costs they are forced to incur as a result of accepting the contract. Warburtons' IPPM program has been in operation since 1995, and is successful because all participants extract enough benefits to continue operating within the system. (Smyth and Phillips, 2001). Warburtons bread and the Canadian wheat used to produce it have superior intrinsic qualities. Consumers are willing to pay more for qualities that they can taste, see, or smell. These are known as search or experience attributes. The following chart outlines the premiums paid by Warburtons to the parties involved in their IPPM system.

Table 5: Premiums received in Warburtons IPPM system

PARTICIPANT	PREMIUM RECEIVED
Producers	$20.00/t
CWB	$2.00-3.00/t
Agricore	$7.50-10.00/t
Warburtons	$1.00-1.10/loaf

Source: Adapted from Smyth and Phillips, 2001.

However, it is unclear whether consumers will be willing to pay more for on-farm assurances. The OFFS will guarantee safe production practices, which is undistinguishable by consumers before, during, or after consumption. Evidence from Scotland's SQC scheme indicates that end-users do not compensate producers in the form of premiums for increased production costs (Fearne and Garcia, 1999). If consumers in Scotland will not pay a premium to compensate their own producers, it is doubtful if they will have the willingness to pay a premium to Canadian producers and to Canadian grain companies for the costs of an IPPM program.

Outside of organic grain, widespread use of IPPM programs in Canada is not expected to develop in the near term. The current transportation system is not able to handle a large number of small parcels of grain. The whole infrastructure of the transportation system would need to be overhauled before it could do so efficiently. It may be necessary to develop a separate handling system altogether. Under such a separate system, container cars could be used to move identity preserved grain to a port that is exclusively dedicated to handling identity preserved product. Substantial premiums from grain end-users would be required to justify the development of such a system (Pratt, 2002).

An implication of a voluntary program is that there probably will be an uneven acceptance by producers due to their uneven costs of adoption. Some producers currently maintain an elaborate record-keeping system that rivals the documentation required by the OFFS. Adoption costs for these producers will be minimal since they will not have to devote a significant amount of

additional time to management. Producers who do not currently maintain a high level of record keeping will be less inclined to adopt the program due to higher management costs and because of the intensive time demands.

As a result, the majority of producers who adopt the OFFS program will probably be those farmers who already practice many of the required safety production practices. If the ultimate goal is to make the entire Canadian grain supply 'supersafe', on-farm assurances programs should specifically target producers who are not producing their grain in a safe and accountable manner. By its nature, a voluntary OFFS program will not attract poor farm managers, and it is their grain that is probably at the most risk of being associated with safety issues. Poor farm managers will not normally join the program unless the program is mandatory and heavily regulated or they are given a large enough financial incentive to cover their costs and compensate them for hardship.

In terms of logistics, it might be more cost-efficient for the operation of the transportation system if all producers were made to undertake the program, rather than attempting to have parallel movement of assured grain and non-assured grain. The grain transportation system would not need to be modified to deal with this uniform supply of on-farm assured grain. Blending could also occur as normal and none of the costs and inefficiencies associated with dealing with small packets of identity preserved grain would be incurred. Participation could be guaranteed through federal government legislation.

Table 6 summarizes the potential benefits and costs of alternative OFFS for grain. The table is based on a qualitative assessment of benefits and costs from discussions with industry stakeholders.

Table 6: Benefits and costs of alternative on-farm food safety programs

	Voluntary industry-wide OFFS	Enforced industry-wide OFFS	Buyer-specific OFFS	Regulatory standards
Market benefits				
Reduce transaction costs for consumers	Minimal	Minimal	Moderate	Minimal
Build consumer confidence	Moderate	Moderate	Moderate	Moderate
Convey additional information	Minimal	Minimal	Significant	Minimal
Provide differentiation on international markets	Minimal	Minimal	Significant	Minimal
Facilitate trade by reducing NTBs	Minimal	Minimal	Moderate	Minimal
Reinforce and develop trade networks	Minimal	Minimal	Moderate	Minimal
Improve productivity of inputs	Minimal	Minimal	Minimal	Minimal
Improve efficiency in production	Minimal	Minimal	Minimal	Minimal
Reduce logistic costs	None	None	None	Minimal
Reduce measurement costs: performance vs process standards	None	None	None	Minimal
Reduce monitoring and enforcement costs	Minimal	Minimal	Minimal	Minimal
Reduce product liability costs	Minimal	Minimal	Minimal	Minimal
Ex-post cost reduction following contamination	Moderate	Moderate	Moderate	None
Reduce free-rider impacts	Minimal	Minimal	Minimal	Minimal
Non-market benefits				
Reduce incidence of foodborne illness	Very minimal	Minimal	Moderate	Minimal
Reduce information asymmetry	Minimal	Moderate	Minimal	Minimal
Total benefits	Minimal	Minimal	Moderate	Minimal

Table 6: Benefits and costs of alternative on-farm food safety programs (Continued)

	Voluntary industry-wide OFFS	Enforced industry-wide OFFS	Buyer-specific OFFS	Regulatory standards
Management costs				
fixed – establishing the HACCP plan	Significant	Significant	Moderate	Moderate
variable – revising plan to reflect external changes	Significant	Significant	Minimal	Moderate
Compliance costs				
fixed – capital costs	Moderate	Very significant	Moderate	Moderate
variable	Very minimal	Minimal	Minimal	Minimal
Sunk investments				
risk of hold-up	Minimal	Minimal	Significant	None
Segregation costs				
fixed	Minimal	Moderate	Significant	None
variable	Minimal	Moderate	Significant	None
Monitoring and enforcement costs				
fixed	Minimal	Minimal	Minimal	Moderate
variable	Moderate	Very significant	Moderate	Moderate
Total costs	Moderate	Significant	Moderate	Minimal
TOTAL NET BENEFITS	Moderate cost	Significant cost	Moderate benefit	Uncertain

Source: Author's estimate.

5.4 *Modeling the effects of OFFS*

A technical analysis of the economic impacts of OFFS at various stages of the supply chain is presented in Appendix A of report #3 (pork sector report). A similar graphical analysis (for the situation of an exporting industry) could be applied to the grain sector. This section summarizes the main conclusions from the technical analysis under different scenarios[3]. First, the effects of implementing OFFS on the cost structure of producers is explored. In theory, the net effect of OFFS on producers' costs can be either positive or negative. Second, the potential implications of OFFS initiatives on the demand for farm and processed products is explored.

Four different scenarios are relevant to the grain industry.

Scenario 1: OFFS simply increases producer costs without any demand-side benefits, leading to a decrease in production and a decrease in grain exports. The assumed negative impact of the OFFS is not transmitted downstream to processors and consumers; producers incur the full cost impact. In this scenario, any benefits stemming from implementing the OFFS would also be captured exclusively by producers.

Scenario 2: Implementing HACCP at the farm and processing levels can also have positive implications if it leads to efficiency gains that decrease both producers' and processors' costs. There will be an increase in grain production but it does not affect the farm price if we assume free trade. Quantities processed by domestic processors increase. The increase in domestically processed grain is all exported. In this scenario, producers and processors benefit.

3. *Readers are referred to the technical appendix of report #3 for a graphical analysis and full explanation of the assumptions underlying this analysis.*

Scenario 3: It is also important to consider the impact of OFFS on foreign markets. Assume that OFFS increases the demand for Canadian grain. Under a free trade assumption, this increases domestic grain prices. The final effects are increases in grain exports and production. But domestic grain consumption decreases due to higher prices. These effects unambiguously decrease domestic consumers' benefits (consumer surplus) and increase producers' benefits (producer surplus). The impact on processors is ambiguous because of the effect on the domestic price of grain. Processors' sales increase but purchases of their necessary inputs cost more than before the implementation of the OFFS.

Scenario 4: In a final scenario, assume that implementing food safety initiatives at the farm level increases consumers' demand for Canadian grain. Under the assumptions explained in Appendix A of the pork industry report (i.e., free-trade and the small country assumptions), the domestic price of grain products does not change as Canadian provinces remain net exporters of grain. Hence, given the constant domestic price, domestic consumption of grain products increases and exports decrease. Producers and processors do not benefit from this positive demand-side effect of food safety initiatives since prices remain constant at all market levels. Grain production also remains constant.

Chapter 6

Potential benefits and costs of environmental farm plans

EFP are often introduced as a part of an OFFS; this is the case in Sweden and in the organic industry. However, the two systems are conceptually different. While OFFS are directed specifically at providing safer food to the consumer, an EFP is designed to reduce adverse impacts agricultural production may have on the environment. Some consumers are willing to pay more for food produced in an environmentally friendly way, providing they can be assured that the claim is accurate.

One of the prerequisites for premiums to be paid is that the EFP must address some environmental concern that is important to consumers. Media coverage of environmental problems associated with grain production has been far less than that given to livestock manure related problems. Rolling grain fields are perceived to be a clean environment, relative to the urban environment. The continued reduction in cultivated area in Canada has reduced the pressure on wildlife habitats.

Whether this willingness to pay by some consumers translates into higher farm prices depends on supply and demand conditions, and whether the premiums paid at the consumer level more than offset the additional costs in the supply chain. This is particularly an issue in grain production because of the additional costs of segregation and the lost benefits of blending. Tables 7 and 8 summarize the potential benefits and costs from EFP in the grain sector.

Table 7: Potential private benefits and costs of environmental farm plans in grain production

DEMAND-SIDE BENEFITS	DESCRIPTION
<u>Domestic market</u>:	
Build consumer confidence	The three principle concerns shared by some consumers regarding grain production are associated with the pollution of surface and ground water with nitrogen fertilizer, the use of chemical pesticides and the introduction of GMOs
Convey additional information (when used with identity preservation systems)	In regions of the country where ground water nitrification has become an issue, nutrient planning has some importance with consumers A small but rapidly growing portion of grain is produced and marketed as organic production where the certification involves some form of EFP and GMO-free production. The premium paid for these products by some consumers reflects that there is some consumer support for this type of production. As long as organic production is available, it is unclear whether a non-organic EFP will have any saleability to consumers
<u>International markets:</u>	
Provide differentiation on the international market Facilitate trade by reducing non-tariff barriers Reinforce and develop trade networks	Having an EFP is not a precondition for trade except in organic production. Foreign standards for organic products must be complied with to gain access to these markets. The standards in the EU, Japan and the U.S. all require an EFP as part of the organic certification process. There are currently international negotiations to develop equivalency and harmonize different national standards. Canada has yet to achieve a regulated national standard for organic production Given the growing importance of the organic market, and the consumer choice afforded by this market, it is unlikely that foreign countries will require EFPs for non-organic grains
SUPPLY-SIDE BENEFITS	**DESCRIPTION**
Improve efficiency in production	Training sessions to implement the EFP could help some producers in the planning exercise to identify opportunities for cost savings. The mandatory record keeping may help some producers identify where production improvements are possible, as they record more information about their farm. If soil testing is required, this could increase the efficiency of fertilizer use but this could be partially offset by testing costs. Both of these effects are likely to be small
Reduce monitoring and enforcement costs	An EFP can demonstrate compliance with applicable laws and regulations and thus may decrease monitoring costs for the industry The introduction of EFP can eliminate or minimize environmental incidents and in the process demonstrate due diligence in the event of prosecution or litigation. It could also lead to a reduction in the environmental risk assessed by insurance and lending institutions; leading to lower insurance premiums

Table 7: Potential private benefits and costs of environmental farm plans in grain production (Continued)

Reduce free-rider impacts	The widespread use of EFP could reduce vulnerability to environmental disaster originating on neighbouring farms
SUPPLY-SIDE COSTS	**DESCRIPTION**
Planning costs	Planning costs will primarily involve training costs and investment decisions to address problems. The ongoing costs will be very small. These costs will be nearly the same regardless of farm size
Management and mitigation costs	For producers with old farm buildings and equipment the implementation of an EFP may require significant investment A compulsory or a cross-compliance EFP will have a significantly greater financial impact on older, smaller farms

Source: Authors' estimates.

Table 8: The benefits and costs of alternative environmental farm plans

	Voluntary EFP	New building EFP	Annual EFP	Annual enforced EFP	Emission standards	Land use regulations
Product market benefits						
Reduce transaction costs for consumers	Significant	Minimal	Minimal	Minimal	Minimal	Minimal
Build consumer confidence	Significant	Minimal	Minimal	Minimal	Minimal	Minimal
Convey additional information	Moderate	Minimal	Minimal	Minimal	Minimal	Minimal
Provide differentiation on international markets	Significant	Minimal	Minimal	Minimal	Minimal	Minimal
Facilitate trade by reducing NTBs	Significant	Minimal	Minimal	Minimal	Minimal	Minimal
Reinforce and develop trade networks	Moderate	Minimal	Minimal	Minimal	Minimal	Minimal
Reduce monitoring and enforcement costs	Moderate	Minimal	Moderate	Moderate	Minimal	Minimal
Reduce free-rider impacts	Moderate	Minimal	Moderate	Moderate	Minimal	Minimal
Non-pecuniary benefit to farmers (feel-good factor)	Moderate	Moderate	Moderate	Minimal	Minimal	Minimal
Non product market benefits						
Direct effects on human quality of life	Moderate	Minimal	Minimal	Moderate	Moderate	Moderate
Reduce negative human health externalities (disease, toxic substances, etc.)	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate
Negative impact on value of assets (air quality, etc.)	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate
Nuisance (odours, etc.)	Minimal	Minimal	Minimal	Minimal	Minimal	Minimal
Ecosystem effects (upland habitat, riparian/wetland habitat, water quality, greenhouse gases, soil resource quality, etc.)	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate Significant
Total benefits	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate to Minimal

Table 8: The benefits and costs of alternative environmental farm plans (Continued)

	Voluntary EFP	New building EFP	Annual EFP	Annual enforced EFP	Emission standards	Land use regulations
Costs						
Planning costs						
fixed – establishing the framework	Minimal	Moderate	Moderate	Significant	Moderate	Moderate
variable – revising policy to reflect external changes	Minimal	Moderate	Moderate	Significant	Moderate	Moderate
Monitoring and enforcement costs						
fixed	Minimal	Moderate	Moderate	Moderate	Moderate	Moderate
variable	Minimal	Moderate	Significant	v. Significant	Significant	Moderate
Mitigation costs						
fixed – capital costs	Minimal	Moderate	Significant	Significant	Significant	Moderate
variable	v. Minimal	None	Minimal	Moderate	v. Minimal	v. Minimal
Segregation costs						
fixed	Moderate	Moderate	Moderate	v. Minimal	None	None
variable	Moderate	Moderate	Moderate	v. Minimal	None	None
Total costs	Minimal	Moderate	Moderate Significant	Moderate Significant	Moderate	Moderate Minimal
TOTAL NET BENEFITS	Moderate	Minimal	Minimal	Negative	Minimal	Minimal

Source: Authors' estimates.

Chapter 7

Conclusions

The recent AFP has made it clear that the federal government is devoted to establishing a national identity for Canadian agriculture based on food safety. This policy shift has the potential to fundamentally change the face of Canadian grain farming. The CGC's OFFS is the spearhead of the APF's policy implementation for grain farmers. A "super-safe" brand may assist Canadian marketers in preserving current markets and developing niche market opportunities abroad. There may be possible marketing opportunities because there are very few on-farm assurance programs in operation worldwide. Countries producing assured grain in Europe are catering primarily to domestic markets and are not large exporters. Australia has been working on safety assurance programs for four years, yet producer acceptance is quite low, and the Australian bulk grain transportation system is not capable of keeping on-farm assured grain separate from conventional grain commodities.

The results of this preliminary analysis show that the costs could exceed the benefits for compulsory OFFS and EFP. OFFS will be expensive to implement. In addition to direct program costs, farmers may need to devote additional time to management duties and compliance costs. There will also be large transportation logistical costs if the OFFS program maintains its status as voluntary. A mandatory OFFS would likely alleviate logistical costs, but could create resentment and discontent among farmers and increase direct program costs. It is uncertain how costs will be borne along the supply chain, and whether premiums will be sufficient to compensate for the added costs.

The results for the grain industry stand in sharp contrast to the benefits and costs for OFFS and EFP in the livestock sector. There are several reasons why the benefits are lower and the costs higher in the grain industry relative to the livestock sector. First, Canadian grain has a good record and reputation for food safety. The sampling and inspection system used by the Commission is relatively inexpensive and very effective. Similarly, the grain industry has a good reputation for environmental stewardship, and unlike the livestock industry, has avoided high profile major environmental disasters. The good record of the grain industry limits the consumer's willingness to pay for alternatives.

Some consumers do have a concern over pesticide and chemical fertilizer use in grain production. While the growth in organic farming suggests that consumers are willing to pay for this form of production, the organic sector will likely be able to meet consumer demand through its own supply chains. The existence of a vibrant organic industry, which has well-developed OFFS, EFP and marketing systems suggests new OFFS or EFP will in fact face competition from the organic industry.

Secondly, grain is moved in a bulk handling system, which is based on blending as a means of supplying customers with large volumes of consistent product. This property makes grain IP systems expensive for many supply chain participants.

Third, there is difficulty in monitoring compliance with OFFS and EFP on farms. A single owner-operator typically manages a grain farm that is subject to a great deal of weather variation. In this circumstance, a problem will be detected by a third party only if the farmer chooses to report the problem. For these reasons, performance standards and regulations may be a far more cost-effective means of meeting consumer demands.

7.1 Areas for further assessment

Additional studies are needed to fully assess world market demand for on-farm assured production, the consequences of not initiating OFFS and the costs of initiating mandatory traceability for grains at every stage of the supply chain. Farmers and private companies should be permitted to implement IPPM programs if it is profitable for them to do so. The EU currently has the highest demand for traceable agricultural products. However, it must be clear that much of this demand for traceability in grain stems from the fact that Europeans want to ensure that GMO foods stay out of the food supply. To emphasize this fact, the EU has clearly defined grain traceability in relation to GMO products (Smyth and Phillips, 2002). Europeans also want to preserve their own countryside and guarantee that environmentally safe production practices are performed. OFFS have taken the form of national brands. These brands not only provide on-farm assurance, but also inform the consumer that the product was produced in their home country. Much of the popularity of these 'super-safe' brands can be attributed to consumers simply wanting to buy locally produced food.

There are alternatives to OFFS and EFP that warrant further study. Safety will continue to be one of the most important characteristics of Canadian grain; a marketable feature that customers can depend on. However, not all consumers or producers of Canadian grain may choose to embrace the CGC's OFFS, or any other OFFS. Therefore, possible alternatives should be explored to ensure that grain continues to be safe at the farm gate. Many farmers may not be aware of the safety hazards that exist and the good production practices necessary to prevent them. The CWB could conduct annual grain safety training courses in each community. These courses could function as a mandatory requirement for anyone wishing to sell wheat to the CWB.

Farmers will produce safe grain if they are held accountable for any problems with the product they ship. Under the current grain safety system, once the producers have successfully delivered grain to their primary elevator, there is no mechanism to hold individual producers accountable if contamination is found during ship loading. It may be possible to trace the grain back to a catchments area or terminal, but it is impossible to discover which producer(s) are responsible for the contamination. The sample retention recently proposed by the Commission could address the potential free riding.

Another option that may warrant study is the possibility of bundling the OFFS with a national organic program, since organic production and on-farm assurance programs share many similar concerns. It is also possible that the COFFS grain may compete with Canadian organic grain. It is not clear how large the markets are for organic production and on-farm assurances, or whether these two markets overlap. Identity preservation programs are already in place for organic production, and the premiums are high enough to warrant identity segregation. Therefore, bundling the two systems is a logical step. Perhaps the organic industry should be represented as a commodity group within the COFFS.

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Glossary of terms and list of abbreviations

APPENDIX A

Glossary

TERMS	DEFINITIONS
Demand-side effect	A benefit or costs that manifests itself by increasing or decreasing the demand for a product
Externality	Costs or benefits that flow between economic agents but that are not paid for in the market place
Free-ride	The ability to benefit from something without incurring the costs
Information asymmetry	When one party to a transaction (e.g. the seller) has more information than the other (e.g. the buyer)
Market benefit/cost	See Private benefit/cost
Non-market benefit/cost	See Public benefit/cost
Private benefit/cost	Benefits and costs for products that bought and sold in the marketplace
Public benefit/cost	Benefits and costs that flow between economic agents but that are not paid for in the market place (see externality)
Social benefit/cost	See Public benefit/cost
Supply-side effect	A benefit of cost that manifests itself by increasing or decreasing the supply of a product
Sunk costs/investments	Costs that cannot be recovered
Traceability	The ability to traceback a commodity through the supply chain, identifying where it came from
Transaction cost	The cost of carrying out an exchange, including search costs of gathering information, the costs of negotiating the transaction costs, the costs of monitoring product quality or actions of trading partners and the costs of enforcing the terms of the transaction

Abbreviations

ACCS	Assured Combinable Crops Scheme
APF	Agricultural Policy Framework
CFIA	Canadian Food Inspection Agency
CGC	Canada Grains Council
COFFS	Canadian On-Farm Food Safety program
Commission	Canadian Grain Commission
CWB	Canadian Wheat Board
EFP	Environmental Farm Plan programs
GM	Genetically modified
HACCP	Hazard Analysis, Critical Control Points
IPPM	Identity Preserved Product Management
NFU	National Farmers Union
OFFS	On-Farm Food Safety programs
SQC	Scottish Quality Cereals