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AFC Agra Services

May 4, 2007

Risk Analysis Steering Committee
C/O Investment Agriculture Foundation
P.O. Box 8248, Stn. Provincial Government
Victoria, British Columbia V8W 3R9
Attention: Mr. Stewart Paulson

Dear Mr. Paulson:

RE: RISK ANALYSIS STUDY OF THE BC POULTRY INDUSTRY

We are pleased to provide the attached integrated set of reports which have been prepared in the development of a risk management strategy for the BC poultry industry.

Four reports have been prepared and are attached in sequence to this letter.

- **Final Synopsis Report – Risk Management Strategies and Recommendations** (April 4, 2007). This report is inclusive of an Executive Summary, and provides a summary of the project history, a description of the possible risk response strategies, the development of an integrated risk management strategy, proposes recommendations and an action plan.
- **Interim Report – Risk Analysis of the BC Poultry Industry** (January 22, 2007). This report is inclusive of the secondary research findings, an analysis of the BC poultry industry, the results of the extensive industry and stakeholder consultations, which leads to the identification and ranking of a wide range of risk factors.
- **Second Interim Report, Part 1: Issues, Gaps and Options** (April 10, 2007). This report evaluates the major identified risk factors and issues, undertakes an analysis of risk gaps that need to be mitigated, develops a range of possible risk management response options, and introduces a framework for the subsequent benefit cost analysis of the risk response options.
- **Second Interim Report, Part 2: Benefit Cost Analysis** (April 23, 2007). This report focused on the evaluation of the expected long term benefits of undertaking three major alternative risk response strategies, and their respective costs, applied to the total BC poultry value chain over a fifteen year planning period.

Serecon Management Consulting Inc. has very much appreciated and enjoyed the full cooperation, input and guidance from the Risk Analysis Steering Committee over the course of this study and analysis period. In particular, the efforts of Mr. Stewart Paulson, Provincial Poultry Specialist, BCMAL, as chair of this committee, must be recognized in keeping this complex project focused and on track. Finally, Serecon is very much appreciative of the input and open and frank comments that were freely shared by industry within the stakeholder consultation process.

We wish the BC poultry industry future success in moving ahead in the development of a pro-active animal disease risk management strategy that sustains the long term growth of the industry and consumer confidence in BC produced poultry products.

Yours truly,
SERECON MANAGEMENT CONSULTING INC.

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Risk Analysis Of The BC Poultry Industry

Final Recommendations, Strategies And Analysis Reports

Prepared For

Risk Analysis Steering Committee
The Poultry Industry Advisory Management Committee
Investment Agriculture Foundation
Victoria, BC

Prepared by

Serecon Management Consulting Inc.
Calgary, Alberta

May, 2007

Funding provided by:

Investment Agriculture Foundation of British Columbia

BRITISH COLUMBIA
The Best Place on Earth

Risk Analysis Of The BC Poultry Industry
Synopsis Report
Risk Management Strategies And Recommendations

Prepared For

Risk Analysis Steering Committee
On Behalf Of The Poultry Industry Advisory Management Committee
Investment Agriculture Foundation
Victoria, BC

Prepared by

Serecon Management Consulting Inc.
Calgary, Alberta

May 4, 2007

Funding provided by:

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BRITISH COLUMBIA The Best Place on Earth

ACKNOWLEDGEMENTS

Serecon Management Consulting Inc. wishes to acknowledge the valuable contribution by the members of the BC Risk Analysis Steering Committee in the preparation of and guidance given for the development of this Poultry Industry Risk Management Strategy document.

The members of the Steering Committee have been:

Scott Cummings, Industry

Garnet Etsell, Industry

Ken Falk, Industry

Rick Gammer, Government, (CFIA)

Tracey Innes with assistance from Dr. D. Pervis, (AAFC)

Ron Kilmury, Industry

Elise Legendre, (AAFC)

Stewart Paulson, (Chair) BCMAL

Funding for this project entitled "Risk Analysis of the BC Poultry Industry" was provided by the Investment Agriculture Foundation of British Columbia through programs funded by the Province of British Columbia.

The author also wishes to acknowledge Coreen Moroziuk, Program Manager of Investment Agriculture and Lynn Elwell, Program Administrator and Communications Coordinator for their assistance in the financial and communication aspects of this project

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List Of Acronyms

AAFC	Agriculture and Agri-Food Canada
AI	Avian Influenza
BCA	Benefit Cost Analysis
BCMAL	BC Ministry of Agriculture and Lands
BCMOH	BC Ministry of Health
BCR	Benefit Cost Ratio
CAFI	Canadian Agriculture and Food International
C and D	Cleaning and Disinfecting
CAIS	Canadian Agriculture Income Stabilization
CCWHC	Canadian Cooperative Wildlife Health Centre
CFIA	Canadian Food Inspection Agency
COP	Cost of Production
FAD	Foreign Animal Disease
GMP	Good Management Practices
HOA	Health of Animals Act
NPV	Net Present Value
PSRMP	Private Sector Risk Management Partnership
PVB	Present Value of Benefits
PVC	Present Value of the Costs
SPFG	Sustainable Poultry Farming Group
SRMS	Shared Risk Management System
TRQ's	Tariff Rate Quota's
WTO	World Trade Organization

Executive Summary

Project History And Background

This study represents the accumulation of an intensive industry and government consultation, analysis and evaluation process between October 2006 to May 2007, for the development of a pro-active risk management strategy for the mitigation of animal disease risk within the BC poultry industry.

The objectives of this project have been four fold: to identify and assess risk factors which predispose the poultry industry to infectious disease outbreaks; to provide opportunities and risk management options to industry and government; to minimize impact of disease outbreaks on public confidence in poultry produced in BC; and to maintain expansion of domestic and international markets for poultry products produced in BC.

This risk management and strategy development was built in four major phases. The first phase, concluding with a first interim report (January, 2007) was focused on identifying and ranking a broad range of risk factors which could impact on the frequency and intensity of future animal disease outbreaks. An extensive consultation process with over 50 industry stakeholders was the primary research tool, leading to the identification of some 34 risk factors facing the industry. Complementing these consultations were secondary research activities of animal disease risk experiences in other jurisdictions. An industry profile and overview of the current industry structure and concentration have been included.

The next phase of the study focused on a process of assessment and evaluation of the gaps that exist with respect to the mitigation of these risks from industry structure, policy, and management practice perspectives. This phase led to the consolidation of the risk analysis into a range of possible options and alternatives by which risk could be mitigated or eliminated. These options were organized under two major categories – options that could be taken to reduce the risks related to the existing infrastructure and structure of the industry, and those options that relate to operational and management practices within the industry. The results of this phase are summarized in a further interim report (Second Interim Report, Part I, April, 2007).

The third phase of the study and process focused on the economic and financial evaluation of a limited number of possible and practical response options. The risk management principle identified by this comprehensive analysis recognizes the reality that no one single risk management action by itself will be effective. An effective risk management response will necessarily involve an integration of a number of related and complementary actions, that collectively will lead to a positive impact on risk reduction. Consequently, potential risk management strategy options were narrowed down into three “risk response options” which have become the basis for further evaluation and consideration by decisions

makers. These three risk response options (nominal, intermediate, and comprehensive risk response options) were further evaluated using a industry investment economic model. From this analysis, the costs and benefits, and impacts of each response option were formally evaluated, with continued involvement of industry. The results of this phase are provided in the Second Interim Report, Part II, April 2007.

The final phase of this risk management process was the development of a series of strategies, recommendations and actions for consideration by decision makers. A summary of options, their relative costs and benefits, and suggested recommendations were made, based on the results of the previous interim reports and industry input.

Major Findings And Results

Three risk management response strategies were identified and analysed within the scope of the study. These possible strategies are described in the table below. These strategies are a composite of actions both with respect to the management of industry concentration, and operational or management actions and programs. It is critical to recognize that management actions with respect to a universal bio-security, and active surveillance programs are important pillars within all three of the risk response strategies.

Overview of Risk Management Response Options

Risk Management Option	Infrastructural Changes Proposed	Operating Changes Proposed (equivalent for all response options)
Nominal Response	No significant changes proposed	1) Universal bio-security system 2) Active surveillance program 3) Responsive financial management and compensation system
Intermediate Response	Segregation of high risk/ high value flocks and policies and programs in place to arrest further concentration	1) Universal bio-security system 2) Active surveillance program 3) Responsive financial management and compensation system
Comprehensive Response	Industrial compartment-alization and segregation of industry into bio-secure clusters, and policies and programs in place to reduce further concentration.	1) Universal bio-security system 2) Active surveillance program 3) Responsive financial management and compensation system

The following table summarizes the financial and economic results of the benefit cost analysis completed in the supporting interim reports to this risk assessment. The comprehensive option is segregated into two, reflecting different assumptions if newer or older barns are relocated. The depreciated costs of an older barn is estimated at $300,000 per barn and reflects the comprehensive low cost option. The depreciated cost to relocate a newer barn is estimated at $600,000, and is the basis of the comprehensive high cost option.

The analysis suggests progressive increases in the benefit cost ratio, but only to a point, for increasing investment in proactive risk management actions. As previously indicated, two alternatives were evaluated for the comprehensive response option, reflecting different assumptions on poultry barn relocation costs.

Summary Analysis of Risk Management Response Options (Inflation Adjusted)[1]

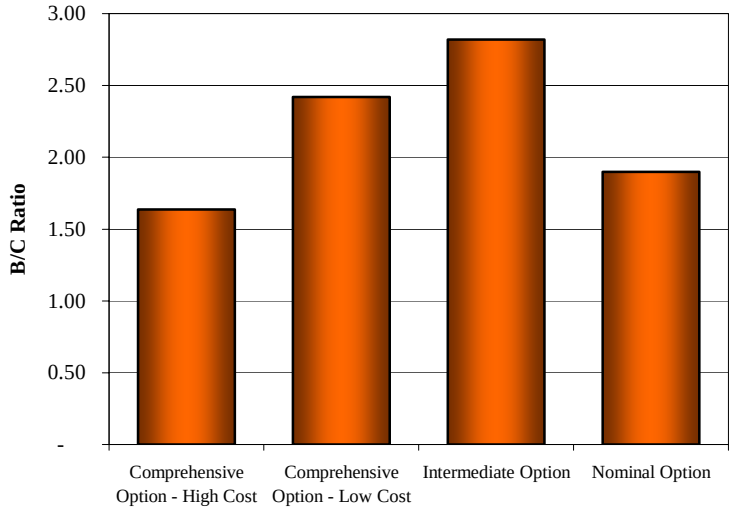
Possible Response Option	Expected Total Long Term Benefit ($2007,m)	Expected Total Costs ($2007,m)	Time to Breakeven (years)	Benefit Cost Ratio
Comprehensive (High Cost)	$288	$176	11	1.64
Comprehensive (Low Cost)	$288	$119	9.0	2.42
Intermediate	$177	$63	7.5	2.81
Nominal	$90	$47	9.0	1.91

Note: benefits are defined as the incremental net industry profits over the profits that would have been generated if no proactive strategy is introduced. The costs are those industry expenditures that need to be made to implement the management and policy changes proposed in the respective response options.

The benefit cost ratio of each of the possible range of response options are illustrated in the figure below. Both the intermediate response and the low cost comprehensive options have fully acceptable benefit cost ratios that support a focus on their potential.

[1] Unless otherwise noted, the benefits and costs that have been developed in this study have been adjusted to remove the impact of inflation. The approach to this, is to standardized the future estimates of either costs and benefits to values in 2007.

Benefit Cost Ratio of Alternative Risk Response Strategies



RECOMMENDATIONS

The primary results of this study and analysis has been the development of six interrelated options. These are listed below.

Implementation of Intermediate Risk Management Response Option

Recommendation #1: It is recommended that the industry and government consider implementing the intermediate response option as developed in this study.

Develop and Implement Universal Bio-Security System

Recommendation #2: The BC poultry industry develops a "universal bio-security program, which encompasses the full value chain of the sector (inclusive of allied supply and service industries, through the production, and processing sectors), and provides inducements and guidance for the inclusion of the non-regulated and small/speciality flocks to participate in this bio-security program.

Implement Active Surveillance Program

Recommendation #3: As a mechanism for early detection and to reduce the intensity of animal disease outbreaks, the industry establish an on-going active surveillance program, inclusive of all production sectors, and supported by a compensation system that compensates industry for their economic losses and recovery costs in the event of detection and business disruption/closure.

Improve Management of Industry Concentration

Recommendation #4: The BC industry undertakes a series of progressive steps leading to arresting, and to eventually reducing the degree of physical and business intensity and density. This would involve the concurrent steps of finalizing an acceptable long term plan for the compartmentalization and the industrial clustering of the industry into bio-secure zones;

implementing a plan which leads to the transfer of high risk, high valued poultry enterprises to locations determined to reduce risk and fit with the overall plan; and undertaking the other operational and structural actions as outlined in the intermediate response option.

Development and Implementation of Shared Risk Management System (SRMS)

Recommendation #5: The industry and government develop, and implement an integrated financial management and compensation program, "The Shared Risk Management System", that provides funding mechanisms for recovery from disaster, self insurance, government supported production insurance, private insurance, and compensation that substantively protects the industry from the significant perils it will face due to disease risks, and which will serve to sustain and grow the industry.

Development of Regional Economic Zones

Recommendation #6: Develop geographical zones that could function independently in the event of a disease outbreak. This would involve regionalization or compartmentalization consistent with OIE guidelines. These results must be recognized by the international trade community to mitigate exposure of the BC poultry industry to potential province wide export bans.

INTRODUCTION

PROJECT HISTORY

The 2004 Avian Influenza (AI) outbreak reinforced to the British Columbia poultry industry and government the profound economic and financial risks that animal disease outbreaks can have on all levels of the poultry value chain inclusive of:

- The impact on consumer demand and confidence in the safety of poultry products
- The impact on imports and exports of poultry products.
- The impact on the industries value added processing sector, who rely on the production of export product as a source.
- The impact on the industries value added processing sector, who are challenged with maintaining retail and other final markets sales and quality reputation of the poultry products
- The impact on the production sectors – hatcheries, breeders, growers, and
- The consequences on the allied industries and other sectors that supply services and that are dependant on a viable poultry industry.

The economic consequences of the 2004 AI outbreak were estimated to have been in the range of $350 million.

The 2004 AI outbreak, and the continued incidence of AI and other poultry disease risks, set the foundation for the BC poultry industry in partnership with both the provincial and federal governments, to take a proactive approach to becoming prepared for, and be better able to manage future disease outbreaks.

Consequently a Risk Analysis Steering Committee (RASC) was formed in early 2006 on behalf of the BC Poultry Industry Advisory Management Committee, for the purpose of undertaking a poultry industry risk analysis and developing a proactive risk management strategy.

A terms of reference for this risk assessment was developed in mid 2006. A contract was let out to Serecon Management Consulting Inc. in October, 2006 at which time this risk management assessment commenced.

RISK MANAGEMENT STUDY OUTLINE

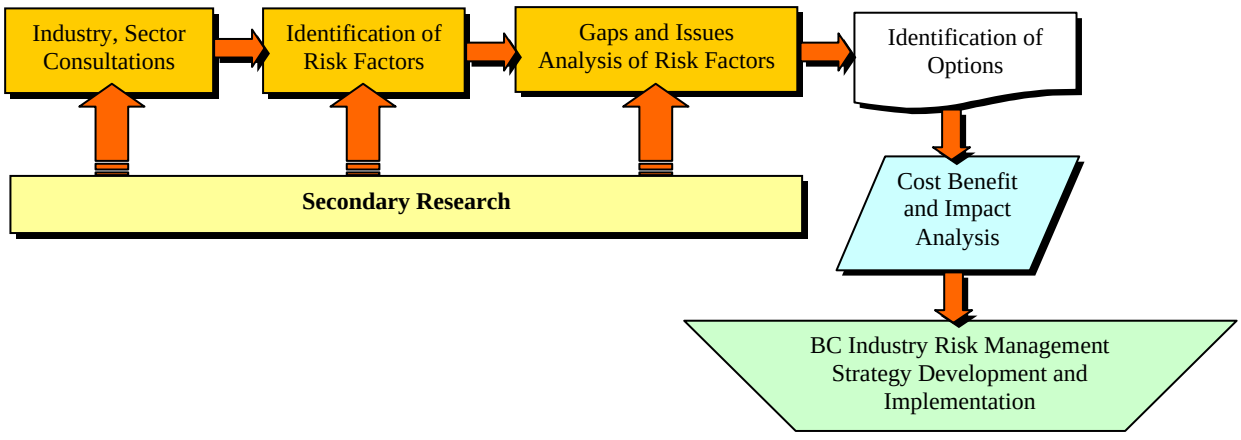
The process through which this risk management strategy has been developed is illustrated in Figure 1. A major and consistent theme of the risk management development strategy has been to engage and consult with the major industry stakeholders From an initial process of consultations with over 50 individuals and groups representative of the total industry value chain, an extensive list of the major animals health risk factors were identified. Through further research and with the guidance of

the RASC, the risk factors were focused and integrated to a manageable and most critical set of risk issues.

The process moved to an assessment and evaluation of the gaps in policies, practices and conditions that exist and need to be mitigated or reduced in an effort to reduce the risk exposure of the BC poultry industry. From the assessment of the major gaps, the RASC and the consulting team developed a range of risk management options that could be considered to help to close or remove the identified gaps. These options were organized under two major categories – options that could be taken to reduce the risks related to the existing infrastructure and structure of the industry, and those options that relate to operational and management practices within the industry.

Options were further evaluated, and grouped into integrated risk response alternatives. The risk management principle applied here recognizes the reality that no one single risk management action by itself will be effective. An effective risk management response will necessarily involve an integration of a number of related and complementary actions, that collectively will lead to a positive impact on risk reduction. Through further RASC consultations and guidance, the potential risk management strategy options were narrowed down into three "risk response options" which have become the basis for further evaluation and consideration by decisions-makers. These three risk response options (a nominal, intermediate, and comprehensive risk response options) were further evaluated using a industry investment economic model. From this analysis, the costs and benefits, and impacts of each response option were formally evaluated.

Figure 1: BC Poultry Industry Risk Management Strategy Development Process



This final report provides the integration of the results of this risk management process, and develops a series of strategies, recommendations and actions for considerations by decision-makers. This report should be considered in the context of the three major previous reports which are considered the building blocks upon which this synopses and recommendations report is based, namely:

- First Interim Report: Risk Analysis of the BC Poultry Industry (January , 2007),
- Second Interim Report: Part I: Issues, Gaps, Options Analysis (April 2007), and
- Second Interim Report: Part II: Benefit Cost Analysis (April 2007).

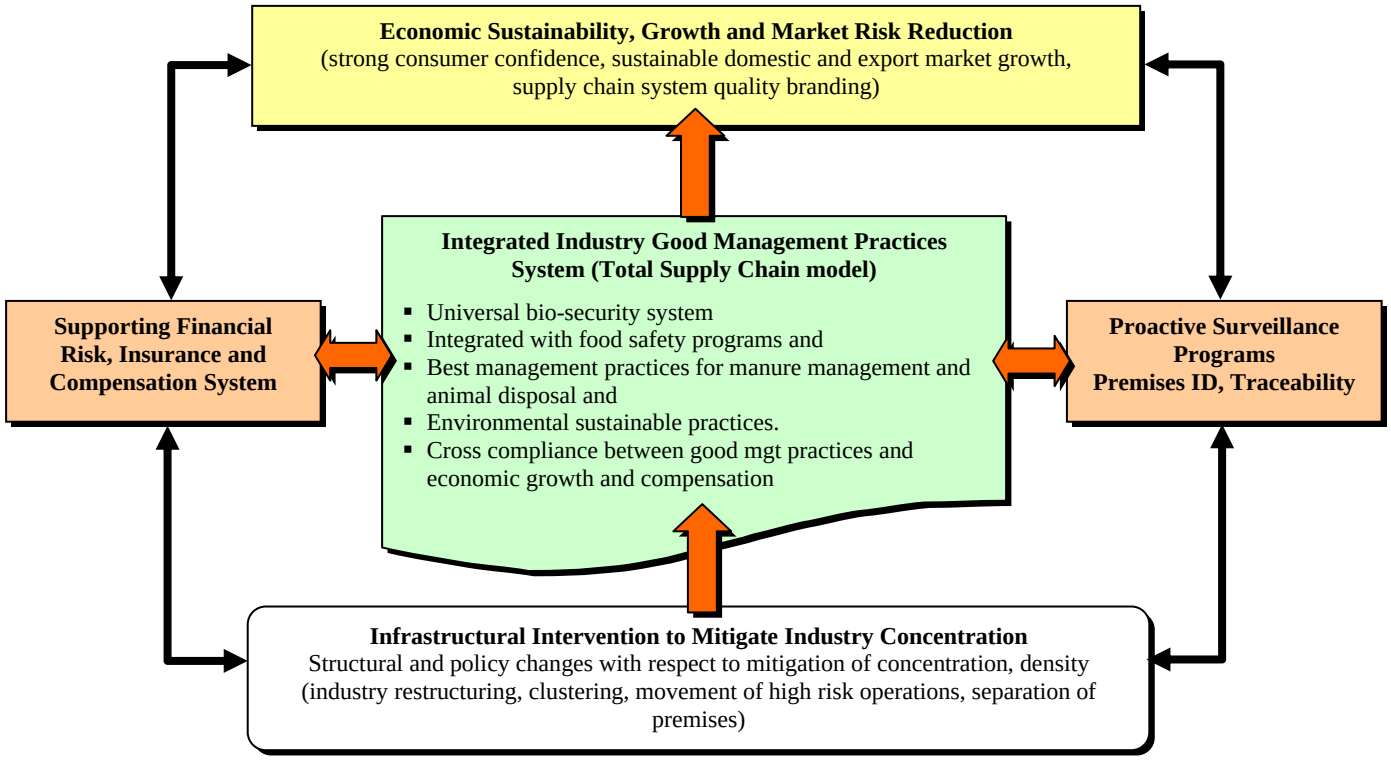
Risk Management Model

The overall focus of the risk management strategy approach for the industry has been with respect to identify risk issues, and to develop risk mitigation practices and programs that can contribute to the economic sustainability of the BC poultry industry by maintaining consumer confidence in BC produced products, and maintain and grow domestics and export markets.

A theme of the risk management strategies that have been analysed and developed by the RASC and the consulting team is that of integration and dependency. A risk management model, showing the interdependency between the host of different actions that can or need to be taken, to sustain and grow the industry is illustrated in Figure 2. There are four major elements of this risk management model and proposed strategy:

1. **Infrastructural Management**: Those policies and changes that can be made to mitigate the impact on animal disease risk related to the structure, concentration, and degree of economic integration within the industry.
2. **Integrated Good Management Practices**: The impact of and the changes that can be made with respect to the array of good management practices, with respect to bio-security, nutrient management, food safety, and environmental practices.
3. **Industry-Wide Proactive Management Preventative System**: The practices that can be introduced and applied for early detection, prevention, and disease control such as an active surveillance program, premises identification, and traceability capabilities.
4. **Supporting Financial Management and Compensation System**: The proactive design and acceptance of financial management systems inclusive of production insurance and income stabilization programs, private insurance, and compensation for disaster management.

Figure 2: BC Risk Management and Structural Dependency Model



Risk Management Response Options

The previous interim report has developed three major risk management response strategies to be considered by the BC poultry industry and government.

The three possible options[2] identified in this analysis are similar, except for the degree to which various infrastructural risk management strategies are proposed to be utilized. These are briefly described below and in Table 1.

Nominal Response Option: No infrastructural changes contemplated, but with a an universal bio-security and active surveillance programs in place.

Intermediate Response Option: Segregation of high risk/high value flocks and policies and programs in place to arrest further concentration, and with a universal bio-security and active surveillance programs in place as proposed in the other options.

Comprehensive Response Option: Partial industrial compartmentalization and segregation of industry into bio-secure clusters, and policies and programs in place to reduce further concentration, and with an universal bio-security and active surveillance programs in place as in the other options.

It is critical to recognize that universal bio-security, and active surveillance programs are important pillars within all three response strategies.

Table 1: Overview of Risk Management Response Options

Risk Management Option	Infrastructural Changes Proposed	Operating Changes Proposed (equivalent for all response options)
Nominal Response	No significant changes proposed	1. Universal bio-security system 2. Active surveillance program 3. Responsive financial management and compensation system
Intermediate Response	Segregation of high risk/high value flocks and policies and programs in place to arrest further concentration	1. Universal bio-security system 2. Active surveillance program 3. Responsive financial management and compensation system

[2] These obviously are not the only possible options. These three give a useful and distinctive range of possibilities for decision makers to consider.

Table 1: Overview of Risk Management Response Options		
Risk Management Option	**Infrastructural Changes Proposed**	**Operating Changes Proposed (equivalent for all response options)**
Comprehensive Response	Industrial compartment-alization and segregation of industry into bio-secure clusters, and policies and programs in place to reduce further concentration.	1. Universal bio-security system 2. Active surveillance program 3. Responsive financial management and compensation system

Table 2 summarizes the financial and economic results of the benefits cost analysis completed in the supporting interim reports to this risk assessment (Second Interim Report, Part II: Benefit Cost Analysis). For the comprehensive response option, two scenarios were evaluated, reflecting different assumptions about the costs for moving and relocating poultry barns as a mechanism to reduce risk. The two assumptions are that it costs $300,000 per barn to move an older broiler breeder barn and $600,000 to move a newer broiler breeder barn. These values were estimated average depreciated values.

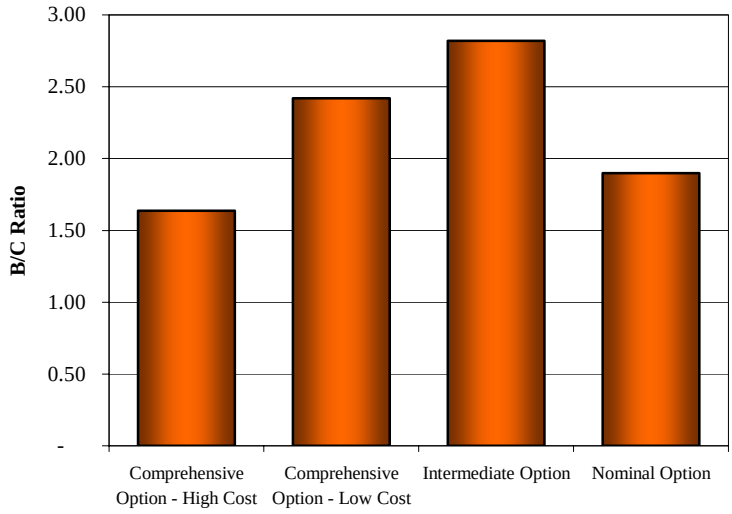
The analysis suggests progressive increases in the benefit costs ratio, but only to a point, for increasing investment in proactive risk management actions. As illustrated in this table, the benefits from a nominal response to risk, are deemed to be in the range of $90 million, for a cost over fifteen years of $47 million. This results in a benefit cost ratio of 1.91. For an intermediate response, the benefits are expected to be $177 million, for an investment of $63 million, and a benefit cost ratio of 2.81. For the low cost comprehensive response, the benefit cost ratio, and the time to break even on these costs declines marginally from what could be expected under the intermediate option. The high cost comprehensive option shows financial results significantly lower than any of the other options.

Table 2: Summary Analysis of Risk Management Response Options (Inflation Adjusted)[3]				
Possible Response Option	**Expected Total Long Term Benefit ($m,$2007))**	**Expected Total Costs**	**Time to Breakeven (years)**	**Benefit Cost Ratio**
Comprehensive (High Cost)	$288	$176	11	1.64
Comprehensive (Low Cost)	$288	$119	9.0	2.42
Intermediate	$177	$63	7.5	2.81
Nominal	$90	$47	9.0	1.91
Note: benefits are defined as the incremental net industry profits over the profits that would have been generated if no proactive strategy is introduced. The costs are those industry expenditures that need to be made to implement the management and policy changes proposed in the respective response options.				

[3] Unless otherwise noted, the benefits and costs that have been developed in this study have been adjusted to remove the impact of inflation. The approach to this, is to standardized the future estimates of either costs and benefits to values in 2007.

The benefit cost ratio of each of the possible range of response options are illustrated in Figure 3 below. Both the intermediate response and the low cost comprehensive options have fully acceptable benefit cost ratios that support a focus on their potential.

Figure 3: Benefit Cost Ratio of Alternative Risk Response Strategies



Detailed Description Of Strategies

The specific and more detailed elements of the risk management actions that have been developed are detailed in Table 3. This first table distinguishes the different levels of infrastructure interventions proposed. Following the table, the detailed description of what is proposed with respect to universal bio-security, active surveillance, and financial management and compensation are outlined.

Table 3: Detailed Risk Response Options Description -Infrastructure

Category & Response	Mitigation Options Description
Nominal Response Option	➡ No proactive actions taken to deal with industry concentration issues, except as what already is in current policies and programs. ➡ Current government policies with respect to the siting of facilities, proximity of poultry establishments to one another, and the integration of different types of poultry operations and non-poultry livestock operations remains and continues. ➡ The interface of rural and urban establishments, transportation, systems, and competition for resources continues.

Table 3: Detailed Risk Response Options Description -Infrastructure	
Category & Response	**Mitigation Options Description**
Intermediate Response Option	➡ Focus on policy, operating and management changes to deal gradually with issues that currently contribute to concentration – forward looking versus looking at major structural change of existing industry. ➡ Enterprise management polices, such as tree barriers, policies established for distance between barns, facilities, venting, etc. enhanced ➡ Future facilities siting, subject to strict separation, setback policies improved ➡ Pro-active policies and strategies put in place to prevent location of other livestock enterprises (non-poultry) being located in close proximity to poultry operations. ➡ All future buildings, new operations, subject to industrial risk segregation policies ➡ Existing high risk operations identified (limited to 6-8), removed and re-established away from center of FV. These would include a number of high risk, high valued production and breeding operations.
Comprehensive Response Option	➡ Segregation of high risk enterprises, high valued breeding flocks geographically separated, as indicated in intermediate response option ➡ Additional 50-60 broiler production and breeder operations removed from FV, with removal of related allied support industries (feedmills, hatcheries) ➡ Desired future industry structure model designed – stand alone poultry value chains established within FV, the Island, and Interior, each with breeders, hatching, growing, processing, and allied supply systems, ➡ Eventual geographic separation of regulated from unregulated and small flocks, ➡ Polices established for all future investment to achieve desired future industry model ➡ European model reviewed as to color zoning – supply, services, allied industries maintained within zones, by use of color coding, to restrict movement across unique bio-secure and separable zones (compartmentalization) ➡ Incentive system established to encourage industrial reorganization, and change ➡ Conflicts with existing policies that encourage uncontrolled, small scale livestock operations within concentrated areas to be removed. ➡ Segregation between poultry and other types of livestock production established ➡ Clearer policies developed between agricultural and non-agricultural/urban investment, location, and practices. ➡ Two cost assumptions were developed to consider the different depreciated costs of relocating poultry barns. The two assumptions are that it costs $300,000 per barn to move an older broiler breeder barn and $600,000 to move a newer broiler breeder barn. These values were estimated average depreciated values.

The risk mitigation responses which are desired to be constant for the BC risk management strategy, irrespective of the response level with respect to infrastructure policies and changes include:

- ➡ An universal bio-security system
- ➡ Active surveillance, and
- ➡ A responsive financial management and compensation system.

These are elaborated upon below.

Active Surveillance

- Active surveillance program, national in scope, designed within existing CFIA policies, with compliance policies established for industry and fully communicated to all stakeholders
- Program designed with identification of surveillance triggers, with respect to such factors as mortality rates, and feed, water consumption levels, which would result in active testing and surveillance. With effective triggers, frequency of surveillance can be minimized.
- Initial surveillance "sweep" conducted and recognized to likely lead to at least low pathogen detection, temporary industry shut down, limited depopulation, and negative consumer market reaction – financial implications quantified and anticipated.
- All members of regulated and unregulated industry would be part of the active surveillance program. In addition, an active surveillance program must be national in scope in order to achieve the following benefits:
  - to maintain the competitiveness across all regions of Canada
  - to facilitate use of third party insurance
  - to provide a national market advantage, and
  - to safeguard Canadian consumers
- Incentives, compensation and cross compliance policies established and in place to ensure compliance and success of the surveillance program. Support for non-regulated industry to re-establish markets.
- Canada should implement trade policies that require imported product to meet the equivalent criteria as Canadian produced product with regard to surveillance requirements. This is necessary to ensure competitiveness and safeguard Canadian consumers.

Universal Bio-Security System

- Full and comprehensive bio-security programs established, and enforced within the regulated poultry sectors (mandatory, audited)
- The allied industries are provided incentives, compliance protocols to follow bio-security protocols (required)
- Non-regulated poultry and other poultry sectors are influenced to participate in bio-security programs through incentives, the cross compliance through participation in compensation programs, insurance programs.
- Federal policies implemented that ensure foreign competitors that are accessing Canada's markets must comply with similar standards. In the absence of trade policies that require imported product to meet domestic standards, a means of at least partial cost recovery of implementation for non-regulated sectors to be built into programming.
- Non-regulated industry as a minimum to be part of premises ID system, and nutrient management protocols
- Comprehensive and proactive communication, reporting, system established for animal health management issues between all participants in poultry industry – regulated, non-regulated, small flocks, speciality, processing, government, etc.

Responsive Financial Management and Compensation System

- Incentive based, integrated insurance, compensation, investment, risk management system developed and implemented (would need to include some other provinces from the perspective of insurance management)
- A Shared Risk Management System (SRMS) is proposed in which perils are uniquely identified and quantified. The SRMS would allow for individuals to identify their priority for coverage, and cost shared between individuals, poultry organizations, third party insurers, and government. This proposed system is outlined in the next section.
- Participants in system would practice acceptable level of GMP's, inclusive of universal bio-security, premises ID, and traceability. It would be incumbent upon the participating poultry operators to meet risk reduction management standards.
- Cover risks of reimbursements for affected/destroyed animals, attendant costs of named perils disease, business interruption, legal liability risks, export markets risks
- Inclusive of an "investment" component to facilitate response of industry in making the operating and structural changes recommended in this strategy paper.
- System might ideally be harmonized with other provinces and initiatives now underway to develop indemnification options for the feather industries in Canada.
- There are few insurance programs designed for industry stakeholders other than producers. Industry insurance is needed to act as an incentive for proactive recovery initiatives such as rapid C and D after an outbreak. This is necessary to protect all industry stakeholders.

Strategy Development

Foundations Of Strategy

The critical underpinnings to the development of a sustainable risk management strategy is that the financial costs be anticipated and arranged for, both with respect to the risk management investment costs as they have been identified in this study, but as well the other risks and costs that will result in the event of an animal disease, or similar catastrophic event.

Risk Costs and Funding Gaps

It is understood by AAFC and the industry that there exists a range of risk and funding gaps faced by the poultry industry in Canada and in BC. A study is currently underway by AAFC, Risk Management and Production Insurance Division, to fully identify and quantity the financial and program gaps faced by the Canadian poultry industry[4]. It is recognized that the poultry industries risk mitigation needs have not fit well with the current structure of the Canadian Agricultural Income Stabilization (CAIS) program, nor has it qualified under the Crop Insurance (now being remodelled and renamed Production Insurance) programs, and the Advance Payment and Price Pooling Programs offered by AAFC, and available to the crop sectors. The Private Sector Risk Management Partnership Program (PSRMP) has been in place for a number of years to help industries such as poultry to develop private risk management tools (in particular insurance) to deal with risk.

The risk issues facing the poultry industry are with respect to a number of costs that are not covered in the event of an animal disease outbreak – in particular those related to the costs of business interruption, business recovery, and market re-development.

An evaluation has been undertaken, based on this risk management study, to quantify the broader range and magnitude of the different costs that the BC poultry industry would be exposed to in the event of an animal disease outbreak. In addition, the gaps that are anticipated to exist are identified.

The economic model analysis was extended to look at the other costs (beyond investment costs and loss of profits) that would be incurred in the event of animal disease outbreaks. These other costs include the direct costs of disease control, depopulation and disposal costs, cleaning and disinfectant (C&D), and the cost of business interruption and business recovery. These costs have been estimated using assumptions that the recovery costs would be equal to 60% of the costs of the lost profits when they occur. This cost estimate was based on cost coefficient parameters used in the 2001 Economic Impact Study of Foot and Mouth Disease on Canada, completed by the Canadian Animal Health Coalition. The depopulation, animal disposal, and C&D costs were based on 25% of lost profits, based on assumptions from this same study.

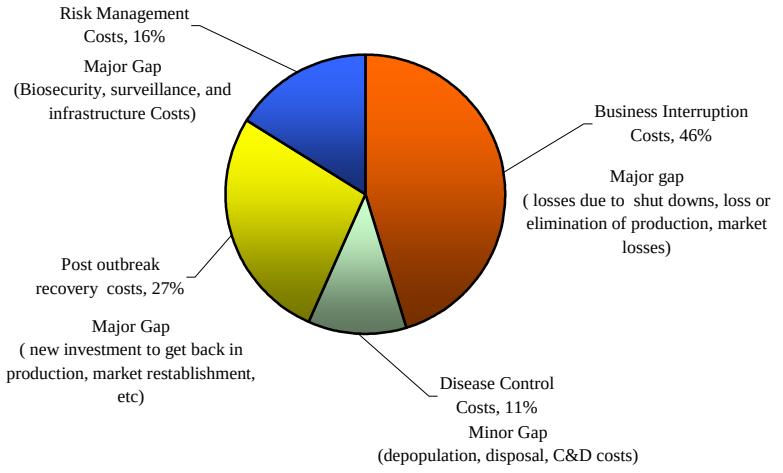
[4] The study is being led by Watts and Associates (US), in partnership with Serecon Management Consulting Inc.(Canada)

The summary results of this analysis are shown in Figure 4. The largest single cost is that of expected lost profits due to business interruption in the event of an outbreak. This magnitude of cost is followed by the costs of business recovery, and then the costs of prevention and investment of a proactive investment response strategy. The smallest cost is the direct disease control costs (animal depopulation and disposal) and related cleaning costs. Paradoxically, these latter costs are the costs currently most adequately compensated for in any animal disease outbreak situation by CFIA. This is with the exception of C&D costs which are the responsibility of the producer.

This chart also describes in qualitative terms, what funding gaps now exist, and possible financial and funding sources or instruments now in place, or could to applied to cover these costs. The smallest funding financial management gap is with respect to the covering of the control and C&D costs. Most of these are currently covered by existing CFIA programs. With respect to profit and business interruption losses, existing CAIS programs can cover only a minimal amount. For the circumstances contemplated in the report, CAIS is inadequate. Possibly there are some limited private insurance options available. However, for the most part, this is a major and existing financial/funding gap for the industry.

The funding gaps are considered in the design of recommendations with respect to a responsive financial management and compensation system for the industry.

Figure 4: Total Estimated Poultry Animal Disease Outbreak Cost and Investment Proportions



Relative Industry and Government Benefits

In the second interim Issues, Gaps and Options report, a conceptual framework was developed with respect to the way in which society and private sector benefits can be determined and estimated for an industry such as poultry. This framework is summarized below.

Societal economic welfare, focused on the BC poultry industry, can be viewed as the accumulation and optimization of the net benefits between the private and the public sectors[5].

Societal economic welfare** = sum of the **net benefits within the private sector**, and the **net benefit of the public sector

This economic welfare balance equation is expanded for each sector.

1) **Industry Net Benefits** = (Gross Industry Revenue[6] – Operating and Overhead Costs – federal and provincial corporate taxes) – Net Animal Health Risk Costs[7]

   The industry net benefits are the summation of the net benefits with respect to the primary production, value added processing, and the retail and distribution sectors.

2) **Public Sector Net Benefits** = Sum of Net Corporate Tax Receipts (federal and provincial) + Income Taxes From Direct and Indirect Employment Created by the Industry – (Transfer Payments and Subsidies to the Sector + Federal and Provincial Animal Health Risk Costs).

   The net public sector benefits are similarly accumulated within each segment of the industry value chain – primary production, value added processing and final distribution and retail.

3) **Net Societal Benefit** = Industry Net Profit After Tax + Government Corporate Taxes + Government Employment Taxes – Transfer Payments – Animal Health Care Costs.

It should be noted that this analysis does not include externalities that may affect the balance of benefits and cost to both industry and government. This could include negative environmental impacts of an industry, and the publics' desire and rights with respect to a safe and reliable food supply.

This societal benefits model was integrated into the industry economic model, and the respective net benefits of both government and industry were determined using average corporate and marginal tax rates and indirect employment multipliers.

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[5] The public sector is defined as the different levels of government, and of society to the extent they are the beneficiaries of tax revenues generated from industry, and are provided with a safe and reliable food supply.

[6] Inclusive of government transfer payments and subsidies.

[7] Net animal health risk costs are industry costs related to developing and operating animal health risk management practices (bio-security, etc.), less the benefits received from government in terms of financial disaster risk support, safety net, and CFIA disease control compensation.

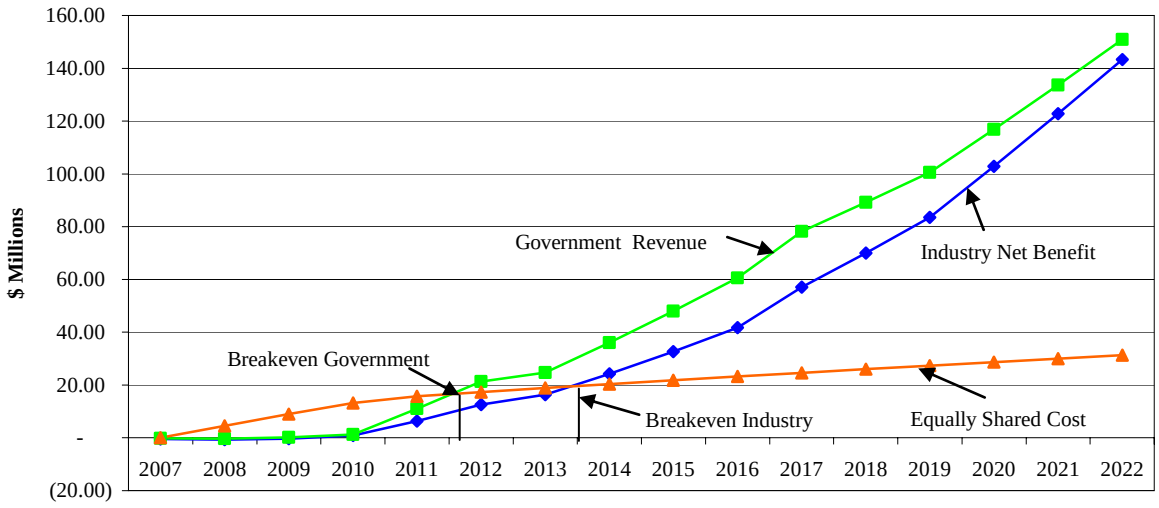
The benefits that could be realized independently to industry and to government for undertaking the intermediate risk responsive strategy have been estimated. The net benefits to industry are the after tax returns under the intermediate response option, less the after tax returns that industry would have realized under the baseline, or no-response scenario. The net benefits to government are revenues they would realize from corporate and employment taxes under the intermediate option, less the revenue they would realize under the baseline scenario.

Figure 5 below provides a graph of the net profits to industry and the expected revenue to government for the intermediate response option. This graph accumulates these net benefits over the 15 year projection period. As is illustrated government revenue marginally exceeds industry net profits over this period. The net accumulated benefit to government is estimated at $151 million (in $2007) and $143 million (in $2007) for industry. This suggests a government to industry net benefit ratio of 1.06. That implies for every dollar of net after tax benefit to industry of undertaking the intermediate risk response strategy, government would receive $1.06.

This figure illustrates as well, the situation where the intermediate response costs (which were previously estimates to be about $63 million in 2007 dollars) are shared equally between government and industry.

Under these assumptions of equal sharing of costs, the government added revenues due to the sector taking the intermediate risk response strategy, would be recovered in approximately four years. Under the same cost sharing assumption, industry would recover their costs from added benefits of this risk strategy within about six years.

Figure 5: Intermediate Response Option, Net Profits, Government Net Revenue and Breakeven Period ($2007)



Allocation of Costs and Funding Responsibilities

The above two sections provide a framework for the possible allocation of costs by major component, and a suggested proportioning of the responsibility for these costs. The overall allocation suggested is at 50%, based on the above analysis. The proportions vary from a higher government weighting for the control and eradication costs.

Risk Cost Category	Estimated Proportion of Total Outbreak Costs	Sources of Financial Support and Cost Sharing
Risk Response Costs	16%	More equally Industry and government
Control Costs (depopulation, disposal, C&D)	11%	Primarily government under existing Health of Animals Act, administered by CFIA. Current costs of C& D largely responsibility of industry. Some potential for self insurance
Business Interruption During Control Period	46%	Balanced between government based Production Insurance (PI) and other income insurance programs, disaster programs, Industry self insurance through reciprocals, private insurance
Post Outbreak Recovery Costs	27%	Proportionally more industry self financed, private insurance, less government

Potential Financial Management And Compensation Strategy

There is a critical need to have a financial management and compensation strategy and program to support the development and maintenance of an effective poultry risk management system for the industry. Such a strategy is at the heart of the ability to develop an effective proactive risk management approach for the BC poultry industry, and for the Canadian poultry industry.

The above analysis has indicated that:

- The opportunity of having a healthy poultry industry has a near equal benefit to both industry and government.
- The costs related to animal disease outbreaks are significant and inclusive of
  - control costs, after an outbreak has occurred
  - the preventative costs that the industry could take such as have been estimated in the alternative response strategies that have been developed in this study,
  - the costs of business interruption due to the outbreak, and
  - the recovery and market re-entry costs that industry will incur in the post outbreak period.

- There exists major gaps with respect to how these costs and losses would be funded, and
- An effective risk management strategy must anticipate and plan for all of these costs and risks for it to be effective and have a reasonable chance of success.

The following sub-section lays out some principles and concepts by which a holistic financial management and compensation strategy could be based.

Principles

There are a number of principles that are important and fundamental with respect to the design of an effective system. These principles include the following.

1. The overall design and methodology for industry financial, insurance and compensation support, should be viewed within the concept of an industry-wide model, using "insurance like" principles: the risks and costs must be clearly defined, measurable, the liabilities must be limited, moral hazard[8] and adverse selection must be minimized, and good behaviour rewarded.
2. The system should be incentive based. The adherence to proper bio-security, the participation in an active surveillance program and other Good Management Practices should be reflected in both premium and contribution costs, and/or in insurance and compensation payouts and indemnities.
3. The system should be inclusive. All sectors of the poultry industry must have the option to be involved. Arguably, the system should be mandatory, based on providing incentives to encourage all sector participants to participate. For the unregulated producers cost recovery will be an important consideration in determining the level of participation.
4. As possible, animal health financial management, compensation, and disease control support should be integrated under one administrative body, from the perspective of response effectiveness, and costs.

Suggested Proposal

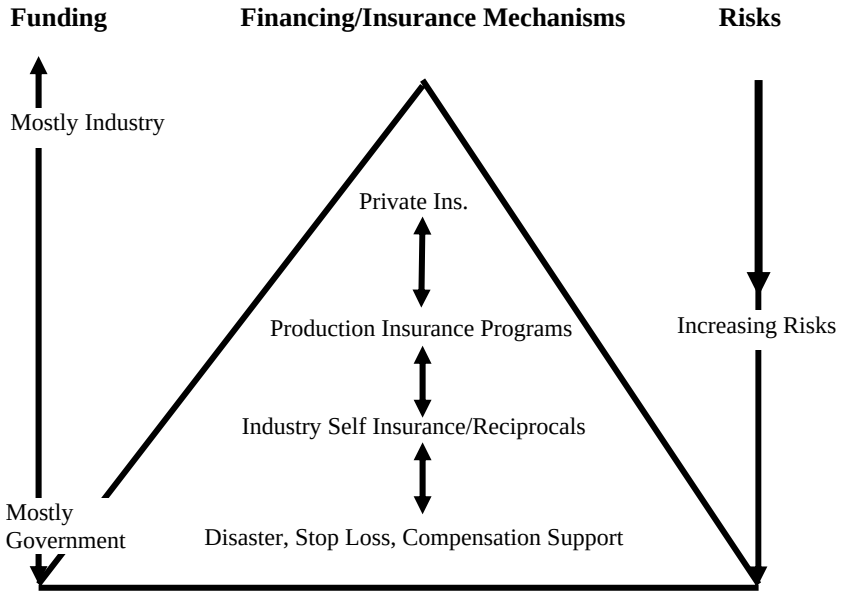
The following suggestions are made with respect to the creation of a mechanism and system whereby the BC poultry industry, likely in cooperation with the whole industry, leads the development of a "Shared Risk Management System", or SRMS.

There is every evidence that the system ideally would need to be national in scope – indemnification is based on the premise that the premiums of the many will cover the losses of the few.

[8] Moral hazard refers to the possibility that the availability of certain risk tools such as insurance will influence or change peoples behavior, such as taking more risk, or being less diligent in risk management practices.

The management of disease and risks can be considered within the context of a risk management pyramid. Such a system is illustrated in Figure 6 below.

Figure 6: Risk Management Pyramid



The concept of a Shared Risk Management system requires the integration of a number of risk management tools, cooperation between individual producers, producer organizations, and both levels of government.

The risk management tools available are:

- **Self insurance** – the individual producer assumes the responsibility for the peril and its possible risk cost.
- **Reciprocals –** a contractual arrangement whereby individuals (subscribers) share risk among themselves (an example of this is with the Ontario Broiler Hatching Egg Producer Association has for Salmonella) in a formal way. Contributions are made by subscribers, and payouts used to compensate members for individual losses of defined perils. Also equivalent to a cooperative, self directed mutual fund.
- **Insurance, and Re-insurance** – private sector insurance policies are designed for quantifiable and defined perils, other insurance agencies insure the primary insurance underwriters (re-insurance).
- **Federal and Provincial Production Insurance** and similar income insurance mechanisms such as CAIS.
- **Government disaster programs and mechanisms,** both at provincial and federal levels to react to catastrophic events, and
- **CFIA compensation** support under the Health of Animals Act in the event of an outbreak and the ordered destruction of animals and products.

The outline of the SRMS is outlined below. A schematic to illustrate the system is shown in Figure 7.

The different possible risk management options are designed to reflect specific perils they can practically cover. A possible linkage between perils and the risk management option is illustrated in Figure 7.

For the example shown in Figure 7, the total costs are estimated at 100 units. For the first 10 units of cost, this would be covered 50% by the individual producer (self insurance), and the other 50% by other producers, in the form of a deductible, or program payment.

The next 15 units of coverage would be managed by a formal reciprocal. This reciprocal itself can be used to access additional risk coverage in the insurance/reinsurance market, in this example, for a additional 35 units of risk coverage. The final 40 units of coverage would be provided by government, either federal or provincial.

The important elements of the SRMS are as follows.

1) To be risk efficient, the major components must be national in scope, for risk sharing, and premium cost reduction.
2) The elements of self insurance, government and third party risk transfer integrated into one system
3) Each coverage group selects specific perils and provides full coverage
4) Insurance premiums and indemnity payouts related to participation in Bio-security, surveillance program, and other GMP's. Proposed graduated system of coverage, plus premium reductions for full use of bio-security and surveillance participation, and payout level also based on compliance
5) Reciprocal established in BC for mutual self insurance
6) SRMS to be inclusive of all components in the poultry industry, incentives for full participation.
7) Exhaustion points established – where one level of coverage runs out, and another kicks in)
8) Single independent administration, such as a not-for profit organization

Some comments on current risk management system and existing gaps are summarized below.

Disease Eradication and Control:

- system currently managed by CFIA, minimal gap
- covers costs of depopulation, cleaning of barns and removal of litter and birds ordered depopulated, partially for disposal including infected litter.
- responsibility for cost now with government, for about 95%
- program is under review and modification

Proactive Disease Management Strategy:

- represents the costs as developed in this study
- costs would be borne both by government and industry
- part of the costs are operating costs of bio-security, and for surveillance
- includes the other costs of GMP's
- are responsible actions that will trigger lower insurance and other program premiums
- part of costs could be offset by a new industry risk management fund (reciprocal), supported by check-offs by industry

Disaster Compensation Mechanisms

- federal government now designing new disaster program frameworks for major disasters
- cover costs with respect to cease movement orders, shut downs, market failures
- government could establish a "stop loss" threshold, which would serve to entice more private sector insurance schemes, programs.

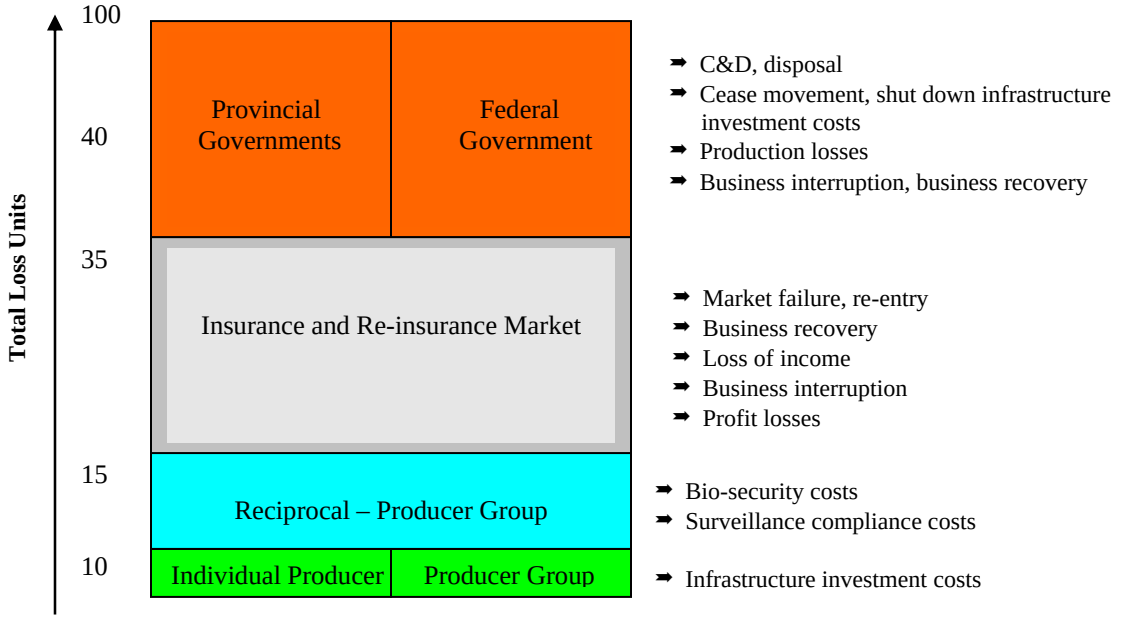
Production Insurance

- AAFC now looking at gaps in existing programming such as CAIS, crop insurance
- Is integral part of the system for risk management
- Previous government insurance programs have not fit well with poultry industry
- Covers a portion of loss of income due to price or yield declines, not for major disasters
- Could have some help in business interruption losses.

Private Insurance/reinsurance

- New innovations needed in this area - reciprocals
- Can be available for defined perils, and premium costs and payouts positively impacted by compliance with GMP, bio-security, surveillance
- Cover profit losses, interruption, etc.

Figure 7: Suggested Design and Elements of a Shared Risk Management System



Elements

- ➡ Would benefit by being national in scope
- ➡ Self insurance, government and third party risk transfer integrated
- ➡ Each group selects specific perils and provides full coverage
- ➡ Insurance premiums and indemnity payouts related to participation in Bio-security, surveillance program, and other GMP's.
- ➡ Incentive based
- ➡ Reciprocal established in BC for mutual self insurance
- ➡ Inclusive, incentives for full participation
- ➡ Exhaustion points established –where one level of coverage runs out, and another kicks in)
- ➡ Single independent administration

RECOMMENDATIONS

There are several major directions that decisions makers can take with respect to reacting to the analysis, suggestions, and recommendations made in this report (and the two supporting interim reports which have been prepared). These directions include:

1. **Acceptance of one of the risk response options for action**: decision-makers desire to take proactive steps, and put in place a series of actions that lead to the eventual operationalization and implementation of one, or a combination of the proposed risk response options.
2. **Maintenance of the status quo**: upon reflection, it is decided by decisions makers, that the current efforts now underway in the industry with respect to bio-security, surveillance, nutrient management, and premises identification are adequate at this time.

The recommendations and the subsequent action plans that have been developed below assume that the first direction is chosen by decision makers.

A series of recommendations are made for consideration by decision-makers. These recommendations are made within each of the different risk management response areas – financial management and compensation. infrastructure management, active surveillance ,and bio-security.

IMPLEMENTATION OF INTERMEDIATE RISK MANAGEMENT RESPONSE OPTION

Recommendation: It is recommended that the industry and government consider implementing the intermediate response option as developed in this study.

DEVELOPMENT AND IMPLEMENTATION OF SHARED RISK MANAGEMENT SYSTEM (SRMS)

Recommendation: The industry and government originate, develop, and implement an integrated financial management and compensation program, named the "Shared Risk Management System" that provides financing and funding mechanisms for recovery from disaster, self insurance, government supported production insurance, and private insurance that substantively protect the industry from the significant perils it will face due to animal disease risks, expedite recovery in the event of and outbreak and serve to sustain and grow the industry.

Relevant background information:

- Significant gaps face the poultry industry with respect to insurance, income support, and disaster costs and impacts.
- AAFC is currently analysing some of these gaps and potentially looking to design Production Insurance programs to partially close these gaps.
- A proactive risk management strategy will provide the industry with the necessary operational management processes (bio-security, surveillance programs) and modifications in the infrastructure of the industry, to support the design of, and make private insurance more affordable.
- At the national level, the National Feather Industries are undertaking a review of Indemnification options for the industry.
- The industry has expressed major concerns, that if appropriate compensation systems are not proactively in place, it will be difficult to introduce active surveillance, and other risk reduction programs for the industry.

Proposed elements of the market enhancement and financial management program:

- The program would be designed as an industry-wide model, using "insurance like" principles: the risks and costs must be clearly defined, measurable, the liabilities must be limited, moral hazard and adverse selection must be minimized, and good behaviour rewarded.
- Program would integrate disaster, production insurance, private insurance, self insurance and reciprocals concepts and tools.
- The system should be incentive based. The adherence to proper bio-security, the participation in an active surveillance program and other Good Management Practices should be reflected in both premium and contribution costs, and/or in insurance and compensation payouts and indemnities. Incentives must be such that they encourage parties to undertake proactive recovery initiatives to expeditiously resume normal operations after an outbreak.
- Participation in the program would be conditional on industry proactively participating and adapting the management practices as envisioned in this industry risk management strategy.
- The elements of self insurance, government and third party risk transfer integrated into one system.
- Each coverage group selects specific perils and provides full coverage.
- Insurance premiums and indemnity payouts related to participation in Bio-security, surveillance program, and other GMP's. Proposed graduated system of coverage, plus premium reductions for full use of bio-security and surveillance participation, and payout level also based on compliance.

- Reciprocal established in BC for mutual self insurance.
- SRMS to be inclusive of all components in the poultry industry, incentives for full participation.
- Exhaustion points established – where one level of coverage runs out, and another kicks in.
- Single independent administration, such as a not-for profit organization.
- There be an investigation of tax incentive systems wherein pre-tax profits may be used for insurance programs, and is non-taxes if used for a disease crises, but taxed if used for other purposes.
- Industry and government would jointly fund the premiums and other costs of the system, on a cost shared basis.

Improve Management Of Industry Concentration

Recommendation: The BC industry undertakes a series of progressive steps leading to arresting, and to eventually reducing the degree of physical and business intensity and density. This process would involve three major steps. This would involve the concurrent steps of finalizing an acceptable long term plan for the compartmentalization and the industrial clustering of the industry into bio-secure zones, implement a plan which leads to the transfer of identified high risk, high valued poultry enterprises to locations determined to reduce risk and fit with the overall plan, and undertake the other operational and structural actions as were outlined in the intermediate response option.

Relevant background information:

- Generally recognized that the Fraser Valley, and in particular the Abbotsford has a high degree of poultry livestock concentration
- High bird density within a particular premise in itself may not be a risk factor. However industry concentration can lead to animal health risk exposure when concentration is defined as multiple species operating in close proximity, the geographic proximity of specialty, small and backyard flocks, the close integration with non-poultry livestock, the close interface between agricultural and non-agricultural enterprises, and the urban population, and the high intensity of the commercial services of suppliers (feed, bedding, barn cleaners, and other suppliers) and end product transporters. Concentration risk is further defined as the concentration of production between hatcheries, breeders, growers, feedmills, processors, and the integrated transportation system.
- The industry premises are concentrated within the Fraser Valley. In the broiler industry, 88% of the growers and 100% of the breeders are in the Fraser Valley. 90% of the hatcheries, 78% of the layers, and over 95% of the specialty and turkey industry are in the Fraser Valley. 90% of the processor establishments are in the Fraser Valley.

Proposed elements of industry concentration management program:

- Focus on policy, operating and management changes to deal gradually with issues that currently contribute to concentration – forward looking versus looking at major structural change of existing industry.

- Desired future industry structure model designed – stand alone poultry value chains established within FV, the Island, and Interior, each with breeders, hatching, growing, processing , and allied supply systems – this should only be done on the basis of a more detailed analysis of options and alternatives for locating part of the poultry industry infrastructure into areas of lower concentration or lower exposure to business intensity/concentration risks as defined in this study. This additional required analysis should be based on future growth in the industry and is not to imply a wholesale relocation of significant portions of the existing industry into separate geographical regions at this time. To an extent there is some regional self sufficiency in existence today. Further detailed analysis may show that this can be enhanced during periods of industry growth.
- Enterprise management polices, such as tree barriers, policies established for distance between barns, facilities, venting, etc.
- Future facilities siting, subject to separation, set back policies.
- Pro-active policies and strategies put in place to prevent location of other livestock enterprises (non-poultry) being located in close proximity to poultry operations.
- All future buildings, new operations, subject to industrial risk segregation policies.
- Existing high risk operations identified, removed and re-established away from center of FV. These would include a number high risk, high valued production and breeding operations.
- Geographic separation of regulated from unregulated and small flocks.
- Segregation of high risk enterprises, high valued breeding flocks geographically separated.
- Polices established for all future investment to achieve desired future industry model.
- European model reviewed as to color zoning – supply, service, allied industries maintained within zones, by use of color coding, to restrict movement across unique bio-secure and separable zones (compartmentalization).
- Incentive system established to encourage industrial reorganization, and change.
- Conflicts with existing policies that encourage uncontrolled, small scale livestock operations within concentrated areas removed.
- Segregation between poultry and other types of livestock production established.
- Clearer policies developed between agricultural and non-agricultural/ urban investment, location, and practices.

Recommendation: Develop geographical zones that could function independently in the event of a disease outbreak. This would involve regionalization or compartmentalization consistent with OIE guidelines.

Implement Active Surveillance Program

The results must be recognized by the international trade community to mitigate exposure to the BC poultry industry to potential province wide export bans.

Recommendation: As a mechanism for early detection and to reduce the intensity of animal disease outbreaks, the industry establish an on-going active surveillance program, inclusive of all production sectors, and supported by a compensation system that compensates industry for their economic losses and recovery costs in the event of detection and business disruption/closure. It is recommended that surveillance be national in scope, and that trade policy ensure that product entering Canada meet equivalency with respect to active surveillance so as to ensure competitiveness and safeguard consumers.

Relevant background information:

- CFIA is currently developing and will introduce a national surveillance system under new OIE guidelines.
- US has a voluntary surveillance program with costs paid for animals destroyed, and C&D, with cross compliance incentives to encourage participation
- Is expected that the initial introduction of an active surveillance program will lead to a detection of animal disease virus with resulting economic consequences on industry. Processors and further processors may be adversely impacted by initial market damages and therefore some form of compensation may be required to cover this element.
- Producers are strongly adamant that a compensation system must be in place in advance of an active surveillance system to be effective.
- Current levels of testing under the current voluntary surveillance system has declined.

Proposed elements of the active surveillance program:

- Compensation system for negative impacts of surveillance needs to be in place and a linked component of the program.
- The active surveillance program to be designed within the existing and new CFIA national program.
- Program would be designed with the identification and use of "surveillance triggers", where changes in mortalities, feed and water consumption would result in active testing of birds. With effective triggers, frequency and cost of surveillance can be minimized.
- The surveillance system must be inclusive of all members of the producer sector, as practically possible .
- Incentives need to be in place to encourage compliance – related both to compensation, but also related to insurance premiums and indemnities or payouts.
- Surveillance system will need to be mandatory.
- Trade policy and rules are amended to ensure product entering Canada meet equivalent standards

Develop Universal Bio-Security System

Recommendation: The BC poultry industry develops a "universal bio-security program, which encompasses the full value chain of the sector inclusive of allied supply and service industries, through the production, and processing sectors), and provides inducements and guidance for the inclusion of the non-regulated and small/speciality flocks to participate in this bio-security program.

Relevant background information:

- The BC industry, lead by the supply managed sector, are currently engaged in the development of a mandatory bio-security, which will be inclusive of an independent auditing and compliance system.
- The allied and service industries are not fully a part of this system currently. It is recognized that a bio-security system that is not inclusive of the complete value chain is not fully effective. The non-regulated, small flocks, and specialty poultry industry in BC are an important and significant part of the industry. Their methods of bio-security and management practices must be customized to an appropriate standard. Proposed elements of the bio-security program:
- A full and comprehensive bio-security program to established and enforced within the regulated poultry sector. This system would be mandatory and would be audited.
- A system of bio-security practices be developed for the allied industries, and that these become mandatory and audited.
- The non-regulated, small and specialty flock industry producers be provided the support, systems, for becoming part of the industry bio-security system. Eventually, all poultry production at least in the Fraser Valley would be under a mandatory and audited bio-security system.
- Efforts underway continue to establish a complete and effective premises identification system which will be inclusive of all poultry operations in the province, regulated, non-regulated and small flocks.

Development Of Regional Economic Zones

Recommendation #6: Develop geographical zones that could function independently in the event of a disease outbreak. This would involve regionalization or compartmentalization consistent with OIE guidelines. These results must be recognized by the international trade community to mitigate exposure of the BC poultry industry to potential province wide export bans.

The subsequent recommendations outline the different individual elements of the suggested actions and responses.

Recommended Action Plans

A set of action/strategic plans are below. These plans set out a planning concept for each of the four recommendations. These action plans are provided as an example of actions which industry and government might carry out. Industry and government decision makers may choose to revise this action plan based on the recommendations they choose to implement. The action plans are separated into three future periods:

- Short term – zero to three years
- Intermediate term – four to seven years, and
- Long term – over seven years.

Management And Coordination Strategy

Recommendation	Short Term (0-3 years)	Intermediate Term (4-7 years)	Long Term (Over Seven Years)
Management and Coordination of BC Risk Management Strategy Implementation	➡ Sign off by the RASC with respect to reports and recommendations ➡ Risk analysis Report given final review and acceptance by Poultry Industry Advisory Management Committee ➡ Steering Committee develops terms of reference for selected recommendations ➡ Interim funding mechanisms established for operations ➡ Team leaders, committees struck for management of individual recommendation strategies	➡ Steering Committee continues to monitor and control progress of sub-committees, working groups ➡ Progress report prepared for Poultry Advisory committee by 2014 ➡ Funding requirement for other committees developed and arranged	➡ Steering Committee continues for monitor and control progress of sub-committees, working groups ➡ Continued progress reports prepared for Poultry Advisory committee semi- annually

Universal Bio-Security Strategy

Recommendation	Short Term (0-3 years)	Intermediate Term (4-7 years)	Long Term (Over Seven Years)
Develop and Implement a Universal Bio-security System for the BC Poultry Industry	➡ Government-Industry project management team established ➡ Consultations held with allied industries, and all sub-poultry industry segments on direction and intent of industry wide bio-security plan – in first six months ➡ Industry wide bio-security system introduced by end of year three for the regulated industry ➡ Set up of auditing and compliance system for the regulated industry ➡ Bio-security specifications, needs assessments carried out for each sub-sector ➡ Bio-security plans integrated with federal standards, and other provincial plans ➡ Special plans and alternatives for non-regulated, speciality industry segments developed. ➡ Mandatory, and optional bio-security elements recommended for all sectors ➡ Compliance costs, benefits, and incentives analysed ➡ Auditing and compliance system designed, costed ➡ Integration of premises ID system assessed ➡ Implementation plan prepared for industry – within one year ➡ Pilot trial developed for bio-security system in non-supply managed sectors – beginning in year two and into year three ➡ Quarterly reporting to Steering committee	➡ Costing model established for bio-security compliance and management, by sub-sector ➡ Cost sharing established ➡ Monitoring and evaluation system put in place ➡ Formal progress report prepared and submitted to Steering Committee within 18 months ➡ Industry wide biosecurity introduced into the unregulated industry	➡ Management and monitoring of bio-security system ➡ Progress reports to Steering Committee ➡ System modifications made as required

Active Surveillance Strategy Plan

Recommendation	Short Term (0-3 years)	Intermediate Term (4-7 years)	Long Term (Over Seven Years)
Develop and introduce an Active Surveillance Program	➡ Government-Industry project management team established ➡ Government establishes criteria for active surveillance program, with consultations with industry ➡ Government amends trade policies ➡ Surveillance triggers established and communicated with industry ➡ Special analysis of applying active surveillance, and their implications completed on non-regulated, speciality industry producer segments. ➡ Final costing of program developed, with estimation of benefits – within 18 months ➡ Final plan for active surveillance program, inclusive of all producer sectors communicated ➡ Trade rules developed that place similar testing standards on countries and their products they wish to ship into Canada. ➡ Active surveillance system put in place for supply managed and major non-regulated producers– in year three ➡ Quarterly reporting to Steering Committee	➡ Full active surveillance program put in place for all producer sectors in the poultry industry ➡ Monitoring and evaluation system established for surveillance programs. ➡ Semi annual reporting to Steering Committee	➡ Continued monitoring and evaluation of surveillance program

Management Of Industry Concentration Strategy

Recommendation	Short Term (0-3 years)	Intermediate Term (4-7 years)	Long Term (Over Seven Years)
Development Strategy for the Management of Industry Concentration	➥ Government-Industry project management team established ➥ Policy review of existing regulatory environment, and all agricultural policies with respect on farm location, citing, set backs, small farm incentives, organic production, etc. – in first 6 months ➥ Develop forward looking policies for regulatory management of BC industry concentration, coordinated with longer term plan – by one year ➥ Special analysis done of cost of relocating targeted high risk barns, and other infrastructure (special attention paid to older versus newer premises) ➥ Long term industry structure rationalization and infrastructure management plan (for economic clustering and compartmentalization) developed with stakeholders–plan would include identification of incentives, needs, and cost impacts, and be consistent with OIE definitions – major task of the team – completed within two years ➥ Short term plan to identify, costing, operational considerations, and implications of moving selected number of high risk, high valued operations – completed within one year. ➥ Enterprise management polices, such as tree barriers, policies established and enforced for distance between barns, facilities, venting, etc ➥ Pro-active policies and strategies put in place to prevent location of other livestock enterprises (non-poultry) being located in close proximity to poultry operations. ➥ Conflicts with existing policies that encourage uncontrolled, small scale livestock operations within concentrated areas removed. ➥ Evaluate regionalization/compartmentalization of relevant poultry operations. ➥ Program report to Steering Committee semi-annually	➥ Movement of high risk/high valued enterprises operationalized and completed ➥ Policies established to all future investment to achieve desired future industry model ➥ Clearer policies developed between agricultural and non-agricultural/urban investment, location, and practices. ➥ Economic costs, impacts, benefits quantified of long term industrial reorganization plan ➥ Semi-annual progress reports to Steering Committee ➥ Conflicts with existing policies that encourage uncontrolled, small scale livestock operations within concentrated areas removed.	➥ Annual review of industry concentration plans made and reported on. ➥ Conflicts with existing policies that encourage uncontrolled, small scale livestock operations within concentrated areas removed.

Integrated Financial Management And Compensation Strategy Plan

Recommendation	Short Term (0-3 years)	Intermediate Term (4-7 years)	Long Term (Over Seven Years)
Develop Integrated Shared Risk Management System	➡ Government-Industry project management team established ➡ Further assessment, analysis done of the concept outlined in this study for this integrated shared risk management system. Risk and insurance specialists engaged for this analysis and evaluation. ➡ Linkage made with AAFC Poultry Gap Analysis, with expectation to benefit from the outputs from this study – and possibly be the pilot for recommendations of this study (re production insurance, modified CAIS programs) ➡ Formal linkage made with efforts underway at national level of industry with respect to the development of risk management and indemnification options ➡ Short term industry support/compensation plan designed to allow the more immediate elements of the risk management strategies, particularly active surveillance. ➡ Application made to PSRMP program of AAFC, for resources to undertake assessment on design of private insurance based tools for the industry – particularly with respect to the establishment of reciprocal in industry ➡ Final plan put in place for BC risk shared risk management system within one year ➡ Quarterly reporting to Steering Committee	➡ Specific new programs with respect to production insurance, compensation, private insurance introduced for industry. ➡ Semi-annual reporting to Steering committee	➡ Monitoring and evaluation of risk management system ➡ Semi annual reporting

Risk Analysis Of The BC Poultry Industry
Interim Report

Prepared For

Risk Analysis Steering Committee

On Behalf Of The Poultry Advisory Management Committee

Investment Agriculture Foundation

Victoria, BC

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INTRODUCTION

This interim report has been organized into seven sections. The first section provides a review, using secondary research, of animal health disease experiences and risk factors with respect to the poultry industry in other jurisdictions.

The next section provides an overview of BC's poultry industry structure, focusing on the concentration of the industry within the Fraser Valley, Vancouver Island, and the Interior.

A major part of this interim report is dedicated to an evaluation and quantification of the exposure this industry may be facing with respect to future animal disease risk. This involved undertaking future scenario analyses with respect to a healthy future, and futures that include low pathogenic and high pathogenic recurring outbreaks.

The next section provides the feedback and input acquired from the industry and government consultations. This consultation process has led to the identification of a significant number of risk factors facing the poultry industry in BC.

The last sections include a preliminary gap analysis, and a risk ranking and priorization of the major risk factors. This has lead to the identification of a reduced list of important risks which will be further analyzed in the next phases of this study.

The final section of this report provides a list of the next major steps that need to be followed to complete this study.

Secondary Research: Risk Profile

The secondary research has focused on a number of supporting issues relevant to the development of a risk management strategy for the BC industry. These include looking at ways in which poultry viruses are transmitted, as there is considerable uncertainty in this area. Other research includes: looking at what risk factors have been identified in other regions; and what strategies other countries have applied to the management and mitigation of this risk.

Most of the findings as reported below refer to Avian Influenza (AI) and exotic Newcastle disease. These two diseases are reportable to the OIE (World Organization for Animal Health) and control and eradication procedures must be immediately applied. A full list of the references used in this secondary research are provided in the Appendix.

Vectors Of Poultry Viruses' Transmission

- **Direct bird to bird contact**
  - Direct contract between infected (dead or alive) and susceptible birds
  - Wild birds (e.g. migrating birds)
  - Virus-containing scabs of other birds
- **Air-born transmission:** Although there is often great concern about air-born transmission of Newcastle disease and AI, Belton (2001) and Beard (2003) concluded that air-born transmission is likely only of very limited importance. However, recent findings of the Canadian Food Inspection Agency (CFIA) has found evidence of fecal particles on feathers. This suggests that air-born transmission may be of greater importance.
- **Fecal dust** – on equipment, feathers, people, etc.
- **Contaminated feathers:** There are some reports of disease transmission through feathers contaminated with infected feces, litter, etc. – the contaminated feathers can be blown to neighbouring poultry houses (Personal communication Pabilonia, 2006)
- **Mechanical spread by humans:** Spread by humans and human activities associated with poultry flocks is considered the most likely vector of transmission of poultry diseases between farms. (Personal communication Pabilonia, 2006). The following are possible pathways of transmission (modified from Butcher et al. 2003):
  - Contaminated footwear and clothing
  - Caretakers/personnel/visitors
  - Feed deliveries
  - Tires

- Soiled equipment
- Feed sacks
- Crates
- Poultry feed ingredients and spillage
- Water
- Infected housing equipment
- Manure
- Imports (legal or illegal) of infected live birds and their products
- Contaminated feed, water, eggs, and other poultry products
- Contaminated filler flats, egg cartons, and shipping boxes
- Catching crews and their crates, trucks, or other catching/hauling equipment
- Construction, vaccination, and other service crews and equipment
- Rendering trucks
- Informal and business meetings of poultry personnel and their families
- Unrestricted movement of children who play and work on farms near poultry buildings
- Hunters transiting among poultry farms
- Dressing wild waterfowl or game fowl on poultry farms or workers that hunt
- Improper disposal of poultry carcasses, litter, contaminated water, or other poultry wastes

➟ **Mechanical spread** – other (modified from Butcher et al. 2003):

- Dust-laden fur of rats, mice, dogs, cats, and birds
- Mosquitoes
- Predators and rodents
- Insects (e.g. fleas, beetles)
- Pets (e.g. dogs, cats)
- Mites

In addition, Sabirovic et al. (2006) provides a detailed overview and description of potential pathways of HPAI H5N1 introduction into the UK. They distinguish two broad groups of pathways by which the virus can be introduced to the UK:

1. **Legal Trade:**
    a. Live birds (poultry, game birds and other birds)
    b. Poultry products
    c. Mechanical transmission (e.g. transport vehicles, feathers, etc.)
    d. Other susceptible species (e.g. pigs, cats)

2. **Other:**
    a. Wild birds (sedentary and migratory)
    b. Illegal activities. Relevant examples may be the smuggling of pet birds through airports, illegal pickup and sale of ungraded eggs and other poultry products.
    c. Personal imports (poultry products)
    d. Mechanical transmission (people)

Poultry Industry Risk Factors

Poultry risk factors found in other jurisdictions, overlapping with those initially identified in the RFP, include:

- Farm density – concentration of poultry farms (e.g. East et al., 2006).
- Production unit site layout – e.g. distance between poultry buildings both on the farm and between farms.
- Proximity of long life birds to short life birds – when disease spreads from birds with a short life cycle to birds with a long life cycle (egg producing stocks, breeders) due to the close proximity of these two types of birds, either on the same farm or on adjacent properties, the financial loss is often significant. A major component of this loss is due to foregone income during downtime. Long life birds like layers and breeders need to be scheduled back into production in an orderly manner to meet market demand requirements. This requirement for orderly replacement scheduling increases the downtime, further driving up losses. Further, most replacement birds are contract grown and are not readily available in large quantities, at any single point in time. Delays in placement due to lack of availability of replacement birds increases the downtime and requires poultry product to be imported into the province to meet market demand. In addition, long life birds often comprise valuable breeding stock. Losses due to damages to structured breeding programs, another cost, is particularly significant to breeders of specialty birds as many of these producers produce their own breeder lines. Long life breeder stocks such as specialty primary and secondary breeders, layer breeders, turkey breeders, broiler breeders, require significant compensation, if ordered destroyed.
- Proximity of poultry to other farm animals that can cross-transmit diseases e.g. poultry and swine.
- Proximity of valuable breeding stock to grower meat stock on and between farms – particular focus on turkey breeders, layer breeders, rare breeders, grandparent stocks, specialty birds breeders and waterfowl breeders.
- Mixed species farms – different types of poultry; different types of animals.
- Mixed species poultry hatcheries.

- Vertical integration – processing plants, on same property as hatcheries and production operations.
- Export production – The loss of export revenue due to closure of export markets during and subsequent to an outbreak. The extended closure of the BC industries export markets to the Philippines, South America and Hong Kong are examples. Exports averaged $22 million per year prior to the 2004 AI outbreak.
- Contaminations of wooden pallets – the possible transmission of infection through the use of contaminated, poorly washed and infected wooden pallets between livestock premises.
- Movements of un-graded eggs outside regulated channels; the possible transmission of disease by the people or equipment picking up and distributing ungraded eggs.
- Manure management – the potential transmission of manure poorly stored on the premise, or the movement of contaminated manure through high density areas.
- Re-use of materials.
- Any and all service providers, supplies.
- Catching and vaccination crews.
- Agro-tourism – the movement of urban and other people, and vehicles between premises

Additional Risk Factors

Secondary research has identified some risk factors in other jurisdictions. The risk factor, the country, and the reference is discussed in this section.

- Non-confinement systems:
  - These include, but are not limited to, free-range and organic poultry, which may present an increased risk of exposure to Avian Influenza because animals are more likely to come in contact with wild birds that are natural reservoirs of Avian Influenza (Gilbert et al, 2006). The increased risk is primarily due to the greater exposure these flocks may have to migratory and other wild birds (CFIA Risk Assessment to Determine Likelihood of Transmission of Highly Pathogenic AI, 2006). Since poultry on hobby farms are often housed outdoors, the possibilities for contact with wild birds are higher than with confined poultry. Therefore, in the Netherlands, hobby farms have to either vaccinate their poultry or house them indoors during a certain time of the year (Publication of the EU, 2006).

  Disposal of dead birds by rendering off-farm (McQuiston et al., 2005):

  - Using questionnaires on 155 infected premises (128 turkey, 23 chicken) and 199 non-infected premises, risk factors were examined associated with the spread of low pathogenicity H7N2 AI virus among commercial poultry farms in western

Virginia during an outbreak in 2002. The study found that farms rendering carcasses off-farm were 7.3 times more susceptible to AI infection than farms not rendering carcasses off-site. The basis of this increased risk is the disposal of contaminated birds that are transported to an off-premise disposal site; the risks of spreading the disease by transporting through and by other poultry operations. The study measured the frequency of possible infection, not the total extent or intensity of the outbreak. The disease is deemed to be transmitted through the movement of vehicles, and the insecure movement of the contaminated birds.

- Increased age of the flock:
  - For Newcastle disease: – Australia, as reported by East et al., 2006.

Strategies Applied For Risk Management In Other Countries

EU

Since 2002, member states of the European Union have been implementing surveys for Avian Influenza in domestic poultry and wild birds (co-financed by the European Commission) (Pittman et al., 2006). Experiences indicated that passive surveillance of dead wild birds can provide an early warning system for the introduction of HPAI H5N1. In addition, the EU banned the import of poultry and poultry products from countries that have AI, and banned the import of animal products for personal consumption (European Commission, 2006).

Vaccination for AI is still of very limited scale and focused on high risk populations – less than 0.1% of all EU poultry are currently vaccinated (Pittman et al., 2006). Specifically, France uses vaccination for ducks and geese in one department (area of the country), the Netherlands use it for hobby poultry and organic layer hens as an alternative to indoor housing, and vaccination is also used in certain areas of northern Italy for laying hens and turkey. Finally, in 16 EU member states, birds maintained in zoos are vaccinated for AI.

Netherlands

During the Dutch Avian Influenza outbreak of 2003 (Stegeman et al., 2003), around 30 million birds were slaughtered, e.g. about half of the Dutch poultry population.

Soon after this outbreak, a Dutch policy report on 'Poultry and Contagious Diseases' (Den Hartog, 2003) made the following conclusions:

- In high-density populated poultry areas in the Netherlands, the probability for an introduction of a foreign poultry disease to an individual farm is not higher than in low-density areas. However, a higher density can considerably increase the speed the virus can spread. High density poultry areas can be a result of:

  - The density of farms: In general, the density of farms is not a risk factor for the *start* of an infection on an individual farm. After introduction, a high concentration of farms does however, greatly influence the spread of the disease and the effectiveness of prevention measures.
  - The size of the farms (number of animals per farm): This is of much smaller importance and does not need to be a risk factor for the introduction of a disease. It does however, have an effect on the speed of destruction of the animals and thus the effectiveness of control measures.

- The geographical separation of clusters of poultry farms is a disease management strategy that is theoretically effective to limiting the spread of diseases. In the Netherlands however, it is not technically or financially feasible.
- It is more effective and feasible to apply the current biosecurity rules with more regime, than it is to develop and implement more rules.
- It is *critically important* to have an easy and quickly accessible system of registration of all contacts between poultry farms. The fines for not complying with registration or disease prevention rules have to be very high.

In addition, it was suggested (Den Hartog, 2003) that some sort of insurance system (e.g. levy system) could be used in the poultry industry that would encourage prevention by putting some of the economic risks with the individual poultry farmer. In such a system the risk behaviour of a farmer should be linked directly with the insurance premium and pay-out in case of an outbreak.

After the 1997 Classical Swine Fever outbreak in the Netherlands, the Dutch government decided for the reconstruction of areas with high pig, poultry or cattle densities in order to better control disease outbreaks in the future. However, because of limited funds, this initial policy had limited effect. A more integral approach to high-density areas is now used with most of the focus on environmental and natural aspects (this is also more in line with EU policies). Natural aspects refer to the practical considerations of site location through premise and barn separation, and clustering. Two main considerations are important (Den Hartog et al., 2003):

1. If the spread of diseases through the air is an important mechanism, a greater distance between farms could decrease the probability of spread. For many list-A diseases, a radius of 1.0 km is used for destruction around infected farms – locating farms (or clusters of farms). However, 1.0 km or more from each other is not feasible in the Netherlands in the short term;
2. If the spread of diseases through contact between farms is an important mechanism, governments could decide to locate business together with great contacts (‘clusters’). By limiting the contacts to only within such clusters, the disease could be prevented from

spreading to farms outside the cluster. The idea to develop 'agro-production parks' (specialized business parks) is an example of clustering. While a full 'clustering' of the Dutch poultry industry does not seem feasible in the short term, an intermediary step could be implemented where transport of animals only occurs within certain areas (i.e. a compartmentalization strategy during 'peace times'). The latter can be implemented by specifying a maximum distance over which poultry can be transported.

Since the 2003 bird flu outbreak, the Netherlands employs an early warning system. Its features include (MinLNV, 2006):

1. Poultry farmers are required to consult a veterinarian if egg production falls by 5% or more a day on two consecutive days.
2. Poultry farmers are required to consult a veterinarian if feed and drink intake falls by 5% or more a day on two consecutive days.
3. Increased mortality of chickens older than 10 days of 0.5% or more a day for two consecutive days must be reported immediately to the National Animal Disease Center.
4. Increased mortality of turkeys of 1% or more a day for two consecutive days must be reported immediately to the National Animal Disease Center.
5. Increased mortality of all poultry of 3% or more a week must also be reported immediately.

In addition, a voluntary vaccination plan was developed for hobby farms and free-range organic poultry farms (all typically characterized by outdoor non-confinement systems) as an alternative to the indoor confinement during periods in the year with the greatest risk of infection from migratory birds (in 2006, May – June).

USA

The United States Department of Agriculture (USDA) engages in collaborative efforts with state governments and industry to undertake measures to prepare for and prevent an outbreak of highly pathogenic Avian Influenza (HPAI) in the US.

The US Poultry & Egg Association (www.poultryegg.org) developed a free interactive CD training and reference program entitled 'Poultry Disease Risk Management: Practical Biosecurity Resources CD'. The purpose of this CD is to educate and get 'buy-in' by all involved in maintaining a high level of biosecurity on poultry operations.

The US recently developed a Strategic Plan (USDA, 2006) for a unified national system for the early detection of HPAI in migratory birds. The plan recommends decentralized planning and execution of early detection efforts, with agencies and local organizations encouraged to use one or more of the following five strategies:

1. Investigation of morbidity and mortality events of wild birds;
2. Surveillance of selective live wild birds (sampling live-captured birds);
3. Surveillance of hunter-killed birds;
4. Surveillance of sentinel (e.g. backyard flock) birds; and
5. Environmental sampling (including water and fecal material).

Given the relative high risk on HPAI and the considerable consequences in case of an outbreak, USDA-APHIS (USDA, 2006-2) recommends that poultry producers who raise birds in outdoor, non-confinement systems, should take the following precautions to prevent contact with wild birds and wild bird excrement:

1. Identify high risk areas to include (a) wetlands along migratory fly ways or other areas where wild waterfowl or shorebirds congregate, and (b) high density poultry production areas;
2. Implementing preventive measures for these high-risk areas:
   - Keep birds indoors;
   - Alternatively, restricting outside open access by maintaining outdoor enclosures covered with solid roofs and wire mesh or netted sides;
3. Keeping outdoor enclosures covered with wire mesh or netting in lower risk areas (solid roofing not required);
4. Providing feed and water for all non-confinement-raised poultry in an indoor area.

Economic losses because of poultry disease can be placed in the following categories (Van Asseldonk, et al., 2003):

- Direct losses – the costs of the execution of the eradication campaign, including the value of the destroyed animals, and costs of the organizational aspects. These losses are often paid for (partly) by the national government and sometimes by a levy system.
- Indirect (or consequential) losses – these costs include:
  - Business interruption
  - Losses related to establishing movement restriction zones
  - Repopulation of the farm
  - Losses from emergency vaccination (if vaccination is used)
  - Price effects – especially for exporting countries, these price effects may result in enormous losses.

Australia

In response to several Newcastle disease outbreaks, Australia held several expert working group meetings in 2002 that led to National Newcastle Disease Management Plans and a formation of a Newcastle Steering Committee. The plan is updated annually by the Steering Committee and

focuses on active monitoring and surveillance, and compulsory vaccination in designated risk areas (Animal Health Australia, 2006).

OIE

In a study of a range of countries in the EU, Van Asseldonk et al. (2003) found that the average expected total loss per year resulting from AI epidemics, varies from 0.02% to 19.46%. Therefore, poultry production regions can be divided on the basis of the degree of risk to experience an AI epidemic. Such a risk classification can be based on several criteria such as border regulation, flock or animal density, and natural borders (rivers, mountains, seas, etc.).

Due to the potential catastrophic consequences of contagious disease outbreaks in poultry, great focus should be on the prevention of infection and the limitation of the spread of the disease. Sound and considerable incentives should therefore be put in place to promote the 'right behaviour' (Den Hartog, 2003):

- *Minimizing behaviour outside of the rules*: Develop clear rules, increase the probability of detecting unlawful behaviour and increase fines. It is important that such solutions are designed together by industry and government.
- *Differentiation of levies and indemnities after loss*: Higher levies for high-risk poultry can only work if they are substantial. In the Netherlands, early experience indicates that great differences in levies are not feasible since establishing the link between the different levy-criteria and the risks of contagious disease is difficult to prove (legally). Differentiation of any indemnities of losses can be based on how well a farmer followed the disease prevention rules (e.g. were all the Identification and Registrations rules followed).
- *Greater financial responsibility of the industry*: A smaller involvement of government in the indemnity of farmers after an outbreak can lead to more risk-averse behaviour in industry. Two possibilities are:
  - *Increasing use of a levy system:* While this would put more responsibility on the poultry industry itself, it could result in 'survivors paying for the losses';
  - *Insurance:* This can prevent survivors paying for the losses of the outbreak. In addition, premium differentiation can motivate behaviour that decreases the probability of and spread of future potential outbreaks. Insurance however, is more expensive, and a pure private-insurance is currently not yet feasible (among others because of the difficulty for insurance companies to find reinsurance options to cover potentially very large losses).

Many OIE member countries have traditionally applied the concept of zoning to establish subpopulations with different animal health status

within a country, because of the difficulty of establishing and maintaining a disease status for an entire country. Recently, the concept of compartmentalization has increasingly been used as an alternative to zoning (Scott et al., 2006). While the rationale for establishing trade regions and zones is based on geographic boundaries, compartmentalization considers all epidemiologic factors (primarily management practices and biosecurity) contributing to a separation that creates an effective boundary. The main criterion for a compartment is that the animals contained in it are clearly recognizable as part of a unique subpopulation with limited or no epidemiological links to other populations of risk. There are seven factors that can be used by an exporting country to identify and document a compartment (Scott et al., 2006).

United States Surveillance Program

Recently, the United States announced their plans to introduce a voluntary low pathogenic surveillance program.[1]

This control program has been in response to the growth frequency of HP AI outbreaks over the past years, as illustrated in the table below.

Outbreaks of HPAI by Decade Since 1955

Years	Number of outbreaks
1955–1964	3
1965–1974	1
1975–1984	4
1985–1994	5
1995–2004	10

It is important to recognize that this program is voluntary. The program is to be focused on the control of H5/H7 subtypes of low pathogenic Avian Influenza in commercial poultry under the auspices of the National Poultry Improvement Plan. The H5/H7 subtypes of low pathogenic Avian Influenza can mutate into highly pathogenic Avian Influenza, which can have serious economic and public health consequences.

The program importantly includes a compensation component for animals which need to be destroyed as a consequence of the surveillance program. The surveillance program includes a combination of active and diagnostic surveillance for AI.

Importantly, the program provides compensation for eggs and poultry destroyed, and covers the costs of cleaning and disinfecting the premises. Further, the compensation is based on a market value system of evaluation. An attempt is made as well to recognize the different values of unique genetics of breeding flocks.

[1] Department of Agriculture, Low Pathogenic Avian Influenza Voluntary Control Program and Payment of Indemnity , Final Rule, September, 2006.

There are two other characteristics of this program that are relevant as they link surveillance to compensation.

While participation in this program is voluntary, full compensation available under the program is only paid to those who participate in the surveillance program. Those that don't participate receive only 25% compensation. USDA expects 90% of the commercial egg industry and 95% of the commercial broiler industry in the US will participate in the program. The linkage between compensation availability and surveillance, along with the right of processors to declare to their import customers that they are under the surveillance program, is expected to provide a sufficient incentive to encourage high levels of participation in surveillance.

BC Industry Analysis

The poultry industry in British Columbia provides a significant economic impact to the province.

British Columbia ranks sixth among the provinces in farm cash receipts, estimated at $1.9 billion over an average of five years (2004)[2]. Primary agriculture represents about 1% of GDP. Commodities producing the largest revenues include dairy, floriculture and nursery, poultry, beef, berries and grapes, and treefruit. Animal agriculture represents about 20% of the industry's value in terms of GDP. Agriculture and related industries also employ more than 30,000 people, excluding consumer level employment. The employment in agriculture represents just under 2% of the BC workforce. A large processing/further processing sector with significant employment exists in the BC poultry industry that is not recognized in this part of the equation.

The poultry industry itself produced goods valued at over $850 million at the consumer level in 2003[3]. Along the value chain some of the economic impacts are seen as follows:

- Consumes over $170 million in feed
- Purchases $65.2 million in poults and chicks
- Sells approximately $400 million in farm gate product and produce, including $33 million hatching egg; $257 million in chicken meat; $76 million in commercial eggs; $36 million in turkey meat
- Produced processed and further processing goods valued between $700 and $800 million wholesale
- Produce goods with an estimated retail value of over $1 billion annually
- Value added processing was estimated at $453 million in 2005

The industry is comprised of producers of broiler chickens, turkeys, egg, broiler and hatching egg, and specialty birds. In addition there are numerous allied industries including feed companies, transportation companies, and processors that add value to the industry. The industry is highly concentrated in the Fraser Valley. Table 1 highlights the producers in each market segment, and also by region.

[2] BC Ministry of Agriculture, Fisheries and Food
[3] S. Paulson 2003, http://www.inspection.gc.ca/english/anima/heasan/disemala/avflu/2004sum/profilee.shtml

Table 1: Profile of BC Poultry Industry by Sector and Region

Industry Segment	BC Combined	Fraser Valley	Okanagan	Vancouver Island	Other
Broiler	➡ 318 quota holders (299 primary, 16 speciality, and 3 growers who hold both primary and specialty quota) ➡ 40 permit holders ➡ Produce 210,000,000 kgs of meat annually ➡ $257 million in farm gate revenue in 2005	➡ 269 quota holders, and 3 permit holders ➡ 88% of production	➡ 30 quota holders, and 8 permits holders ➡ 9.35% of production	➡ 17 quota holders, and 29 permit holders ➡ 2.6% of production	➡ 2 quota holders in the Peace ➡ 0.05% of production
Broiler Breeder	➡ 57 producers ➡ 87 premises ➡ Produce 108,000,000 eggs annually ➡ Eggs valued at $33,000,000	➡ All premises located in Fraser Valley ➡ 100% of production			
Hatcheries	➡ 7 hatcheries	➡ 5 hatcheries ➡ Represents 90% of provincial production	➡ 2 hatcheries ➡ Represents 10% of provincial production		
Layer	➡ 127 Producers ➡ 2,374,000 layers ➡ Produced 52 million dozen eggs in 2005 ➡ $76 million in farm gate revenue in 2005	➡ 91 producers ➡ 78.1% of production	➡ 14 producers ➡ 8.6% of production	➡ 18 producers ➡ 10.5% of production	➡ 4 producers ➡ 2.8% of production
Egg Grading	➡ 30 registered egg grading stations ➡ 1 plant does 70% of grading for the province, with 2 others grading significant volumes	➡ 12 egg grading station ➡ Estimated 80% of egg grading	➡ 6 egg grading stations	➡ 4 egg grading stations	➡ 8 egg grading stations
Turkey	➡ 64 growers ➡ Produce 23.5 million kg of meat ➡ $36.1 million in farm gate revenue	➡ 53 growers ➡ 94.8% of production	➡ 1 grower ➡ 2.4% of production	➡ 5 growers ➡ 2.6% of production	➡ 5 growers ➡ 0.2% of production
Specialty Birds	➡ The industry includes production of ducks, squab (pigeon), silkie breeders, tinamou, emu, ostrich, Taiwanese chicken breeders, pheasant, turkey and layer breeders	➡ 95-97% in Fraser Valley			
Processing	➡ 15 primary killing plants in 2006 ➡ 1 additional killing plant in 2007 ➡ A number further processing facilities ➡ 1 egg processing plant	➡ 10 primary kill plants ➡ 1 new plant to be operating in 2007 ➡ Approximately 90% of primary processing ➡ 1 egg processing plant	➡ 2 primary plants ➡ Approximately 10% of processing	➡ 1 primary plant ➡ Approximately 0.33% of processing	➡ 2 Hutterite killing plants in the Peace River

A more detailed breakdown on the number of premises for each producer segment in the Fraser Valley was provided by Ms. Angela McKee of the BC Broiler Hatching Egg Commission. A premise is defined as a parcel of land defined by a legal land description or, in its absence, by geo-referenced coordinates, on which, or on any part of which, animals regulated under the *Health of Animals Regulations* are kept, assembled or disposed of (CLIA). At present the premise location data is not available for other regions of the province.

Table 2: Location of Poultry Premises by Municipality in the Fraser Valley

Municipality	Broiler	Broiler Breeder	Layer	Turkey	Specialty Birds
Chilliwack	64	32	14	1	4
Langley	49	4	9	12	1
Abbotsford	146	38	55	22	4
Surrey	24	0	1	7	0
Richmond	1	0	0	2	0
Maple Ridge	2	0	0	0	0
Mission	1	0	0	0	0
Rest of Fraser Valley Region	3	1	1	0	0

The density of poultry in the Fraser Valley has been described as a contributing factor to the risk of the industry. Based on annual production information, the density of poultry in the Fraser Valley is estimated at 4,700 birds per km^2. This density varies greatly, with over 15,000 birds per km^2 in Abbotsford, over 8,500 in Chilliwack, 5,000 in Langley, 2,500 in Surrey, and only a few hundred in Richmond, Mission and Maple Ridge.

When the densities in the Fraser Valley are compared to other regions of intensive poultry production, the densities in the Fraser Valley seem high, but not completely out of line with those seen in other regions. In Canada for example, based on 2001 census information, the density in the Niagara Regional Municipality in Ontario was just over 2,500 birds per km; and almost 1,300 birds per km^2 in King's County, Nova Scotia. Internationally, Georgia[4] has a poultry density of over 1,000 birds per km^2, Delaware[5] has a density of about 7,200 per km^2, and the Netherlands[6] of over 2,400 per km^2. These densities will obviously vary when the production is broken out to specific municipalities of the countries or states. The above analysis

[4] Based on agricultural information from Georgia Statistics (http://www.nass.usda.gov/Statistics_by_State/Georgia/Publications/bragsheet.pdf) and land area from Wikipedia

[5] Based on production information from Delmarva Poultry (www.dpichicken.org) and land area from Wikipedia.

[6] Based on production information from Rabobank and land area from Wikipedia.

suggests that poultry livestock densities in the Fraser Valley are likely comparable to other areas of intensive production. Within the Fraser Valley, Abbotsford has a relatively high poultry density, with moderate levels for Surrey, Langley and Chilliwack.

Other things being equal, the higher the density, the higher the risk. However, there is not an established correlation between densities and risk. The densities have little meaning without consideration of other factors like the number of premises, the number of poultry species, the number of backyard flocks, the number of other livestock and wildlife, the density of human population, business traffic and the biosecurity at each production location. For example the presence of one very large broiler operation will increase the density of poultry in an area. However, if the operation is very secure and has a high level of poultry health in its flock, it will not increase the risk to the local industry; rather it will likely decrease the risk. Secondly, the mix of poultry in an area is of critical importance to influencing the statistics on density. If annual numbers of birds are used in doing the calculations, differences in density of birds per square kilometre would vary between areas if there were more layers in one area and more broilers in the other area, because of the life cycle length. Broilers run 6.5 cycles per year whereas, some types of turkeys run 3 cycles a year. Layers on the other hand are in place for the full year.

One factor which may be unique to the concentration within the BC poultry industry, compared to other poultry producing regions, is the degree to which multi-species operations exist side-by-side. In the Fraser Valley, the concentration of production includes breeders, growers, hatcheries, feed mills, and processors, and an integrated transportation industry. It includes both regulated and unregulated producers; a wide range of bird species; large commercial operations alongside small backyard flocks; and management practices that range from intensive systems to organic and free range production.

This preliminary analysis of density per square kilometre suggests that in order for statistical data to be of value in providing an insight into understanding the risk of density, a more comprehensive in-depth analysis of density beyond the scope and budget of this study would be required.

Economic Risk Analysis

An economic risk assessment has been performed on the BC poultry industry in this section. This is conducted within two major sections. The first section provides a historical summary of the changes in the growth of the industry by each respective sub-sector over the past ten years. This analysis provides one basis for evaluating the impact of animal disease outbreaks, particularly with respect to the 2004 AI outbreak.

The second, and more extensive analysis has then been developed for the potential impact of three future industry health scenarios:

- A future healthy industry in which there are no consequential animal disease outbreaks over the next ten years,
- A future in which the industry is subject to additional intermittent outbreaks, but of a more modest low pathogenic level of virus infection (Low Path), and
- A future in which the industry is faced with more significant and recurring animal health outbreaks, of a high pathogenic level of infection (High Path).

A model has been developed for the analysis of these three alternative industry futures. The analysis provides economic projections with respect to outcomes related to industry revenue, exports, consumption, and investment.

Historical Impact Of AI

Figures 1 and 2 track the relative changes in revenue of the major poultry sectors and of the value added sector between 1995 and 2005. These changes are relative to revenue in 2003. While each industry and sector was impacted by the 2004 AI outbreak, the relative impacts were somewhat different. The impacts on the industry have been estimated to have been over $350 million due to the 2004 outbreak.

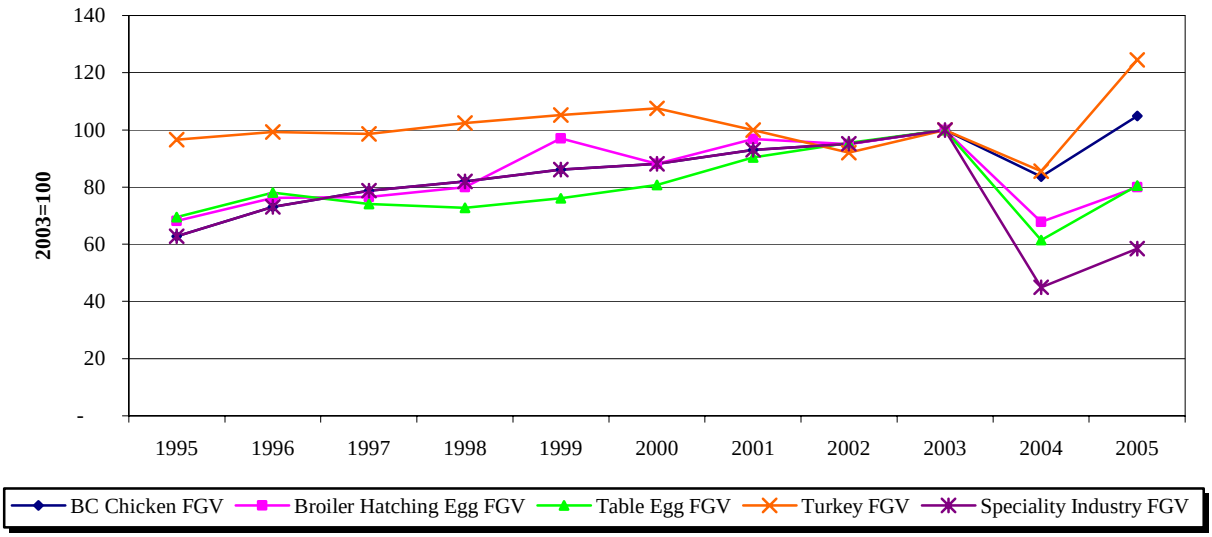
The speciality bird sector, while a relatively small sector in relation to the other poultry production sectors (estimated to be in the range of 8% of the total industry farm gate sales) was disproportionately impacted. From the index base of 100 in 2003, this industry is estimated to have dropped to about 45% of this level in sales.

The next most severely impacted sector, excluding the specialty sector, was the table egg sector, followed by the broiler hatching egg sector, chicken, and then the turkey sector.

The impact on the speciality poultry and primary and value added processing sector are reviewed as a special case.

Figure 2 illustrates the relative changes in the BC poultry value added sector relative to 2003. These values exclude specialty bird processing. From a high of 100 in 2003, the revenue of the processing sector fell to 78 in 2004.

Figure 1: Relative Change in BC Poultry Industry Farm Gate Sales, Base 2003=100

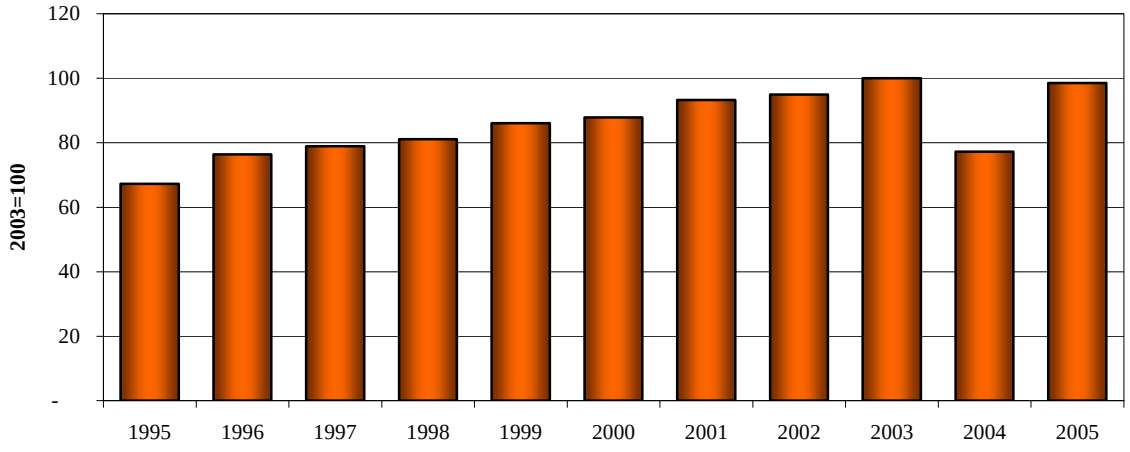


FGV = Farm Gate Value

Source: Based on information from the "Statistical Summary BC Poultry Production and Value (1995-2005), prepared by Mr. Stewart Paulson, P.Ag., Ministry of Agriculture and Lands, Industry Competitiveness Branch.

Figure 2: Value Added Industry Relative Sales

(Excludes Specialty Bird Sales)



Source: Based on information from the "Statistical Summary BC Poultry Production and Value (1995-2005), prepared by Mr. Stewart Paulson, P.Ag., Ministry of Agriculture and Lands, Industry Competitiveness Branch.

The general impacts of recent AI outbreaks on the BC poultry sectors, including the specialty bird sector, can be segregated into two major categories, production and market impacts.

- Production impacts:
  - Production related losses
  - Requirement to slaughter only limited numbers of birds in the rebuilding stage, resulting in costs of production well in excess of market price
  - Immediate staff layoffs
  - Requirements to start over, rehire, costs of retraining staff as production slowly started up
  - Slow restocking by individual age groups, each week, requirements of full crew in advance of reaching capacity, labour redundancy
  - Significant costs related to equipment and facilities being underutilized, costs of decommissioning and recommissioning of plant and equipment, barn maintenance and repair costs, etc.
  - Cleaning and disinfecting costs not covered by Health of Animals compensation
  - Increased product purchased from other provinces by the further processing sector, with a corresponding reduction in BC production grown
- Market impacts:
  - Loss of both export and domestic market during the disease crisis
  - Continued loss of the export market after the crisis was over
  - Wholesale market price reductions of dark meat due to the inability of processors to export dark meat during and subsequent to the disease crisis
  - Increase imports from the US
  - Costs of having to buy back lost markets
  - Brand damage

The speciality bird sector, in addition to suffering all of the above losses, suffered loss of primary and secondary breeding stock and damages to their breeder programs. Their well structured breeder program placement scheduling, needed to supply grower birds to the processing plants in an orderly manner to meet staffing and market needs, was disrupted. Specialty bird producers who were fully integrated from breeding through production, hatching, processing, further processing and value added processing, suffered losses compounded throughout their vertical integrated operations. This was due to lack of input supply and/or shutdown of the resultant downstream facilities. Unlike supply management, competitors in other provinces were not willing or able to supply replacement inputs to the affected processing plants in BC, but rather focused on expanding their markets in BC.

Specialty bird breeding stocks and hence grower stocks, often take longer to replace than other types of poultry because specialty birds have the longest incubation times and it takes many types of specialty birds longer to reach sexual maturity. Rescheduling times and lost foregone revenues are particularly costly to the specialty bird sectors. During an outbreak, replacement stocks for specialty breeders becomes more expensive, due to the reduced supply of grandparent stocks. The ability of BC producers to get good quality replacement stock is always a challenge. Having to access all of their breeding stock from competitors can mean reduced competitiveness for BC producers.

The specialty bird industry is also highly dependent upon export markets and these were severely impacted. In addition, there are no quotas or tariffs on imports of specialty birds. Some sectors of the specialty bird industry lost significant domestic markets due to lack of customer confidence in BC supplier reliability. Markets lost to alternative suppliers during disease outbreaks in BC were not fully recoverable. Specialty bird buyers became more aware of alternative suppliers, competitive pricing and surety of supply issues as a result of the supply interruptions from BC suppliers.

Recovery of markets after disease outbreaks is particularly difficult in the unregulated sectors.

The value of the primary and secondary processing within the BC poultry industry are larger than the farm gate receipts. The impacts on the processors (primary and further processing firms) were significant during and subsequent to the 2004 outbreak. The major component of the labour force employed in the poultry industry is within the processing sector. During the outbreak, processors operated at reduced capacity, resulting in layoffs and high unit costs of production. Due to insufficient supplies of chicken, processors were unable to adequately service their end market customers, and in many cases were forced to give up customers, both domestically and internationally. Additionally, BC processors, were granted special supplemental import permits to purchase product from the U.S. to supply their existing domestic customers. At the time these permits were granted, the U.S. market was extremely short of product, and as a result, BC processors were unable to access sufficient quantities of product to retain their normal customer base, and the product that was obtained was purchased at prices that did not allow the product to be processed and sold at a profit. As a result, processors lost millions of dollars in their attempts to retain their customers.

The processing sector suffered these significant losses during the 2004 outbreak for which there was little to no government compensation.

Further, the loss of export production has widespread future ramifications for the BC industry. Prior to the 2004 disease crisis, the BC industry, in addition to its domestic production, grew 14% additional volume for export purposes. This figure however, does not sufficiently explain the importance of the export program. The domestic markets in both BC and Canada are primarily incremental white meat volume to meet this demand. This incremental white meat was instrumental in building and expanding the BC further processing industry to its current status as the second largest

in the country, behind only Ontario. The excess dark meat component is exported to world markets. Approximately 28% of all BC produced dark meat was sold into world markets prior to the disease outbreak. The losses of export markets due to both the 2004 HPAI outbreak and 2005 LPAI findings have created the following problems:

1) The cessation of exports in 2004 resulted in the collapse of dark meat markets for BC processors when production was restarted due to the inability to export this excess product to overseas markets. During the initial months of recovery after the 2004 disease outbreak, the processors were unable to produce export product and the resulting glut in dark meat caused a collapse in the BC domestic wholesale market for dark meat. This market immediately recovered when BC processors were permitted to re-enter the export market. If exports were discontinued in the future, BC processors would again be faced with this dilemma, and more than likely would need to reduce the amount of domestic production grown to rebalance their domestic marketplace production.

2) Subsequent to the 2004 disease outbreak, BC's two largest primary processors built operations in Alberta and Saskatchewan, in large part, to reduce their future exposure to further disease outbreaks in BC. They have also shifted some of their export production from BC to these provinces, with the resulting loss of production in BC totalling approximately 4 to 5%. While the white meat from the prairie export production continues to be sold to the further processing sector in BC, it is at an increased cost due to the requirement of shipping the product to BC. Further compromises in the ability of BC primary processors to supply further processors in BC, may lead to a shift of capital from BC to the prairie provinces in the further processing industry, similar to that recently experienced in the primary processing sector.

One other major and ongoing challenge for the processing sector is restoring confidence with their national buyers. They are under strong pressure to provide evidence that the poultry products produced in BC are safe, and that the products are produced under biosecure conditions. Retailers, distributors and large retail chains have increased the level of assurance BC processors must provide with respect to disease control and prevention in order to continue doing business with them. This level far exceeds the requirements placed on processors operating in other jurisdictions. This difference in requirements is due to the two recent AI incidents encountered in BC. Should the BC industry fail to provide these types of assurances, and further outbreaks occur, these large buyers will shift their purchasing to other jurisdictions in the future.

The major primary processors in BC are integrated into the hatchery business and hence closures of the hatcheries compounded their financial losses. Employment plummeted in the BC hatching and poultry service industries (ex. catching, vaccinating) during the 2004 outbreak.

Two feedmills shut down in BC in 2004 and feed losses were non-compensatable. Feedmills struggled to maintain highly skilled staff like those running the pelleting mills. Many of these workers were trained by

experience and would have been difficult to replace if lost. As a result, many of these skilled employees were maintained on payroll during the downtime. Equipment suppliers reported that they had lost knowledgeable installation staff to the construction trade and these people did not return after the outbreak.

Future Animal Health Risk Costs And Impacts

Animal disease risk has significant economic consequences. A fundamental issue in the development of an animal health risk mitigation strategy for the BC poultry industry is to assess the magnitude of economic and financial risk the industry may be facing. That is the purpose of this section.

Two critical questions are posed for the poultry industry that are the basis of the economic analysis and used for developing a rationale for the implementation of a proactive risk management strategy:

- What could be the long term economic and financial impacts and costs to the sector of continued animal health disease outbreaks?
- What would be the benefit to the sector of being able to reduce or mitigate future animal health disease outbreaks?

Serecon has developed a simulation model to evaluate three different futures the BC poultry industry could face. These three "futures" are defined below.

- **Healthy Future**: The industry does not face any future significant animal health outbreaks over the next ten years. There would be no high pathogenic virus outbreak, and likely no or inconsequential low pathogenic virus outbreak. There would only be very sporadic low risk animal disease issues faced by the industry, paralleling the industries animal health history between 1993 and 2003
- **Low Path Future**[7]: Continued low pathogenic virus outbreaks of a relatively infrequent basis over the next ten years. This future scenario would reflect the more limited rates of growth that the industry has experienced since 2004, but no future High Path outbreaks are expected to occur.
- **High Path Future**: The industry continues to be exposed to recurring High Path animal disease outbreaks.

Model Design And Assumptions

The economic model and analysis was developed using the following structure and assumptions.

- A ten year projection period was utilized, beginning in 2005, given the availability of data to establish a solid beginning period benchmark.
- The model included farm gate, value added processing, domestic consumption, exports, and investment projections for the industry.

[7] The generally accepted abbreviations of Low Path and High Path, are used to represent the more scientific low and high pathogenic virus outbreak terminology.

- The basis of estimating economic consequences was based on future growth rates for the three industry futures. The healthy industry is expected to be one that grows at the rate of growth in the industry just prior to the 2004 outbreak. The Low Path future is a growth rate reflective of the industry since 2004 and the High Path rate reflects a declining growth rate of -2.0% per year. It is important to recognize that under a high path scenario where High Path AI strikes the industry every two or three years that the decline will not be a 2% straight line decline. It is more likely that the decline will be a stair-step decline, with severe and immediate impacts on cash flow. With each decline the recovery will be slower, the down step deeper and more protracted, as the consumers and international buyers lose confidence in the ability of the industry to control zoonotic diseases such as certain specific strains of Avian Influenza. The graphs represent trend lines and the important item to note is the difference between the healthy industry growth in value and the unhealthy industry growth in value over the decade, rather than the actual pattern of decline.
- All financial and economic values represented in the analysis are expressed in real terms. The future level of revenue, investment, and exports, are adjusted for inflation at a rate of 2.5%.
- Exports are reflected differently in each scenario. In the healthy future, the level of exports are eventually restored to the level they were prior to the 2004 AI outbreak (approximately $22 million per year) and then grow at the rate of expected industry growth. In the Low Path future, exports do not reach the pre-2004 level, but do recover to about one-half this level. In the High Path future, the BC poultry industry essentially loses its export potential.
- BC domestic consumption in this model and analysis are defined at the final level of sales from the value added processing sector, adjusted for a retail margin of 35%, and adjusted for the amount of product which is exported, if any.
- Secondary industry impacts are estimated, using historical industry multipliers established by the BC government for this industry.
- Investment levels in the primary and secondary industry have been estimated. Based on current industry analysis from cost of production studies, investment per bird (excluding land) have been acquired. Based on revenue per kilogram of product sold, the level of sales per bird have been estimated. This “investment to sales multiplier” allows for a dynamic representation of changes in investment as the industry grows or consolidates. This investment multiplier for the primary sector was found to be 4.0 ($4 of investment for a dollar of farm sales). A crude investment multiplier of 5.0 was used for the processing sector. These are crude measuring tools. The way they are used in the analysis is to represent changes in investment, and as such the absolute level of the investment multiplier is not as important as the change between periods or future scenarios.

Economic Results

Revenue, Consumption and Export Impacts

Table 3 summarizes the impacts on exports, BC domestic consumption, and revenue for the primary production sector, value added sector, and related impact sectors. Figures 3, 4, 5 and 6 illustrate the ten year growth trends of these economic variables.

Referring to Table 3, the focus of this analysis is to illustrate the relative impact of either a low or High Path animal disease future, from that of a healthy industry. The shaded column in the table represents the ten year cumulative economic contribution that this industry is expected to make if it remains healthy and continues to grow at the per 2004 growth rates.

Exports: If healthy, the industry is expected to export $220 million of product to both international markets and other provinces over the ten years 2005 to 2015. Under the Low Path future, these exports are expected to be reduced by $110 million, or 50%. Under a High Path future, exports are expected to drop to almost zero, or by 93%.

BC domestic consumption: The BC domestic consumption is expected to total over $13 billion in retail and food service sales over the next ten years if the industry remains healthy. Under the Low Path future, domestic consumption is expected to fall by 13% or by $1.7 billion from the healthy future over this period. This fall in consumption is expected to be mainly due to reduced production capacity, and only marginally due to a drop in consumer confidence. For the High Path future, domestic consumption is expected to fall much more significantly, by 20% or $2.6 billion relative to the healthy industry future. Under this scenario, the recurring High Path outbreaks are expected to undermine consumer confidence in BC produced poultry products. This loss in market, coupled with reduced production capacity, reduce significantly the supply capability and consumer confidence in the industry.

Value added processing: Under a healthy future, primary and secondary value added is expected to contribute an additional $5.3 billion in value to the BC economy. Under a Low Path future, this capacity is expected to be reduced by $700 million over the ten year period or by 14%. Under a High Path future, there is expected to be significant changes in the value added processing industry, with a reduction in output of $1.1 billion, or by 21%. This will likely result in the continued strategic geographic investment by the major processing companies to other provinces.

Primary sector sales: Primary sector sales, under a healthy industry are expected to contribute $4.9 billion in revenue. Under a Low Path future, these sales would reduce by $620 million or 14%. Under a High Path future, farm level sales would fall by about $1 billion, or 21 %.

Multiplier impacts: The impacts on other sectors in the BC economy and allied industries is expected to be in the range of $8 billion for a healthy industry. Under a Low Path future this value would decline by $1.1 billion, and by $1.8 under a High Path future

In summary, the total impacts of future animals disease risks on the BC primary and secondary sectors (excluding domestic consumption and exports) are expected to result in losses between $1.3 and $2.1 billion over the next ten years if the industry is not healthy, and follows a Low Path or High Path disease management future respectively.

Including the broader impacts on allied and related industries, the total economic loss over ten years of a Low Path future is expected to be $2.4 billion, and $3.9 billion for a High Path future.

Figures 3, 4 and 5 illustrate the cumulative impacts on the different sectors relative to the current (2005) level of economic activity.

Table 3: Impacts on Exports, Consumption, Farm Gate and Processing Revenue

	Cumulative 10 Year Impacts ($ millions)			Animal Disease Impact ($ m)		Animal Disease Impact (%)	
	Healthy	Low Path	High Path	Low Path	High Path	Low Path	High Path
Exports	**220**	110	15	110	205	50%	93%
BC Domestic Consumption	**13,037**	11,356	10,402	1,681	2,635	13%	20%
Sales of Final Products	**9,820**	8,493	7,716	1,327	2,103	14%	21%
Value Added Processing	**5,233**	4,526	4,112	707	1,121	14%	21%
Farm Gate Sales	**4,586**	3,967	3,604	620	982	14%	21%
Multiplier Impacts	**8,255**	7,141	6,487	1,114	1,768	13%	21%
Total Impact, Primary and Secondary	**18,075**	14,983	14,204	2,441	3,872	14%	21%

Figure 3: Cumulative Production Sector Impacts, Alternative Health Futures (BC Industry)

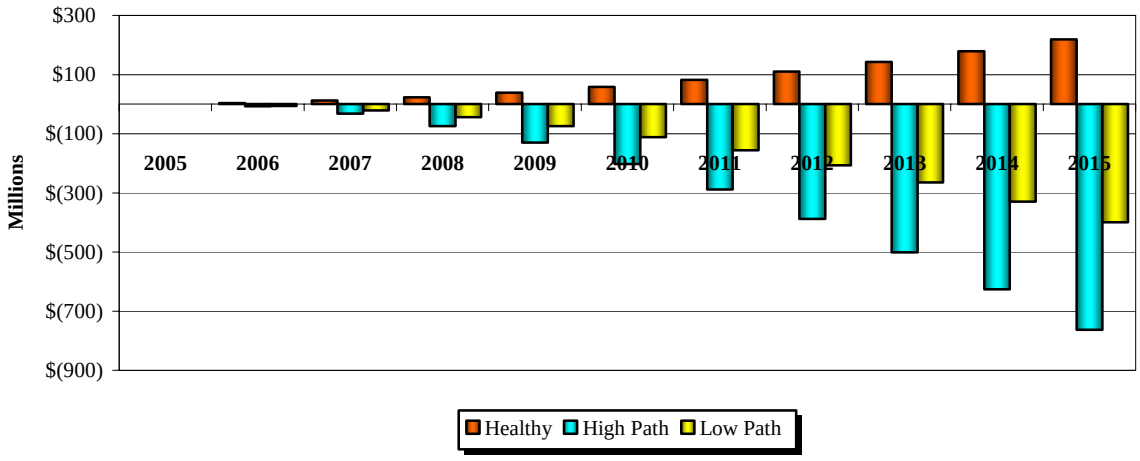


Figure 4: Cumulative Value Added Industry Impacts, Alternative Health Futures (BC Industry)

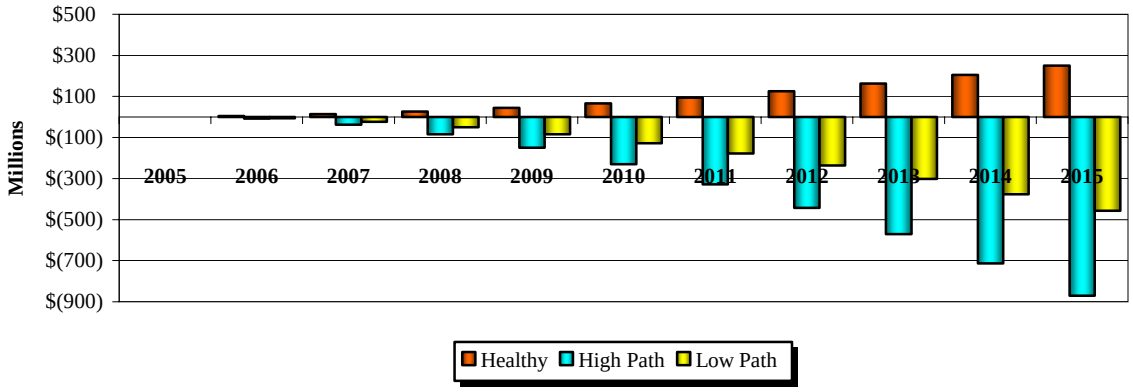


Figure 5: Cumulative Consumption Impacts for Alternative Animal Health Futures (BC Industry)

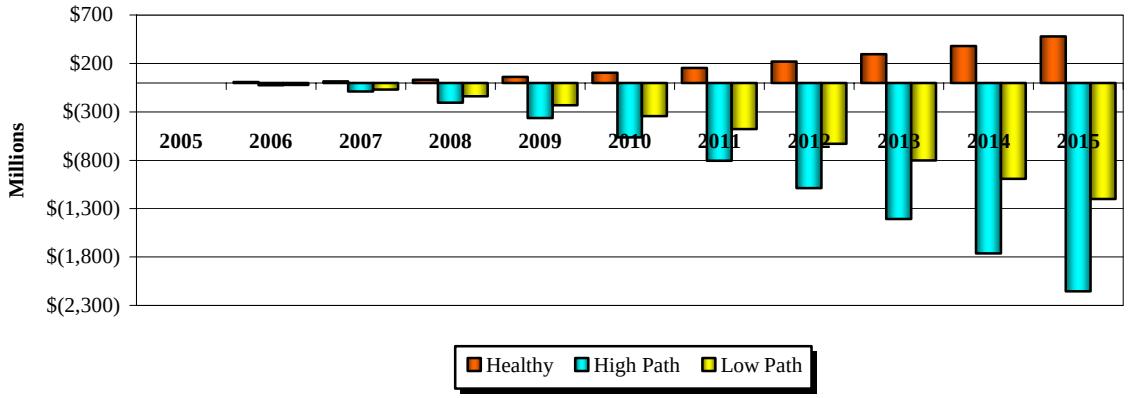
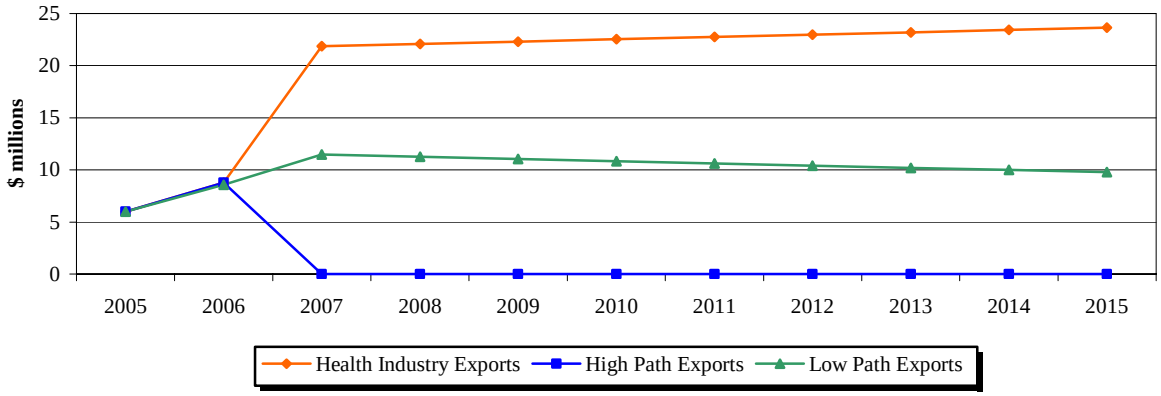


Figure 6: BC Poultry Industry Projected Export Sales, Real Values



Investment Impacts

The investment impacts to the BC poultry are summarized in Table 4 below for the three different possible animal health futures.

Investment impacts are measured on a balance sheet basis, showing changes in the total investment in the primary and secondary sector from its current estimated investment level in 2005, and where the industry may be under each of the three future scenarios by 2015.

The estimated investment in 2005 in the primary and secondary poultry industry in BC is estimated at $1.6 and $2.9 billion respectively. These were derived using the investment to sales multipliers based on cost of production studies.

Under a healthy future, this investment is expected to increase by an additional $231 million in the value added processing sector, and by $162 million in the primary sector over the ten year projection period. Under a Low Path future, investment in the primary and value added processing sector will decline by $284 and $405 million respectively. Under a High Path future, the reduction in investment will be 35% from current levels, in amounts of between $500 and $800 million for the primary and secondary sector respectively.

Any future in which the BC poultry industry is continually plagued with animal health disease outbreaks of either a low or High Path nature will result in a contraction of investment within the industry, either through an exiting of primary operators through the lack of economic growth opportunities, bankruptcies, or the reallocation of investment to other geographic locations, likely outside the province.

Table 4: Impacts of Animals Health Disease Risk in Investment

	Poultry Industry Balance Sheet ($ millions)				Change in Investment ($ millions)			Change In Investment (%)		
	2005	Healthy, 2015	Low Path, 2015	High Path, 2015	Healthy	Low Path	High Path	Healthy	Low Path	High Path
Primary Sector Investment	1,588	1,750	1,304	1,039	162	(284)	(549)	10%	-18%	-35%
Secondary Sector Investment	2,265	2,496	1,860	1,483	231	(405)	(782)	10%	-18%	-35%

CONSULTATION FINDINGS

A substantial number of industry consultations have been completed. As of December 30, 2006, approximately 50 individuals within the industry have been consulted. These consultations have been mostly within small groups of two to five segregated by industry sub-sector, and have reflected most segments within the poultry industry.

The major groups and industry sectors consulted with include:

- Marketing board managers
- Marketing board chairs
- Speciality bird representatives
- Chicken growers
- Broiler producers
- Egg producers
- Turkey producers and processors
- Broiler hatching egg producers
- Provincial vets
- Provincial government representatives
- Private vets
- CFIA
- Major processors, and
- Speciality bird processors.

The results of these consultations have been organized in three major ways. First, the main industry findings have been classified with respect to issues and comments at each level on the industry value chain, and with respect to a structural and disease management continuum. These findings are presented in Appendix A, Table A-1.

Based on this analysis and the industry consultations, a series of draft poultry industry risk factors have been identified. The risk factors which have been identified by industry and secondary research are presented in Table 5. For each risk factor a definition or explanation of the risk is given.

In Appendix A, Table A-2, the industry comments given with respect to each of these risk factors are summarized.

Table 5: Identification and Description of Major Poultry Risk Factors	
Risk Factor	**Risk Factor Description**
Industry Concentration	The density of agricultural industry production and processing within the Fraser Valley, defined in terms of number of poultry premises, other livestock operations, and non-livestock operations, and the proximity between agricultural enterprises, and urban development
Network Integration	The degree to which certain production systems are networked through ownership or supply chains, from input supply, to final processing, marketing and distribution
Production Unit Concentration (proximity)	The farm building site layout, barn proximity, distance between adjoining premise barns, location of intake and outtake fans, etc.
Non-regulated Poultry Practices	The potential contribution to disease risk of poultry production practices that are non-regulated, which may generally apply to speciality flocks, backyard flocks, some organic and free range operations
Business Activity Intensity	Any and all physical and other movement of people, equipment, materials, supplies, pallets, vehicles, feed, products, bedding materials, on and off farm premises
Manure Management	The current deficiencies in how manure is stored, disposed of, and transported both in normal times, and during an outbreak. Includes growing resistance by other regions of the province to manure transported out of the Fraser Valley.
Poultry Catching System	The use of low paid, unregulated workers to catch birds, without proper biosecurity controls, and constantly changing workers
Service Suppliers	The risk related to actions of bedding suppliers, other supplies, feed trucks, cleanup services, etc. This risk involve the possible virus transmission by people and equipment between premises.
Effectiveness of On-farm Biosecurity System	The extent to which the existing and proposed biosecurity system lacks compliance with all acceptable biosecurity hazards, is not inclusive of the complete supply chain, or allows exceptions with respect to unregulated poultry production
Surveillance Program	The reliance on a passive surveillance system and lack of an active surveillance program targeting on testing for specific diseases, weakens detection and response capability Concern of impact of Low Pathogenic surveillance, resulting in continued lockdowns and reduced consumer confidence
Recognition of Risk Problem, and Common Objectives	There is a risk to the industry with respect to the full and common understanding of the potential risks facing the industry, and working in a common way to resolving this risk. There is conflicting ideas and buy-in to the solution
Compensation	Currently the movement toward an active surveillance program is being slowed down as there is deemed by industry the necessity for a compensation plan to be in place in advance
Sale of Eggs, and Other Poultry Products Outside the Regulated Market System	Currently there is a practice with a portion of the industry with respect to the sale of eggs to individuals and end users without going through the regulated market.
Degree of Cooperation Between Different Levels Within the Industry	There exists a certain level of conflict, activities at cross purposes, authority and responsibility being miss-aligned between CFIA, provincial government authorities, private vets, and the production sector. As well certain conflicts exist between the regulated and non-regulated sectors

Table 5: Identification and Description of Major Poultry Risk Factors	
Risk Factor	**Risk Factor Description**
Migratory, and Wild Bird Populations	There is the risk that the continued presence of wild birds, and of migratory birds as animal disease vectors
Rural-urban Conflicts Externalities of poultry industry on urban environment	The concentration and growth of the livestock industry in close proximity to urban centers is developing the potential for major conflicts with respect to land usage, air, water and soil pollution, restrictions on recreation and urban transportation uses, perceptions of human health risks, competition for resources, and individual safety
Mixed Species Poultry Operations	Potential risk related to individual premises housing multiple bird species
All-in, All out, Versus Multi-age Flocks	Relative risk of disease prevention and control between operations that practice all-in, all-out, and of multi-age production management systems
Market Risk	The potential banning from export markets in event of outbreak, as currently exists in some markets due to 2004 outbreak, loss of consumer confidence in poultry products, loss of markets due to other provincial or other supply, loss of processing capacity, and related infrastructure, in event of outbreak
Human Health Risk	The perceived or real risk to human health from the transference of animal disease virus and bacteria, etc., to humans
Disease Outbreak Response Risk	The relative effectiveness of the industry, the federal and provincial governments having effective, responsive, and cooperative response protocols, and communication systems and procedures in place, in advance of next outbreak
Integration and Concentration of Multi Enterprise Agricultural Operations	The potential risk due to the close proximity between poultry, other livestock and other fruit and greenhouse operations
Risk of Loss of Breeding and Genetic Stock Capacity	The potential loss of breeding stock in event of depopulation, restriction on the importing of breeding stock due to ban or competitive actions of suppliers
Government Policy Conflicts	Possible risks due to government policies in agricultural and other sectors, such as encouragement of small unregulated farm enterprises, tax policies that provide property tax advantages if minimum level of farm income generated, etc.
Reduced Genetic Diversity	The potential for greater exposure to animal health diseases due to reduced number of genetic strains or breeds
Public Perceptions and Awareness	The risk of public perception being different from reality and the lack of education with respect to agriculture and food production
Uncertainty of Disease Origin, and Transmission Vectors	The uncertainty that exists on the source of the previous AI outbreaks, how the disease is transmitted can lead to adverse management behaviour, emphasis on the prevention measures that may not be important, and conflict between policies
Cease Movement Risk	The risks and costs associated with the imposition of a cease movement on input supply and product marketing
By-product and Mortality Risk	The potential risks due to methods by which by-products and mortalities are disposed of, or transported on and off-farm premises

Table 5: Identification and Description of Major Poultry Risk Factors	
Risk Factor	**Risk Factor Description**
Loss of Processing Capacity	The continued transfer of processing capacity to other geographic locations by processors, as a risk management strategy
Disease Control Mechanisms	Possible risks that may be incurred due to how chemical disinfectants and other materials are used and applied, related to lack of knowledge and experience
Recovery Period Risks	The risks that all agents within the poultry industry supply chain have during the post outbreak period, due to financial risks, uncertainty of re-stocking birds, supplies, labour, etc.

Summary Comments

The consultations resulted in a wide number of potential risk factors. Not all are of equal weight. In terms of the risk factors that were identified by industry the most frequently, and which appear to be of the highest priority in the minds of industry, include the following (in no particular order):

Table 6: Major Risk Factors as Identified in Consultation Process

Risk Factor	Risk Factor Description
Industry Concentration	The density of agricultural industry production and processing within the Fraser Valley, defined in terms of number of poultry premises, other livestock operations, and non-livestock operations, and the proximity between agricultural enterprises, and urban development
Business Activity Intensity	Any and all physical and other movement of people, equipment, materials, supplies, pallets, vehicles, feed, products, bedding materials, on and off farm premises. This risk includes bird catcher and other service provider activities within the industry
Manure Management	The current deficiencies in how manure is stored, disposed of, and transported both in normal times, and during an outbreak. Includes growing resistance by other regions of the province to manure transported out of the Fraser Valley
Effectiveness of On-Farm Biosecurity System	The extent to which the existing and proposed biosecurity system lacks compliance with all acceptable biosecurity hazards, is not inclusive of the complete supply chain, or allows exceptions with respect to unregulated poultry production
Surveillance Program	The reliance on a passive surveillance system and lack of an active surveillance program targeting on testing for specific diseases, weakens detection and response capability. This risk factor is related to the absence of either a low or high pathogenic surveillance system. Concern of impact of Low Pathogenic surveillance, resulting in continued lockdowns and reduced consumer confidence
Compensation	Currently the movement toward an active surveillance program is being slowed down as there is deemed by industry the necessity for a compensation plan to be in place in advance
Mixed Species Poultry Operations	Potential risk related to individual premises housing multiple bird species
All-in, All out, Versus Multi-age Flocks	Relative risk of disease prevention and control between operations that practice all-in, all-out, and of multi-age production management systems
Market Risk	The potential banning from export markets in event of outbreak, as currently exists in some markets due to 2004 outbreak, loss of consumer confidence in poultry products, loss of markets due to other provincial or other supply, loss of processing capacity, and related infrastructure, in event of outbreak
Cease Movement Risk	The risks and costs associated with the imposition of a cease movement on input supply and product marketing

The second group of risks considered still important, but not as frequently mentioned, include the following:

Table 7: Identification and Description of Secondary Poultry Risk Factors by Industry

Risk Factor	Risk Factor Description
Degree of Economic Integration	The degree to which certain production systems are networked through ownership or supply chains, from input supply, to final processing, marketing and distribution
Non-regulated Poultry Practices	The potential contribution to disease risk of poultry production practices that are non-regulated, which may generally apply to speciality flocks, backyard flocks, organic and free range operations need to describe the actual risk factors-is it non confinement, mixed species?
Effectiveness of On-Farm Biosecurity System	The extent to which the existing and proposed biosecurity system lacks compliance with all acceptable biosecurity hazards, is not inclusive of the complete supply chain, or allows exceptions with respect to unregulated poultry production
Recognition of Risk Problem, and Common Objectives	There is a risk to the industry with respect to the full and common understanding of the potential risks facing the industry, and working in a common way to resolving this risk. There is conflicting ideas and buy-in to the solution, between government and industry.
Sale of Eggs, and Other Poultry Products Outside the Regulated Market System	Currently there is a practice within a portion of the industry with respect to the sale of eggs to individuals and end users without going through the regulated market
Migratory, and Wild Bird Populations	There is the risk that the continued presence of wild birds, and of migratory birds as animal disease vectors
Loss of Processing Capacity	The continued transfer of processing capacity to other geographic locations by processors, as a risk management strategy

Initial Gap Analysis

Based on the industry consultations, a preliminary gap analysis has been completed, limited to the more frequently mentioned risks. In the next phases of this project, a more extensive gap analysis will be completed based on a more extensive review of mitigation programs in place or planned.

In Table 8, gaps are defined as major, intermediate, or minor. A major gap implies that there are no current activities underway, either by government or industry to be proactively dealing with the risk factor. An intermediate gap exists where there is a common recognition of the gap, the need to mitigate it, and some effort is underway to deal with this gap. A minor gap infers that this risk factor is now being dealt with, and this risk is well on the way to being mitigated.

Table 8: Poultry Risk Factors Gap Analysis

Risk factor	Existing Mitigation Programs	Potential Gaps, Comments
Concentration of the industry	Limited regulatory restrictions on production, facility sighting	Major gap Alternatives offered within the consultations included clustering policies, separation of breeding and hatching operations from growing operations, increased regulation
Manure management	Number of initiatives and programs either under consideration or planning, some policies in place to limit time of spreading	Are growing concerns, this is a major area of risk concern, and significant gaps exist in management program. Bio-security protocols do not cover this area
Mixed poultry species	No control or regulations in place to limit mixed poultry species within a premise, or proximity to each other	Major gap
Degree of business intensity	Current bio-security program can go a major distance if effective to control this risk, many aspects of intensity not fully recognized	Not a major gap – is recognized by most as a major concern to be dealt with
Compensation	Outstanding issue that is some distance from being resolved	Major gap Recognition of role of industry, insurance and government are necessary
Lack of proactive surveillance system either for low or high pathogenic testing	Strong commitment from CFIA and province to see active surveillance system in place – push back from industry due to compensation issue. Mixed views on value of Low Path surveillance – is a scientific basis to it, but perceived to have impact on industry economic viability	Major gap
Multi-age, long life flocks	Limited alternatives for major part of industry. Strong bio-security systems will help to mitigate this risk	Minor gap
Disposal risk	Significant concerns and lack of viable options for bird, and risk material disposal at this time	Major gap
Cease movement risk	Cease movement restrictions will intensify under a Low Path surveillance system	Major gap
Market risk	Continued outbreaks or shut downs will impact on industry viability, consumer confidence, export markets	Intermediate/high gap

Risk Classification And Ranking

Risk Classification

The risk factors have been categorized on the basis of two dimensions. The first is that of the risk management continuum (prevention, early detection, elimination and control, and recovery). This section classification within the disease management continuum is between infrastructural risk factors, and risk factors that could be considered management factors.

Table 9: Risk Classification

Disease Management Continuum	Risk Categories	
	Infrastructure and Policy Risk	**Management and Operational Practices Risk**
Prevention	➡ Industry concentration ➡ Degree of cooperation between different levels in the industry ➡ Migratory and wild bird populations ➡ Urban-rural conflicts ➡ Integration and concentration of multi-enterprise agricultural operations ➡ Proximity of barns, premises ➡ Government policy conflicts ➡ Public perceptions and awareness	➡ Business activity intensity ➡ Manure management ➡ Poultry catching management ➡ On-farm bio-security systems ➡ Recognition of risk problems and common objectives ➡ Mixed species poultry operations ➡ All-in, all-out versus multi-age flocks ➡ Reduced genetic diversity ➡ By-product and mortality risks ➡ Disease control mechanisms ➡ Sale of eggs and other poultry products outside of regulated market system
Early Detection	➡ Compensation ➡ Surveillance systems ➡ Uncertainty of disease origin and transmission vectors	
Elimination and Control	➡ Network integration ➡ Production unit concentration ➡ Disease outbreak response risk	
Recovery	➡ Market risk ➡ Cease movement risk ➡ Loss of processing capacity	➡ Human health risk ➡ Risk of loss of genetic stock capacity ➡ Recovery period risks

Risk Ranking

To develop an objective risk ranking and assessment approach,, Serecon Management Consulting Inc. has developed a risk ranking decision tool. As well, Serecon has undertaken a somewhat subjective ranking based on the impressions it received from the consultations, and from the secondary research completed with respect to other jurisdictions.

Table 10 extracts the primary and secondary risk factors identified in the above section, and for each, provides a suggested ranking of this risk factor from the following perspectives:

- a ranking of the risk of this factor (Column 1),
- a ranking of the anticipated economic impact of the risk factor, if it is not resolved (Column 2),

- a ranking of the potential practical structural or management mitigation options that would be available to mitigate this risk, and
- the aggregate importance of this risk factor to be included in the industry risk management strategy. This is the sum of the rankings of the dimensions of risk management given in Columns 1, 2 and 3.

All factors are ranked in the same way, from 1 to 5, with 1 implying little significance, to 5 being very significant. The higher the aggregate ranking in Column 4, the more likely this risk factor should be included in the further steps in this risk analysis.

The highest ranking score that could result from this system is fifteen. This implies the risk is very significant, its economic impact is very high, but at the same time, there are potentially very viable options for mitigation. This is a risk factor that goes to the top of the list in terms of inclusion in a risk management strategy for the BC poultry industry.

A decision-making tool would result from the use of this ranking grid. Those risk factors that result in an aggregate importance ranking of 12 or greater would be of the highest priority.

Table 10 provides a representation of the rankings Serecon Management Consulting Inc. has given these risk factors, based on its experiences in the consultations, and from the secondary research that has been completed.

Table 10: Economic Impact and Subjective Ranking of the Major Risk Factors (Serecon)

Risk Factor	Risk Ranking (1)	Anticipated Economic Impact (2)	Practicality for Mitigation (3)	Aggregate Importance Ranking (4)
1. **Concentration of the industry**, in particular, the degree to which buildings and premises are in proximity to each other	5	5	2	12
2. **Manure management** : the storage, removal and disposal of manure in ways that contribute to disease spread	5	3	5	13
3. **The mixing of poultry species,** either within one farm premise, and/or in close proximity to other premises	4	3	3	10
4. **The degree of business intensity,** reflecting the frequency of any and all business activities that involve movement onto and off the premise, inclusive of all supply and service functions, cleaning, catching, etc.	5	4	5	14
5. **Compensation issues**, that if not resolved, restrict the movement toward a proactive surveillance system	3	2	3	8
6. **Lack of a proactive surveillance system**	5	4	4	13
7. **Multi-age, and long life poultry managemen**t, versus all-in, all-out production practices	4	3	5	12

Table 10: Economic Impact and Subjective Ranking of the Major Risk Factors (Serecon)				
Risk Factor	**Risk Ranking (1)**	**Anticipated Economic Impact (2)**	**Practicality for Mitigation (3)**	**Aggregate Importance Ranking (4)**
8. **Disposal risk** of depopulated, diseased birds either in peace time, or within an outbreak	3	3	5	11
9. **Cease movement risk,** the economic costs associated by producers within a control zone during a lockdown period	3	3	2	8
10. **Market risk,** particularly as related to the potential loss of consumer confidence due to continued disease outbreaks or temporary lockdowns within a surveillance program, and loss of export markets for poultry products	5	5	3	13
11. **Degree of economic integration** or networking between premises due to ownership or supply chain linkages	3	3	2	8
12. **Unregulated sale of eggs** and other products outside of grading or market system	3	3	4	10
13. **Non-regulated poultry management practices**	4	5	5	14
14. **Loss of processing capacity,** the potential to see major processors diversify geographically, if disease outbreaks continue in BC	5	5	4	14
15. **Lack of government –industry cooperation,** the degree to which there are conflicts between different industry segments and between industry and government on surveillance, compensation, and other issues	3	3	2	8
16. **Limitation of biosecurity program** in not extending to all sectors in the poultry industry	5	5	5	15
17. **Migratory and wild bird** populations	3	3	2	8

Risk Factors Identified By RASC

The Risk Assessment Steering Committee, has undertaken a ranking of all the identified risk factors using the risk ranking guide. Each of the members of the Risk Assessment Steering Committee independently evaluated the risk factors, then the results were summarized to identify eight priority risk factors, by consensus. RASC attempted to include in the risk list some source risk factors or what might be termed causal risk factors. By mitigating some causal risk factors, some of the more minor downstream risk factors cease to exist. Some risk factors were seen to fall under the same category and were pooled. The results of the RASC analysis is shown in Table A-3 in Appendix A. As a result of this analysis, the following risk factors were all ranked extremely high. This list of the major risk factors to be further evaluated and included in this industry risk assessment follow. They are in no particular order of importance.

1. **Lack of proactive surveillance system**
2. **Limitations of biosecurity programs** and not extending to all sectors in the poultry industry
3. **Market risk**. particularly as related to the potential loss of consumer confidence due to continued disease outbreaks or temporary lockdowns within a surveillance program, and loss of export markets for poultry products
4. **Concentration of industry**, in particular, the degree to which buildings and premises are in proximity to each other
5. **Degree of business intensity**, reflecting the frequency of any and all business activities that involve movement onto and off the premise, inclusive of all supply and service functions, cleaning, catching, etc.
6. **Compensation issues,** a lack of a compensation program in place to support part of the costs of future disease outbreaks; if not resolved may restrict movement toward proactive surveillance system
7. **Manure management,** the storage, removal and disposal of manure in ways that contribute to disease spread
8. **Disposal risk** of depopulated, diseased birds either in peace time, or within an outbreak, without proper controlled methods

It is important to note that while these eight risk factors were identified as most important by RASC, a significant number of other risk factors were found worthy of consideration within the list of seventeen summarized by Serecon (see Table A-3 in Appendix A) and should not be ignored by stakeholders. All seventeen factors identified in this list are worthy of stakeholder attention and implementation of some level of mitigating action by stakeholders. This risk analysis has been narrowed to major risk factors so as to ensure a comprehensive analysis of critical risk factors and sufficient attention to developing mitigating options for the major risk factors.

Next Steps

The next steps in the project include the following.

1. For the identified eight major risk factors, undertake an extensive gap analysis, identifying what practices, actions and policies are in place or planned to mitigate these risks, and to identify the major gaps facing the industry.
2. For each identified risk factor, develop a list of possible mitigation options. This will include the alternatives for structural changes, policy and legislative changes, change in management practices, insurance options, etc.
3. These gaps and mitigation options are then reviewed by RASC. From this review, the most important mitigation option(s) to be analysed for each risk factor is selected.
4. Of the selected mitigation option, a cost benefit analysis is then completed to determine what the costs will be for the industry to reduce this risk, and what benefit, or reduction in risk cost will the mitigation of this risk using this option achieve.
5. The final major steps will then be to develop a series of recommendations and actions to be taken by the industry which will provide the stakeholders with a short, intermediate, and long term risk management strategic plan.

Appendix A

Consultation Results

Table A-1: Foreign Animal Disease Management Continuum Focus Group Comments

Poultry Industry Supply Chain	Industry Structural Risks and Issues	Preparedness Risk and Issues	Emergency Response Risk and Issues	Recovery Risk and Issues
Policy and Regulatory Environment	➡ Policy toward encouraging small farm holdings ➡ Policy toward allowing unregulated flocks (small flocks) ➡ Policy toward allowing unregulated activities (back door egg/meat sales) ➡ Continued erosion of ALR base to meet industrial, commercial and residential demands ➡ Limited regulation on agricultural building density ➡ Land use planning – setbacks and agricultural zoning not necessarily based on biosecurity considerations ➡ Political desire to see density of industry reduced ➡ Does ALR contribute to or reduce industry concentration? ➡ Does the ALR designation obstruct initiatives to improve industry preparedness? ➡ Urban-rural interface major issue ➡ Agricultural impact on air, water, noise, odour ➡ Highways pass through valley, no way to pass through without going directly by farm ➡ Industry integration major risk – creates a network for spread ➡ Issues of cooperation between provincial vets and industry ➡ Biosecurity being driven by industry and resisting cross-compliant biosecurity measures ➡ Surveillance driven by industry and resisting program, unless compensation is provided ➡ Poultry industry is creating biosecurity externalities and economic implications that cannot be financed by the industry Is this industry or OIE policy ➡ Grower view – society should pay for the level of biosecurity it insists the production sector should have	➡ Focus on Low Pathogen surveillance has potential for more industry shutdowns ➡ Confusion on disease causing agents (we know what causes the diseases, is clarification needed here. ➡ Ability to detect disease is weak, lack of cooperation between government and industry please clarify ➡ Treat if only economic and available?? clarify ➡ Resistance to surveillance- suggested huge risk of industry ➡ Compartmentalization of disease information ➡ Zoning versus network – fallacy? Clarify the term fallacy ➡ Passive surveillance versus active for specific disease ➡ Lack of understanding on disease cause, transmission ➡ Little appetite within the grower sectors to alter predisposition factors that could reduce industry risk exposure, because of economic, financial and regulatory implications ➡ Grower sectors favour on-farm production unit isolation approach to avoiding disease introduction on farms ➡ Proximity of barns, is more of a risk factor than density within a barn or area	➡ CFIA response managed by Ottawa ➡ Previous slow response appeared to contribute to spread of disease ➡ CFIA now better prepared for new outbreak ➡ Large appetite among growers to contain outbreaks quickly on farms ➡ Is response capability and the communication and cooperation protocols in place? ➡ Long cycle birds are more at risk than short cycle birds ➡ There is not an alignment between federal and provincial reportable diseases	➡ Limited or no involvement

Table A-1: Foreign Animal Disease Management Continuum Focus Group Comments

Poultry Industry Supply Chain	Industry Structural Risks and Issues	Preparedness Risk and Issues	Emergency Response Risk and Issues	Recovery Risk and Issues
Supply Sector	➡ Feed industry has dramatically improved practices since last AI ➡ Catchers in particular identified as a risk factor ➡ Integrated operations create different risk vectors than non-integrated operations	➡ Little or no change in preparedness-catchers ➡ Catching crews change continually, low paid, unregulated ➡ Catchers considered major risk ➡ Use of wooden pallets viewed as major risk in egg sectors ➡ Risk increases with volume of supply activity of any kind ➡ Weakest link determines level of preparedness ➡ Limited preparedness up and across the supply chain ➡ Critical point made that supply, service activities undertaken at the beginning of the production cycle, are more critical from a risk perspective, than activities at the end of the production cycle	➡ Size and location of control zone in event of outbreak will break supply ➡ Supply industry not structured to anticipate reaction in event of outbreak What does this mean ➡ Supplies to both poultry and other livestock sectors disrupted	➡ Financial impacts on many suppliers significant
Production Operations	➡ Density of farms is an issue ➡ How defined - # of premises, or birds per area, or barns, or number of operators ➡ Closeness of barns to other barns, and roadways, houses ➡ All in- all out perceived to be lower risk than multi-age flocks ➡ Multi-species on same farm mostly considered a risk issue ➡ Backyard flocks considered by the supply managed sectors to be a risk factor ➡ Concern about trying to decentralize and remain economically viable ➡ Specialty bird operations (ducks, other specialty operations) ➡ Organic, free range, etc. considered by most to be higher risk	➡ Biosecurity first line of defence ➡ Biosecurity has been watered down, weakened ➡ Overlapping of on-farm food safety, biosecurity, high costs ➡ Biosecurity does not apply to non-regulated industries, therefore weakest link ➡ Cross-compliance necessary ➡ Specialty sector does not feel they are at more risk than commercial flocks – each sector has different perception of risk ➡ Much of biosecurity is mandatory, and risk is not applied to non-regulated industries ➡ Manure management growing in awareness, anticipated to become a major FAD risk, and management risk ➡ Lack of treatment of manure before movement	➡ Concern about response capability of CFIA ➡ Can't have risk management program administered by Ottawa ➡ Knee jerk reaction by government to perceived risks is a problem ➡ Limited emergency response articulation in terms of where, when and how the outputs/ by-products of poultry operations go (manure, back door, rodents, mortalities) ➡ Disposal of infected or depopulated birds not yet planned for No they are planned for and functional just not signed off This must be a communication issue ➡ Compensation remains outstanding issue for industry	➡ In event of outbreak, specialty sector more at market risk that other sectors as not regulated ➡ They cannot get breeding stock ➡ Compensation for specialty birds not consistent with higher value ➡ Multi-age flocks and integrated breeder/meat/egg operations suffer impacts that are higher and persist over a longer time frame ➡ Repeated outbreaks have the potential to eliminate multi-age flocks and specialty flocks in the area

Table A-1: Foreign Animal Disease Management Continuum Focus Group Comments

Poultry Industry Supply Chain	Industry Structural Risks and Issues	Preparedness Risk and Issues	Emergency Response Risk and Issues	Recovery Risk and Issues
		➡ Shipment of manure to other regions in BC meeting resistance ➡ Limited preparedness in terms of managing where, when and how the outputs/ by-products of poultry operations go (manure, back door, rodents, mortalities) ➡ Regulatory policy weak at moment ➡ Complex issues – storage, movement, treatment, acceptance by urbans ➡ Frequency of movement in and out of premises is the major risk ➡ Surveillance cannot be applied without compensation in place, too much individual risk, penalty	➡ Current compensation based on replacement value not market value ➡ Particular compensation problems for long life birds (breeders and layers)	
Processing and Distribution	➡ Who pays for changes in distribution and processing protocols ➡ What do processors do when supply is cut off ➡ Where does the industry procure supplies when an outbreak occurs ➡ NAFTA implications ➡ Processors will continue to diversify their processing capacity geographically	➡ How to ensure outbreaks are detected on-farm before anywhere else	➡ How to contain disease on-farm ➡ How to ensure that the safe product supply chain can be segregated from contaminated product in a way that minimizes disruption to the part of the industry that is uncontaminated ➡ During 2004 AI outbreak, processing sector required to step in an assist in clean up, disposal of depopulated birds at own cost ➡ Processing sector does not receive compensation as does the primary sector	➡ Loss of local markets ➡ Loss of export markets ➡ Foregone economic opportunity ➡ Processing sector required to prove quality and safety of the products produced in the BC regions ➡ At risk to losing markets due to continuing perception of disease risk, and inability of industry to made adjustments to reduce risk

Table A-2: Risk Factors, Description, and Industry Comments

Risk Factor	Risk Factor Description	Industry Comments and Input
Industry Concentration	The density of agricultural industry production and processing within the Fraser Valley, defined in terms of number of poultry premises, other livestock operations, and non-livestock operations, and the proximity between agricultural enterprises, and urban development	➡ A recognition of some within the industry that concentration has reached its limit ➡ Differing opinions on whether the number of premises is a risk, or intensity of production on the premise is a measure of risk ➡ Some dissention as to impact of concentration on animal disease risk ➡ General acceptance of need for change ➡ Proximity to blueberry operations being questioned ➡ Any strategy from reduction of industry concentration must reflect economic reality ➡ Unlikely one can do much on existing levels of concentration, but can have policies to reduce for future.
Network Integration	The degree to which certain production systems are networked through ownership or supply chains, from input supply, to final processing, marketing and distribution	➡ Mentioned by a limited number as being a very critical risk factor, and perhaps more important than industry concentration
Production Unit Concentration (proximity)	The farm building site layout, barn proximity, distance between adjoining premise barns, location of intake and outtake fans, etc.	➡ Generally recognized as a significant risk factor ➡ Accepted that industry and government develop regulations for site design
Non-regulated Poultry Practices	The potential contribution to disease risk of poultry production practices that are non-regulated, which may generally apply to speciality flocks, backyard flocks, organic and free range operations need to describe the actual risk factors-is it non confinement, mixed species ?	➡ Is a source of major concern within the regulated poultry industry ➡ The degree to which the non-regulated industry is a risk factor is disputed ➡ Part of unregulated industry feels threat of being controlled, regulated, or eliminated as a means for risk reduction
Business Activity Intensity	Any and all physical and other movement of people, equipment, materials, supplies, pallets, vehicles, feed, products, bedding materials, on and off farm premises	➡ Generally recognized by all that the core way in which a disease may be transmitted, or introduced, is by mechanical or human transfer between premises ➡ Recognized that this is a major part of a biosecurity program ➡ Cannot have exceptions to systems set up to control movements ➡ Currently huge deficiencies in this area of risk ➡ Linkages between biosecurity, on-farm food safety, premises ID, manure management need to be integrated
Manure Management	The current deficiencies in how manure is stored, disposed of, and transported both in normal times, and during an outbreak. Includes growing resistance by other regions of the province to manure transported out of the Fraser Valley.	➡ A growing recognition of manure management as being a critical problem ➡ Current practices, particularly for movement is unacceptable ➡ Growing recognition of environmental impacts and implications ➡ Traditional disposal methods and options are being reduced and may be restricted by environmental regulation ➡ Major growing concerns of other regions in province, including VI, and other areas ➡ Impact on urban environment (odour) becoming significant ➡ Suggestions by some that this will become a major risk and management issue for industry
Poultry Catching System	The use of low paid, unregulated workers to catch birds, without proper biosecurity controls, and constantly changing workers	➡ Widely recognized that this is a significant risk factor ➡ The transition of these workers, impact on finding a solution ➡ Is an end of cycle activity and as such may not be as great a risk

Table A-2: Risk Factors, Description, and Industry Comments

Risk Factor	Risk Factor Description	Industry Comments and Input
Service Suppliers	The risk related to actions of bedding suppliers, other supplies, feed trucks, cleanup services, etc. Clarify the actual risk factor	➡ Bedding is a beginning cycle activity ➡ Other supply of several farms from same truck ➡ 3,000 tonnes of feed delivered every day, or about 120 loads, each going to multiple premises (This is an overstatement)
Effectiveness of On-farm Biosecurity System	The extent to which the existing and proposed biosecurity system lacks compliance with all acceptable biosecurity hazards, is not inclusive of the complete supply chain, or allows exceptions with respect to unregulated poultry production	➡ General recognition that an effective on-farm biosecurity system is needed ➡ Current system under development suggested by some as incomplete, with on-farm food safety system more comprehensive ➡ System will not be effective if not all included ➡ Compliance and independent auditing critical ➡ Must include non-regulated industry ➡ On-farm biosecurity in only part of a biosecurity system and should include the broader value chain
Surveillance Program	The reliance on a passive surveillance system and lack of an active surveillance program targeting on testing for specific diseases, weakens detection and response capability Concern of impact of Low Pathogenic surveillance, resulting in continued lockdowns and reduced consumer confidence	➡ This is one of the more contentious issues within the industry ➡ Most of industry is resistant to any active surveillance system, unless there is a compensation system in place ➡ Significant concern that a pro-active surveillance system is the most important preventative and control measure in addressing animal health diseases ➡ Voluntary or passive disease surveillance activity has dropped off, partially due to concern over potential cost of detection
Recognition of Risk Problem, and Common Objectives	There is a risk to the industry with respect to the full and common understanding of the potential risks facing the industry, and working in a common way to resolving this risk. There is conflicting ideas and buy-in to the solution	
Compensation	Currently the movement toward an active surveillance program is being slowed down as there is deemed by industry the necessity for a compensation plan to be in place in advance	➡ Related to risk of not having a surveillance program ➡ Industry strongly focused on having a compensation program in place
Sale of Eggs, and Other Poultry Products Outside the Regulated Market System	Currently there is a practice with a portion of the industry with respect to the sale of eggs to individuals and end users without going through the regulated market.	➡ Some evidence this practice is continuing, both with table eggs and hatching eggs ➡ Recognized that this practice violates both an effective biosecurity program and likely health regulations ➡ Some possibility this was the source of the 2004 AI outbreak
Degree of Cooperation Between Different Levels Within the Industry	There exists a certain level of conflict, activities at cross purposes, authority and responsibility being miss-aligned between CFIA, provincial government authorities, private vets, and the production sector. As well certain conflicts exist between the regulated and non-regulated sectors	➡ Communication between areas of industry are not in place with respect to animal disease polices and issues ➡ Authority and responsibility between federal and provincial government may not be clear (Is this meaning that industry is unaware of jurisdictions-government employees understand the authorities and jurisdictions? ➡ Potential for growing conflicts between regulated and non- regulated sectors

Table A-2: Risk Factors, Description, and Industry Comments

Risk Factor	Risk Factor Description	Industry Comments and Input
Migratory, and Wild Bird Populations	There is the risk that the continued presence of wild birds, and of migratory birds are animal disease vectors	➡ Arguments remain on the risk due to migratory or wild bird population ➡ Likely a risk. if not of initial contamination, then transmission ➡ Reduced options to control risk
Rural-urban Conflicts Externalities of poultry industry on urban environment	The concentration and growth of the livestock industry in close proximity to the urban centers is developing the potential for major conflicts with respect to land usage, air, water and soil pollution, restrictions on recreation and urban transportation uses, perceptions of human health risks, competition for resources, and individual safety	➡ Concentration and integration between rural and urban environment impacts on efficiency and effectiveness of disease control efforts ➡ Urban perceptions of concentrated production systems on their health and environment ➡ Animal rights issues ➡ Potential contamination of water, soil and air due to concentrated production and close proximity
Mixed Species Poultry Operations	Potential risk related to individual premises housing multiple bird species	➡ Generally perceived that mixed species poultry operations at greater risk ➡ Some arguments that this is not an unmanageable risk and overstated ➡ Impact of issue greater on unregulated poultry operations
All-in, All out, Versus Multi-age Flocks	Relative risk of disease prevention and control between operations that practice all-in, all-out, and of multi-age production management systems	➡ Accepted that all-in, all-out operations are at less risk than multi-age flock operations
Market Risk	The potential banning from export markets in event of outbreak, as currently exists in some markets due to 2004 outbreak, loss of consumer confidence in poultry products, loss of markets due to other provincial or other supply, loss of processing capacity, and related infrastructure, in event of outbreak	➡ Continued animal disease outbreaks have potential to reduce consumer confidence in poultry products, reduce consumption ➡ If continued outbreaks in BC, proportionately to other poultry production areas in Canada, potential isolation of industry and movement of processing capacity elsewhere ➡ Loss of export markets due to trade ban
Human Health Risk	The perceived or real risk to human health from the transference of animal disease virus and bacteria, etc., to humans	➡ Uncertainty of link between animal virus and its possibility to be transmitted to humans ➡ Growing perception of this potential with consumers
Disease Outbreak Response Risk	The relative effectiveness of the industry, the federal and provincial governments having effective, responsive, and cooperative response protocols, and communication systems and procedures in place, in advance of next outbreak	➡ Perception that CFIA is much better prepared for any new major outbreak ➡ Concern that immediate outbreak response decisions still maintained in Ottawa ➡ Significant concern that industry may not be well prepared in event of another outbreak ➡ Gaps exist with respect to an effective and efficient disease response strategy
Integration and Concentration of Multi enterprise Agricultural Operations	The potential risk due to the close proximity between poultry, other livestock and other fruit and greenhouse operations	➡ Likely increased risk due to proximity of other livestock operations ➡ Possible contamination between livestock and other non-livestock operations (fruits, vegetables, greenhouses)
Risk of Loss of Breeding and Genetic Stock Capacity	The potential loss of breeding stock in event of depopulation, restriction on the importing of breeding stock due to ban or competitive actions of suppliers	➡ Risk of loss of genetic capacity, high valued breeding stock ➡ Lack of recognition of value of speciality birds if depopulated ➡ Cut off of replacement breeding stock supply as competitive moves by other jurisdictions
Government Policy Conflicts	Possible risks due to government policies in agricultural and other sectors, such as encouragement of small unregulated farm enterprises, tax policies that provide property tax advantages if minimum level of farm income generated, etc.	➡ Certain government programs and policies contribute to the potential for disease risk ➡ Encouragement of small farms, unregulated poultry operations a potential risk ➡ Tendency for urban population to take advantage of lower agricultural land tax, by establishing small farm operations

Table A-2: Risk Factors, Description, and Industry Comments

Risk Factor	Risk Factor Description	Industry Comments and Input
Reduced Genetic Diversity	The potential for greater exposure to animal health diseases due to reduced number of genetic strains or breeds	➡ Intensive, an d specialized operations have resulted in a reduced number of genetic breeding strains ➡ Arguably, specialty poultry operations have stronger genetic strains, and greater disease resistance ➡ Lack of knowledge on this issue
Public Perceptions and Awareness	The risk of public perception being different from reality and the lack of education with respect to agriculture and food production	➡ Indicated by some, the public perception of the growth and concentration within the poultry industry could be a major risk ➡ Not good communication between agriculture and urban groups
Uncertainty of Disease Origin, and Transmission Vectors	The uncertainty that exists on the source of the previous AI outbreaks, how the disease is transmitted can lead to adverse management behaviour, emphasis on the prevention measures that may not be important, and conflict between policies	➡ No definitive indication of the source of the 2004 outbreak ➡ Alternative theories, ways in which vectors may transmit disease ➡ Argument as to relative risks between unregulated and regulated production
Cease Movement Risk	The risks and costs associated with the imposition of a crease movement on input supply and product marketing	➡ Indicated as being a major risk and cost
By-product and Mortality Risk	The potential risks due to methods by which by-products and mortalities are disposed of, or transported on and off-farm premises	➡ Issues of disposal not yet solved
Loss of Processing Capacity	The continued transfer of processing capacity to other geographic locations by processors, as a risk management strategy	➡ Processors exposed to greater risk if no processing capacity in other regions ➡ Processors challenged by their customers (major retail chains) to prove up the quality of the BC poultry products ➡ Risk losing major national customers
Disease Control Mechanisms	Possible risks that may be incurred due to how chemical disinfectants and other materials are used and applied, related to lack of knowledge and experience	
Recovery Period Risks	The risks that all agents within the poultry industry supply chain have during the post outbreak period, due to financial risks, uncertainty of re-stocking birds, supplies, labour , etc.	

Table A-3: Aggregate Ranking of the Major Risk Factors (RASC)	
Risk Factor	**Aggregate Risk Ranking**
1. **Concentration of the industry**, in particular, the degree to which buildings and premises are in proximity to each other	12*
2. **Manure management** : the storage removal and disposal of manure in ways that contribute to disease spread	13*
3. **The mixing of poultry species,** either within one farm premise, and/or in close proximity to other premises	11
4. **The degree of business intensity,** reflecting the frequency of any and all business activities that involve movement onto and off the premise, inclusive of all supply and service functions, cleaning, catching, etc.	12*
5. **Compensation issues**, that if not resolved, restrict the movement toward a proactive surveillance system	11*
6. **Lack of a proactive surveillance system**	14*
7. **Multi-age, and long life poultry managemen**t, versus all-in, all-out production practices	8
8. **Disposal risk** of depopulated, diseased birds either in peace time, or within an outbreak	12*
9. **Cease movement risk,** the economic costs associated by producers within a control zone during a lock down period	10
10. **Market risk,** particularly as related to the potential loss of consumer confidence due to continued disease outbreaks or temporary lockdowns within a surveillance program, and loss of export markets for poultry products	13*
11. **Degree of economic integration** or networking between premises due to ownership or supply chain linkages	10
12. **Unregulated sale of eggs** and other products outside of grading or market system	**9**
13. **Non-regulated poultry management practices**	8 (amalgamated with risk 4)
14. **Loss of processing capacity,** the potential to see major processors diversify geographically, if disease outbreaks continue in BC	10
15. **Lack of government –industry cooperation,** the degree to which there are conflicts between different industry segments and between industry and government on surveillance, compensation, and other issues	10
16. **Limitation of biosecurity program** in not extending to all sectors in the poultry industry	12*
17. **Migratory and wild bird** populations	8

* Denotes risk factors that RASC evaluated as being high risk, having significant economic impact, and having moderate to high practicality of mitigation.

APPENDIX B

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Risk Analysis Of The BC Poultry Industry
Second Interim Report- Part I
Issues, Gaps And Options Analysis

Prepared For

Risk Analysis Steering Committee

On Behalf Of The Poultry Advisory Management Committee

Investment Agriculture Foundation

Victoria, BC

Prepared by

Serecon Management Consulting Inc.

Calgary, Alberta

April 10, 2007

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INTRODUCTION

This report has been prepared subsequent to the Interim Report of early January, 2007. The purpose of this report is to build upon the consultations and research that have been done in the first phase of this project.

This report has developed the analysis further in the following steps:

1. **Issues Analysis**: Based on the major risk factors identified, provide a summary of the major issues that help to frame the individual risk factors, their significance, provide some background with respect to experiences in other jurisdictions, and provide a context for the development of possible risk mitigation options.
2. **Gap Analysis**: The next step is the identification of any policy, structural, and management gaps that may exist within the BC poultry industry with respect to the individual risk factors and issues.
3. **Options**: The gap analysis leads to the identification of possible options or alternatives that could be further evaluated for mitigating animal health risks to the industry.
4. **Options Evaluation Framework**: A draft framework is developed by which the options could be logically grouped, and then evaluated using benefit cost or similar evaluation tools.

Overview Of Project

It is useful at this point to provide a review of the overall framework with respect to how this risk management strategy is being developed for the BC poultry industry.

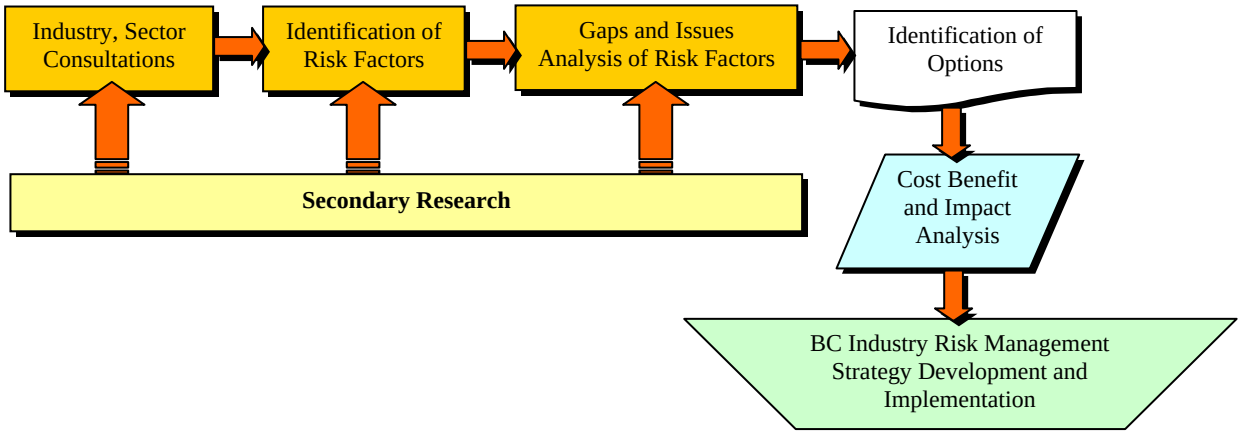
Figure 1 provides a schematic overview of the sequential steps of the process.

The January, 2007 interim report to the RASP Committee focused primarily on the three steps on the left side of this figure. From the industry and sector consultation, and from the secondary research steps, a broad range of risk factors which are considered important to the industry were identified. This list has subsequently been reduced to a more focused list.

This report is focused on the gaps and issues analysis, the identification of options and alternatives for dealing with these risks, and presents a draft framework for the evaluation of these options.

The next steps that then remain to be done include a detailed cost benefit and impact analysis of the selected mitigation options, and finally, the integration of this analysis into a risk management strategy for the industry.

Figure 1: BC Poultry Industry Risk Management Strategy Development Process



Issues And Gap Analysis

An analysis of the major issues with respect to each of the identified risk factors is summarized in Table 1. Wherever possible for each risk factor, the background issues, experiences in other jurisdictions, feedback from the consultations, and secondary research are briefly summarized.

The risk analysis is usefully separated into two sets of risk factors:

Structural risk factors:

- Extent of industry concentration and density;
- Compensation;
- Proactive surveillance; and
- Market risks.

Management and operational risks:

- Biosecurity;
- Manure management;
- Degree of business intensity; and
- Carcass disposal management.

Included on this table is an identification of the possible gaps that exist with respect to each risk factor. A gap is defined as an area of unmanaged risk. A gap can exist in management practices, policies, programs, or structural impediments, and may be contributing to a risk factor.

Following this table, a series of illustrative diagrams have been prepared that help clarify these issues and risks from three major perspectives:

- Issues and gaps with respect to compensation and financial risk management;
- Management and operations issues and gaps; and
- Infrastructure and policy issues and gaps.

Table 1: Issues and Gap Analysis of the Major Risk Factors

Risk Factor	Issues and Analysis	Gap Analysis
INFRASTRUCTURE RISKS AND ISSUES		
1. Industry concentration, the degree to which buildings and premises are in proximity to each other, economic and industry clustering, enterprise/species clustering.	Generally recognized that the Fraser Valley, and in particular the Abbotsford area has a high degree of poultry livestock concentration. Other things being equal, the higher the density, the higher the risk. However, there is not an established correlation between densities and risk. The densities have little meaning without consideration of other factors like the number of premises, the number of poultry species, the number of backyard flocks, the number of other livestock and wildlife, the density of human population, and the biosecurity at each production location. For example the presence of one very large broiler operation will increase the density of poultry in an area. However, if the operation is very secure and has a high level of poultry health in its flock, it will not increase the risk to the local industry; rather it will likely decrease the risk. One factor which may be unique to the concentration within the BC poultry industry, compared to other poultry producing regions, is the degree to which multi-species operations exist side-by-side. In the Fraser Valley, the concentration of production includes breeders, growers, hatcheries, feed mills, and processors, and an integrated transportation industry. It includes both regulated and unregulated producers; a wide range of bird species; large commercial operations alongside small backyard flocks; and management practices that range from intensive systems to organic and free range production. The potential concentration factors that are important to dealing with this risk factor are: a. The site selection of poultry barns – the distance between barns within a premise and distance of barns from premise to premise b. The degree to which the different elements of the poultry value chain are clustered (concentration of breeders, growers, hatcheries, feed mills, processors, etc…)	There exists policy and knowledge gaps with respect to the management of the existing and future concentration of the industry. These gaps are with respect to ➡ How and where new poultry livestock facilities, premises can be sited ➡ Lack of a policy, understanding of current structure, and a strategy to reduce industry concentration, with respect to the existing industry clustering (grouping of multi-species within one geographic area, extent of vertical and horizontal supply chain and ownership integration) ➡ The extent to which specialty, supply managed, and backyard operations are clustered, and the proximity between agricultural and non-agricultural investment and operations. ➡ Lack of information and understanding of the linkage between industry concentration and potential economic consequences. ➡ A gap exists with respect to having more complete information location and livestock numbers on farm premises, particularly of smaller operations outside of the regulated market structure

Table 1: Issues and Gap Analysis of the Major Risk Factors

Risk Factor	Issues and Analysis	Gap Analysis
	c. The number and proximity of different species of birds and other livestock within an area, d. The mix of different poultry livestock types within a given area –large, and small operations, backyard, free range, organic operations, e. The number of livestock premises within a given area, both poultry and other livestock f. Proximity between poultry livestock operations and urban industrial and residential establishments. Current policies in effect include the offset policies for siting buildings from roadways. An industry fact sheet is being developed to help guide the industry with respect to the establishment and siting of new operations and building. This will deal with issues of distance, wind direction, fan hoods, tree barriers, and issues of management of dust and feathers	
2. Compensation, absence of private and public financial support programs and tools, that could restrict the movement toward a proactive surveillance system, or Good Management Practices(GMP)	More broadly defined, there is a need for a financial support system or mechanism supporting the structural and operational changes that the industry needs to make to proactively deal with risk, to reduce its risk profile, and to deal with the economic and financial consequences in the event of further disease outbreaks. The options for dealing with the financial consequences of animal disease or other risk are 1) to ignore it, 2) to transfer the risk and its costs to a third party (insurance, or reinsurance), 3) transfer this risk cost to society (government), or 4) cumulate reserves for an industry investment fund (self insurance) to help protect against future risk costs. The financial support mechanisms, or compensation tools will necessarily be a combination of three sources: a. Industry based contributions, based on a levy on similar system, b. Private Insurance and reinsurance programs for defined risk perils, and c. Government support mechanism, from federal or provincial risk management programs , or other support programs.	The gaps with respect to the compensation issue includes: ➡ Uncertainly with respect to what changes are being proposed through CFIA, through the new AAFC risk management polices through disaster risk programs, through CAIS, and through possible outcomes from poultry industry gap analysis studies currently underway. ➡ Lack of clarity, understanding, with respect to the extent to which government is prepared to support the poultry industry, the balance of financial responsibility between industry, government, and private industry schemes. ➡ Lack of mechanisms, logic, and information to integrate the access to financial compensation (both government and private) to operational good management practices, the need for industry structural change, the role of active surveillance programs, and the impact on market risk reduction.

Table 1: Issues and Gap Analysis of the Major Risk Factors

Risk Factor	Issues and Analysis	Gap Analysis
	The challenges are with respect to defining the total risk the industry is expected to face, the proportion of this risk that needs to financially supported to maintain a viable and sustainable poultry industry, and what are the appropriate tools and responsibilities for covering these risk costs. The needs expressed by the industry for compensation or other financial support center around: ➡ Replacement of assets ➡ Forgone income ➡ Cleaning and disinfection (C & D) In the industry economic analysis, the potential 10 year economic losses within the BC industry value chain if there are continued low and high path disease outbreaks were estimated to be: ➡ Consumption impacts between $1.7 and $ 2.6 billion ➡ Value added processing impacts between $700 million and $1.1 billion ➡ Production sector impacts between $620 and 980 million. Significant gaps currently exist between what CFIA covers in the event of an outbreak, and in the costs that can be covered by the existing CAIS program. These are particularly apparent with respect to business interruption losses and recovery costs. Current actions now underway that need to be considered in the design of any industry/government financial support system include: ➡ CFIA has recently revised its level of compensation under the *Health of Animals Act*. This revised level of compensation will cover replacement cost of destroyed animals, but not economic income loss. The new rules reduce compensation for some birds, but recognize the greater value of breeding flocks. It is based on COP models, reflects in addition the variability of production costs, and as such, will adjust somewhat to inflation of costs.	➡ The gap in time that will occur between when AAFC is able to develop their new programs, and to implement them. This is expected to be in the range of two years. ➡ There is a gap between the current expectations of industry and government, with respect to the costs and responsibilities of FAD outbreaks. Government is increasing adamant that the industry must be more financially responsible for risk costs, in particular the costs related to market decline. ➡ A detailed review of insurance options and principles are presented in Appendix A.

Table 1: Issues and Gap Analysis of the Major Risk Factors

Risk Factor	Issues and Analysis	Gap Analysis
	➡ AAFC is currently working to provide a "top up" to the level of CFIA compensation. Little is known of this additional protection, and no program will be in place for at least another 18 months. Any add-ons will be with respect to a sub-category of business interruption costs, not for recovery costs. ➡ AAFC, related to the above point, is looking to design and implement new catastrophic disaster assistance programs ➡ AAFC is looking at gaps in the poultry insurance program, identify gaps between PI, CAIS and private insurance. Based on this gap analysis, the plan is to develop potentially government/private insurance programs to fill the gaps. ➡ The current CAIS program is being revised, with the potential to change the inventory valuation methods, provide for broader negative margin coverage, and improve the cash advance systems	
3. Lack of a proactive surveillance system	One major risk management tool, is that of an active animal diseases surveillance program and strategy. The objective of this surveillance strategy would be to provide early detection of high and low path viruses in domestic and wild bird populations in BC. Arguments against the introduction of an active surveillance strategy relate to the potential uncompensated costs to individual poultry operations in the event of detection and depopulation. The CFIA is undertaking a national surveillance program under new OIE guidelines. The Canadian Cooperative Wildlife Health Centre (CCWHC) is coordinating a national survey in migratory waterfowl for three years, and one their test sites is in BC. Surveillance likely needs to be linked to proper biosecurity management and programs. The US has introduced a voluntary surveillance program with compensation paid for costs of product destroyed, and for the costs of cleaning and disinfection. Cross compliance for compensation encouraged participation. Full compensation available under the program is only paid to those who	There currently exists only a passive and discretionary surveillance program in the province. There exists a gap with respect to the acceptance by much of the poultry production sector for the needs and benefits of a formal and active surveillance program. This gap is widened due to the lack of clarity with respect to how the risk and costs of an active surveillance program would be paid and compensated for. The need for an active surveillance program is more accepted by the value added processing sector Surveillance risk also extends to other jurisdictions or regions. To protect one region you have to know what is happening is others, in the case of BC poultry Nationally within Canada, and within the North West US.

Table 1: Issues and Gap Analysis of the Major Risk Factors

Risk Factor	Issues and Analysis	Gap Analysis
	participate in the surveillance program. Those that don't participate receive only 25% compensation. USDA expects 90% of the commercial egg industry and 95% of the commercial broiler industry in the US will participate in the program. The linkage between compensation availability and surveillance, along with the right of processors to declare to their import customers that they are under the surveillance program, is expected to provide a sufficient incentive to encourage high levels of participation in surveillance.	
4. Market risk, particularly as related to the potential loss of consumer confidence due to continued disease outbreaks or temporary lockdowns within a surveillance program, and loss of export markets for poultry products.	The RASC interim report (January, 2007) has identified very significant levels of market risks for each level in the BC industry value chain. These risks have been quantified for the production, value added and consumer level, as well as secondary impacts on Allied industries. The market risks are variable relative to whether the BC industry is likely to face a serious High Path disease future, or a more moderate Low Path disease future. In either case, the market risk and economic consequences are very significant. The management or mitigation of the level of market risk is a direct consequence to the degree to which the BC industry is able to design and implement an effective risk management strategy over the next several years. The major types of market risk that are facing BC producers are: ➡ Loss of domestic markets through loss of consumer confidence, and loss of markets due to encroachment by imports ➡ Loss of export markets, due to trade barriers ➡ Market recovery costs – promotion, advertising, to re-establish lost domestic and export markets	There is a gap with respect to the understanding of the economic consequences on export sales and domestic market consumption, prices, and on greater imports due to continued low or high path AI and other FAD disease outbreaks, particularly within the production sector. This is a market gap, of the potential for the BC poultry industry to lose its credibility in the market, and to depreciate the "brand" with consumers. There is a gap with respect to the level of awareness and understanding by the consumer, society with respect to the value and impact of the poultry industry.
5. Manure management (Nutrient Management): the storage, removal and disposal of manure in ways that contribute to disease spread	Manure management practices are viewed as a significant animal health risk, and likely to grow as the industry tries to further expand, and as concerns from other jurisdictions (both agricultural and non-agricultural) grow. Growing risk for contamination of the underground aquifers. The current manure management practices in place include: ➡ To the extent the producers land area allows, manure is spread first on the immediate agricultural land as a source of fertilizer.	➡ Incomplete plans, options and alternatives in place to deal with the current and future manure management needs. ➡ Current options for disposal either on the Island, or in Interior site are increasingly being questioned, and may become more limited. The options become more limited as contaminated manure with vaccines, and possible viruses increases.

Table 1: Issues and Gap Analysis of the Major Risk Factors

Risk Factor	Issues and Analysis	Gap Analysis
	➡ Typically manure is stored on the farm site, until it can be spread on the land or hauled to and sold to locations outside the Fraser Valley. ➡ Restrictions exist on the time period in which manure can be spread on the land. Generally cannot be spread in the winter months due to moisture conditions. ➡ Up until recently significant quantities of manure have been sold and transported to both Vancouver Island and to other locations in the interior ➡ Concerns are growing from other areas, particularly the Island, that this importing of manure is impacting on the Island's biosecurity status. ➡ Current and proposed biosecurity protocol provide guidance with respect to manure storage at the building site, manure equipment usage, barn clean out. ➡ There are as well a series of environmental guidelines for manure management in the province There is the growing potential that the existing manure management practices of spreading manure within the local area, or exporting it to other regions like the Island and the Interior, are not sustainable. There is increasing concern from these regions as to the possible contamination of this manure. Further, possible impacts on the local environment, particularly with respect to odour, and ground water and stream pollution are growing. Considerable work has been done by the SPFG in BC. They have worked to explore alternatives and technologies for manure management and disposal, and are active in the distribution of manure. Conclusions reached by SPFG indicate there is no one single solution. Solutions will require multiple options and disposal alternatives. Manure is a by product of the industry, and as such is an opportunity and problem it owns. Local markets are not large enough to consume the manure in the Fraser Valley. There is currently some composting of local manure and subsequent sale to other jurisdictions.	➡ Technology gaps, with respect to more effective and efficient means of composting, conversion to energy, fertilizer and other products exist. ➡ There exist policy and legislative gaps for guiding the storage, transport and disposal of manure

Table 1: Issues and Gap Analysis of the Major Risk Factors

Risk Factor	Issues and Analysis	Gap Analysis
6. The degree of business intensity, reflecting the frequency of any and all business activities that involve movement onto and off the premise, inclusive of all supply and service functions, cleaning, catching, etc.	The increased frequency of movement within and more particularly between farm premises, and up and down the supply chain contribute to the potential rate of spread of an infectious disease (intensity), although does not have any impact on the potential to introduce a disease (frequency of disease occurrence). The degree of business intensity is impacted by many factors, including the level of industry concentration, and of the degree to which operations are integrated (both vertically and horizontally) through ownership and/or supply chain arrangements. Factors which will potentially mitigate the impact of business intensity on risk, are the strength of the biosecurity system in place, and other positive farm management practices, with respect to traceability, and other best management practices.	The gaps with respect to mitigating the impacts of the risk of high business intensity parallel many issues, limitations may exist with respect to an enhance biosecurity systems, and related good management practices. Exceptions with respect to gaps with may exist in biosecurity and good management practices in Allied industry, supply industries are critical for reduction of risk of high business intensity.
7. Disposal risk of depopulated, diseased birds, and other mortalities either in peace time, or within an outbreak	There currently exists gaps in the way in which depopulated birds, either diseased or otherwise are disposed of. Options for disposal include burial, incineration, digestion, and composting. This issue should be included as part of the analysis and assessment with respect to manure management and disposal.	Similar issues and gaps as exist with respect to the management of manure – policies, knowledge, options, and technology.
8. Limitation of biosecurity program in not extending to all sectors in the poultry industry	Currently, a program of biosecurity is being developed with respect to primarily the regulated supply managed poultry sectors. An audited compliance system is being introduced. The weaknesses and gaps in the current systems include: ➡ Some sectors within the poultry industry are excluded, in particular parts of the specialty and non-regulated sectors ➡ The current system in not inclusive of the complete supply chain ➡ Overlaps and potential replications with the on-farm food safety program The potential for bird catchers to not be fully integrated into the biosecurity program is large. Due to issues of cost and availability (of what?), there are likely to continue to be gaps in the biosecurity measures employed by this allied industry.	Gaps include: ➡ The overlap, and redundancy which may be building between on-farm food safety, biosecurity, environmental plans, and nutrient management (and possibly premises identity/traceability) ➡ Lack of similar standards and exceptions for good management practices (GMP) between all sub-sectors within the poultry industry ➡ Potential to have gaps in the level and extent of auditing of biosecurity and other good management practices. ➡ Proper use and employment of biosecurity procedures by certain allied industries such as catchers, and other input suppliers such as bedding

Table 1: Issues and Gap Analysis of the Major Risk Factors		
Risk Factor	**Issues and Analysis**	**Gap Analysis**
	Issue of illegal unregulated egg sales is a possible gap in the biosecurity system. Ministry of Health can detect and destroy eggs in retail stores	➡ Gaps in protocols and biosecurity procedures of service suppliers such as hydro and other utility people. ➡ Lack of separation of business and social behaviour practices: local farmers meeting at coffee shop in barn clothes, then returning to farming premise. ➡ Ability to traceback, and to regulate the illegal sale of unregulated eggs.

Summary Gap Analysis

Figure 2 provides an illustrative representation of the gaps, particularly as they related to compensation. This is done within the context of the traditional animal disease management framework – prevention, preparedness, control, and recovery. The smallest gap is with respect to the elimination and disease control response area. The second largest gap area is within the early prevention and preparedness area. However, the largest gap is felt to exist in the area of industry recovery, after an outbreak has been effectively controlled.

Figures 3 and 4 illustrate the perceived gaps with respect to the management/operational area, and infrastructural area respectively. The gaps in practices, policies, and programs are most pronounced within the prevention and preparedness disease management areas. These figures help to identify the gaps, and also provide suggestions on how some of the different options may be placed to mitigate the gaps and risks.

Figure 2: Compensation and Risk Management Existing Programs and Gaps

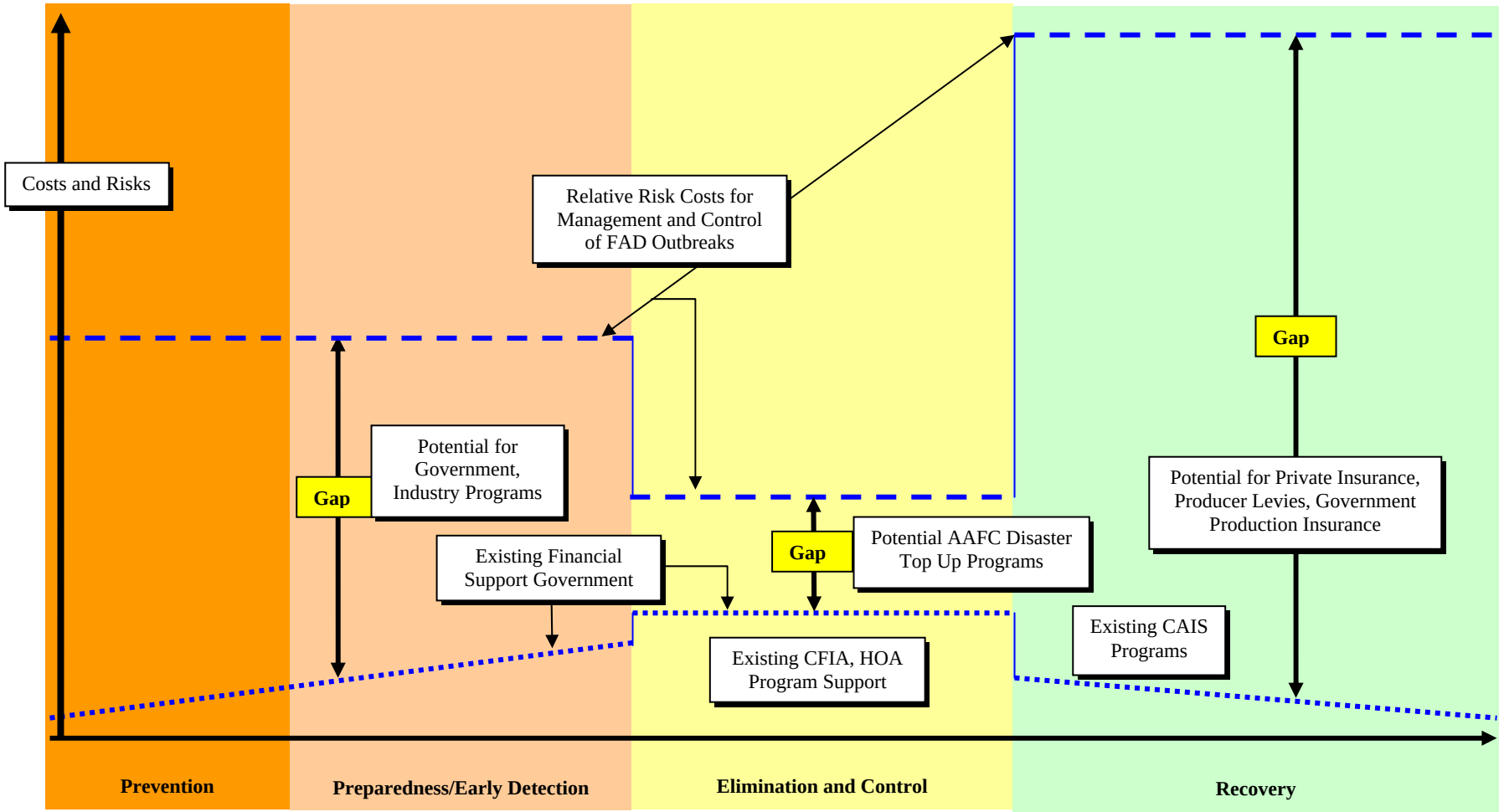


Figure 3: Management and Operational Practices and Gaps

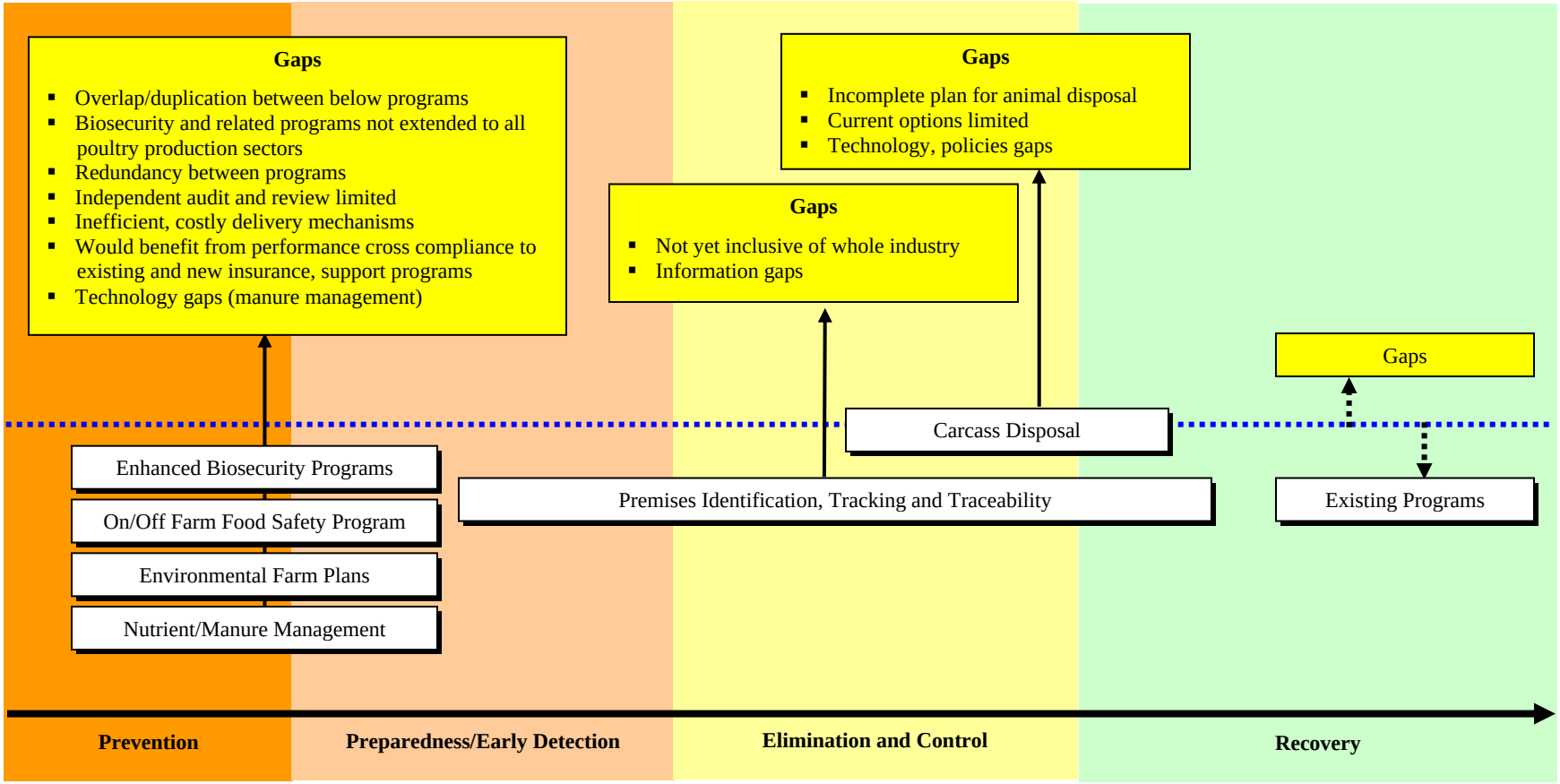
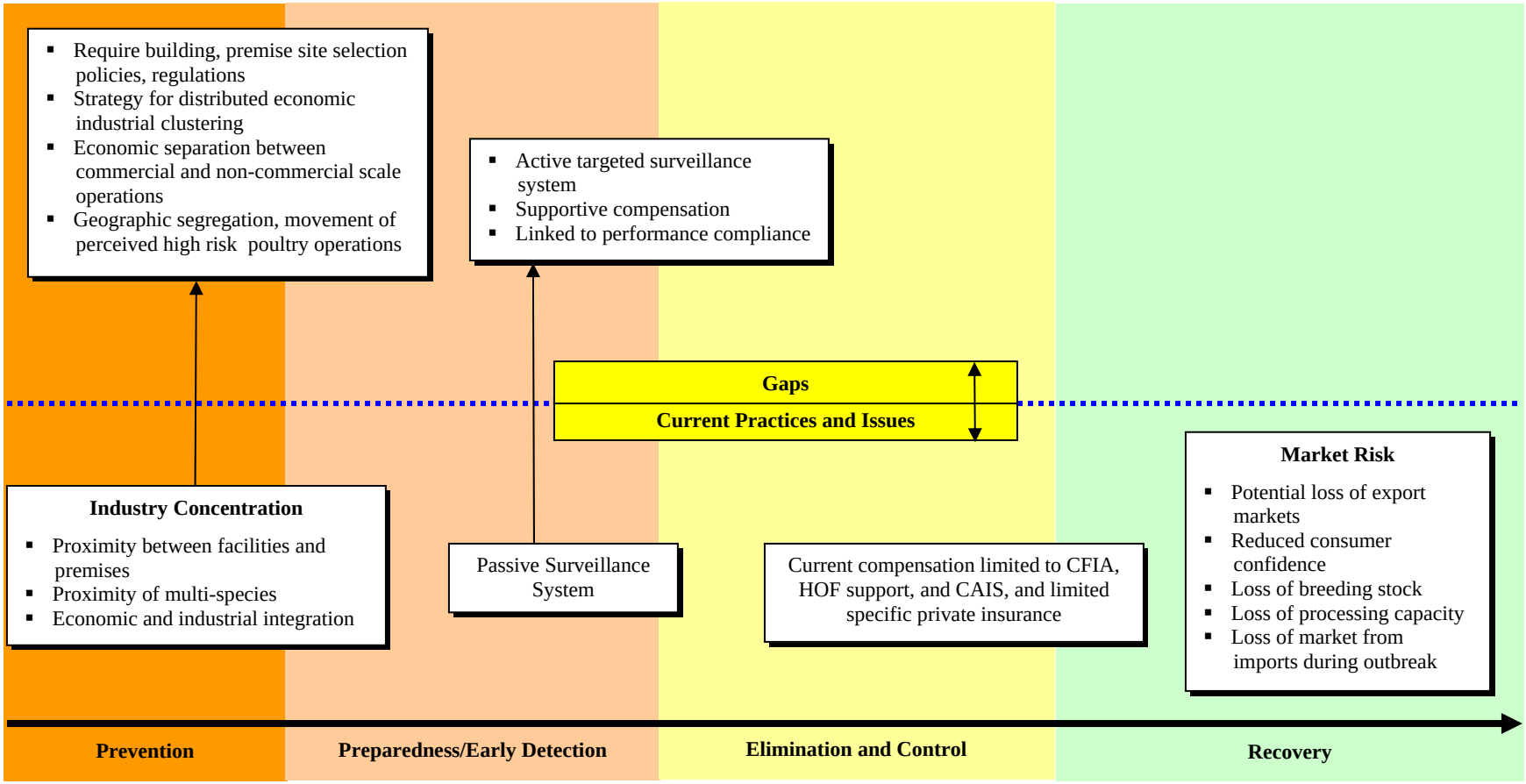


Figure 4: Infrastructural Risks and Gaps



Options And Alternatives Analysis

Building on the previous analysis, a number of possible options and alternatives are proposed with respect to actions the industry may take to close the risk gaps, and which would form the basis of a comprehensive risk strategy for the BC poultry industry.

These suggested options are summarized by risk factor below. This is not considered a comprehensive list, nor is it suggested that any and all of these options should be accepted. There is a need to evaluate, modify and then select appropriate options and alternatives which will then be further evaluated as to impact and cost benefits. As will be discussed in the next section, it may be practical and expedient to group options and alternatives into clusters or cohesive groups for evaluation and implementation.

Table 2: Risk Management Mitigation Options and Alternatives

Risk Factor	Options
1. **Industry Concentration**, the degree to which buildings and premises are in proximity to each other	**Structural Change with Grandfathering** Development of a set of forward looking policies and regulations that establish minimum distances between barns, distances between premises, policies for the location of different species flocks, and flocks outside of regulated supply management system. This option implies a "grandfathering" of the existing industry structure, but imposes strict rules of conduct for all new industry investment, and expansion. This option would make compulsory, the new industry guidelines which are being developed with respect to building spacing, wind direction, offsets, tree barriers, etc. **Premises Identification and Registration** All livestock premises, and possibly other livestock intensity data (barns, livestock numbers, species, etc.) would be registered and maintained as part of an industry wide data base to assist in event of disease outbreak control, and food safety traceability. **Economic Industrial Clustering** The BC poultry industry begins to restructure itself around the concept of biosecure economic/industrial clusters. The clusters are defined as sustainable production and processing units (individual supply/value chains) focused on economical combinations of sustainable poultry sectors (broilers, egg producers, specialty production, hatching egg production, turkey, etc.). Biosecure zones are created for each industrial cluster. The objective is to over time, separate and distinguish the production of poultry production by geographic separation, and maintaining economic viability between supply, production, value added processing and markets within the economic cluster. The potential economic costs of such structural change would be assessed, and evaluations made of proportions which would be internalized, and what would be allocated to society or balance of industry. **High Risk and Small Scale Enterprise Segregation** This option would include the potential for some immediate relocation of a few existing poultry production operations that currently appear to be contributing to concentration risk. In addition, small scale flocks, or other enterprises now operating outside of regulated supply management system would be obligated to operate within a biosecurity management system. The critical issue of the cost of this structural adjustment would likely first estimated, and then assessment of responsibility for cost evaluated.

Table 2: Risk Management Mitigation Options and Alternatives

Risk Factor	Options
2. **Compensation issues**, absence of private and public financial support programs and tools, that could restrict the movement toward a proactive surveillance system, or Good Management Practices (GMP)	**Insurance/Reinsurance Option** The industry focuses on establishing a private insurance program for quantifiable defined perils. This industry engage the commitment and resources of the AAFC Private Sector Risk Management Partnership (PSRMP) program to support this effort. Defined risk perils could include the costs of business recovery, costs of disposal, etc. **Public/Private Production Insurance Program** Evaluate the potential for the development of a production insurance program within the poultry industry, building on the existing federal CIAS and crop insurance programs. Program would be jointly funded by industry and government. Coordinate this effort with the expected Poultry Production Loss Gap Study to be completed by AAFC in 2007. Identify production losses not now covered by CAIS and CFIA, particularly with respect to business interruption losses, and recovery/restocking costs. A unique poultry industry program be designed and costed. **Short term Disaster Risk Insurance** Recognizing the gap that will occur between when the AAFC disaster and risk management programs will be developed and implemented, develop a proposal to federal, and provincial government, and financed partially by industry, to put in place a short term disaster risk program, that would be in place for up to two years, or until the new Federal program are in place. **Private Standby Investment Fund** Evaluation of the potential for an investment fund being established using both industry funds, and bank standby credit lines. Fund contributions may be tax deductible, accumulate interest, and backed by minimal government guarantees. Funded by primarily producer levies. **Cross Compliance** A system of cross compliance would be introduced. This would link good biosecurity, and other management practices with level of compensation with respect to any government supported support program, and would link either insurance premiums or level of coverage under private programs to good management practices, and general compliance with GMP. **Integrated Risk Compensation Programs** All of the above three financial management options integrated together (private insurance, government sponsored PI, and private investment fund) Participation in either private or public insurance and compensation programs would likely be linked to participation in biosecurity, surveillance, and other GMP programs.
3. **Lack of a proactive surveillance system**	**Introduction of Surveillance Program** The costs and benefits of an active surveillance program for the BC poultry industry is evaluated. The evaluation is linked to both the biosecurity program, and to include an evaluation of the type of compensation programs required to neutralized the financial impacts on individuals affected. The costs and benefit of such a possible program would be made on the need for, and the possible benefits. A possible program could require a certain required submission of birds to the appropriate veterinary labs on monthly basis. Compensation would be linked to the compliance of the individual producer to the surveillance program. It is assumed, that a more robust level of compensation would be in place in the event of a shut down or depopulation action.

Table 2: Risk Management Mitigation Options and Alternatives

Risk Factor	Options
4. Market risk, particularly as related to the potential loss of consumer confidence due to continued disease outbreaks or temporary lockdowns within a surveillance program, and loss of export markets for poultry products.	**Import Control Program in Event of FAD Outbreak** Polices and procedures would be introduced to protect the industry from aggressive imports from the US or elsewhere in the event of an outbreak and reduced BC production. A permitting system would be in place which could allow some imports to maintain the existing market supply to end markets while the local operations were able to restock and recover. **Market Recovery Risk Program** A market re-establishment fund is established, funded both by industry and by government. This would provide funds which would help to maintain markets for poultry during an outbreak, and to help in generic promotion and advertising to help re-establish lost domestic and export markets due to animal health disease outbreaks. **Consumer and Industry Education Program** Proactive programs through schools, the media, and other venues are developed to enhance the awareness, and supported by other sectors of the poultry industry. This would be harmonized with respect to the existing supply managed, and other individual sector promotion programs in place.
5. Manure/nutrient management: the storage, removal and disposal of manure in ways that contribute to disease spread	**Sustainable Manure Management Program/Nutrient Management** Undertake the assessment of development of a more sustainable manure management program for poultry manure. This would, in conjunction with existing efforts underway with respect to manure management, evaluate further on-farm and off-farm storage and disposal system, evaluate the use of more advanced technologies for the composting of manure, and realization of other commercial products from it, including energy, electricity and heat. This would be integrated with the need to deal with carcass disposal issues both of diseased and normal mortalities. The regulatory and policy framework would need to be modified to support and enforce manure management.
6. The degree of business intensity, reflecting the frequency of any and all business activities that involve movement onto and off the premise, inclusive of all supply and service functions, cleaning, catching, etc.	**Premises ID and Traceability System** A more extensive system of premises ID established. This would include both premise ID, but also include information on livestock species, numbers, and other information. The system would be designed both for disease management purposes, and for market development, differentiation, and industry branding purposes. **Enhanced Biosecurity Management** The mitigation of this issue is with respect to the success of the extent to which the industry is able to introduce and effective industry wide Good Management Practices system, as identified with respect to Risk factor #8 below.
7. Disposal risk of depopulated, diseased birds either in peace time, or within an outbreak	The option for mitigation of this risk be included in the option for manure/nutrient management (#5 risk factor), and is also deemed to be part of an overall biosecurity system.
8. Limitation of biosecurity program in not extending to all sectors in the poultry industry	**Universal Good Management Practices (GMP) and Biosecurity Program for BC Poultry Industry** An extensive and universal biosecurity/GMP systems be developed, and made compulsory for the entire BC poultry industry. This biosecurity system be extended both vertically and horizontally across the sector (throughout the value chain, and to all poultry sectors).

Table 2: Risk Management Mitigation Options and Alternatives	
Risk Factor	**Options**
	This system be expanded to be inclusive of biosecurity, food safely, nutrient management, and general good management practices. The further aspect of this biosecurity program is the inclusion of a traceability/traceback system. The BC industry would differentiate and brand itself within Canada as having one of the most exclusive safe and secure poultry management systems. BC would lead the way in integrating and making biosecurity, GMP, and food safety seamless from an operational and market perspective. **Special Issues Control Systems** Special efforts and analysis be undertaken to overcome possible biosecurity system gaps. These would include the issues of illegal sale of unregulated poultry products, primarily eggs, and of the special risk issues related to chicken catchers, bedding, and similar suppliers to the industry.

Integration And Summary

The following two figures provide a summary and integration of the above analysis of the issues, gaps and options.

The risk factors, together with the possible options are alternatives are separated with respect to structural and management operation factors.

Figure 5 links the identified major risk factors, with a draft list of possible mitigation options, and with the potential outcomes or impacts these alternatives could influence.

Figure 6 introduces the important concept of interdependence. It is apparent that one cannot isolate or evaluate one risk factor, and its possible mitigation options independently from other issues and factors. As is discussed in the next section, the evaluation of possible options, and the development of a risk management strategy for the BC poultry industry, will require the clustering or grouping of a set of cohesive actions and options.

Figure 5: BC Poultry Industry Risk Management Strategy Framework

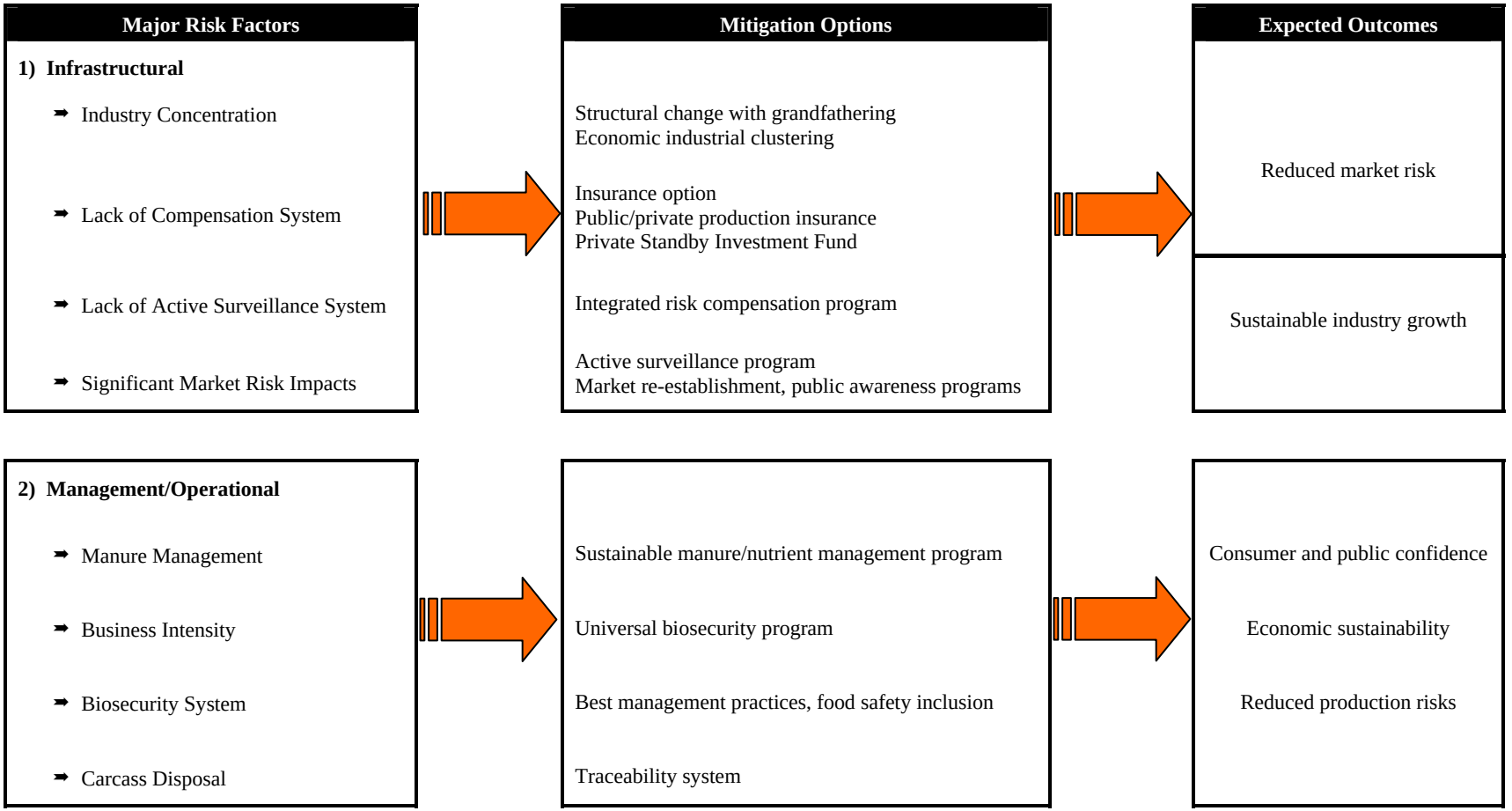
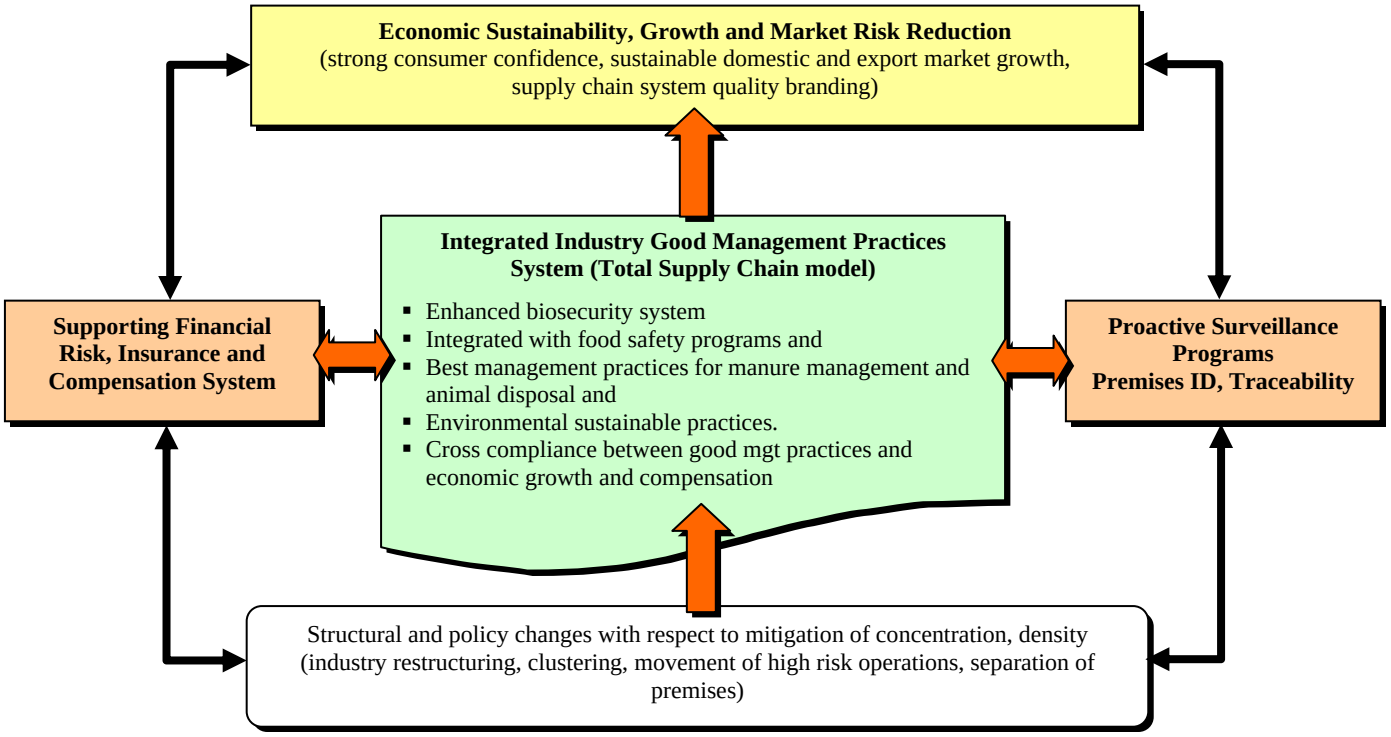


Figure 6: BC Risk Management and Structural Dependency Model



Cost Benefit And Options Evaluation

The next major stages of this project will involve the selection of the major options and alternatives that are the most critical for evaluation as part of a risk management strategy for the BC Poultry industry.

This section provide a preliminary analysis of some of the possible conceptual issues, evaluation constraints and possible foundations for the next steps in this study. The detailed benefit cost analysis is completed in part two of this second interim report.

Evaluation Options

As has been indicated in the previous sections to this Options and Issues report, there is in most cases, a high degree of interdependence between the structural and managerial policies, changes and practices that need to be considered and implemented to effect risk reduction and improved industry economic sustainability. Few of the individual options, independently by themselves, can effect significant risk reduction. There are a minimum number of structural and operational changes that collectively need to be taken that can bring about an expected effective positive change to the industry.

For example, bringing in a comprehensive biosecurity program will not be very effective if the issues of manure and carcass disposal management are not concurrently addressed. A biosecurity program that is limited only to the supply managed poultry production operations similarly is in itself not a viable option to consider. Further, a proactive surveillance program, without consideration of compensation issues, cannot be independently evaluated and considered.

It is suggested that the risk management options/alternatives, and their subsequent benefit-cost evaluations are likely most practically considered as integrated response options or "packages" reflecting different levels of proactive structural and operational changes desired and accepted by the industry and government.

- **Nominal Response Option:** Would reflect a minimum set of management practices, programs and policies that are accepted by the industry and government. This likely would include a basic biosecurity program limited to the regulated supply managed industry only, no significant changes made with respect to existing concentration risks, a surveillance program that remains largely voluntary, and modest efforts to tighten up manure management practices.
- **Intermediate Response Option**: This could include a more comprehensive biosecurity program extended to most of the poultry industry, stronger manure and carcass disposal practices accepted and implemented, a proactive surveillance put in place, and backed by at least a minimal compensation system, policies put in place to deal effectively with the citing and management of poultry operations to at least arrest the forces of concentration, and a premises ID system is implemented over most of the industry, but still limited with respect to individual premise production information it includes.

- **Comprehensive Response Option**: A comprehensive, fully integrated risk management strategy is developed and implemented by the BC poultry industry, in partnership with government. This strategy would be inclusive of a set of management practices that would have uniquely integrated traditional on-farm biosecurity, with food safety, manure management, carcass disposal, and environmental management across the industry value chain, a proactive surveillance program would be implemented inclusive of the commercial, small flock, and wild fowl bird populations, and a comprehensive and integrated private insurance, enhanced government (CFIA and AAFC) based risk support and production insurance program put in place, with industry support and co-financing. The BC industry would have branded itself within the Canadian poultry industry and possibly internationally, as leading in its sustainable risk and economic management practices, GMP, and proactive policies.

If this approach to development of a risk management strategy is looked at from the perspective of different integrated risk response options, each of these response options would be evaluated as a package, to determine their respective costs (of implementation and operation) and benefits.

Evaluation Process

The evaluation of possible risk management options and alternatives would be done within the framework of conventional benefit cost methods. There is little value in undertaking any change or option, unless the current or expected benefits of the option, exceed the costs of implementation, and the on-going operational costs.

Figure 7 provides a schematic representation of an evaluation process using the benefit-cost process. Typically, benefits and costs are estimated for the investment or option, and expressed as a benefit-cost ratio. Benefits are divided by costs to derive this ratio. A benefit-cost ratio greater than one, would indicate the expected benefits are greater than the expected costs, and would receive favourable consideration. A benefit-cost ratio less than one, implies the costs are greater than the expected benefits, and serious questions would be asked as to why this option would be further considered or accepted.

The diagonal line on this figure indicates the vector of possibilities where the benefit-cost ratio is equal to one, and can be viewed as a line that would separate a suite of options and alternatives to the left that would have a benefit-cost ratio greater than one, and all projects to the right that would have a benefit-cost ratio of less than one.[1]

In only a conceptual way, the possible results of the benefit-cost analysis of the above mentioned response options have been indicated as an example only. In this example, the nominal response option which would have the lowest financial costs to implement and maintain, are not expected to generate benefits (reduction in animal disease risk and enhanced revenue and profits) to compensate for these costs.

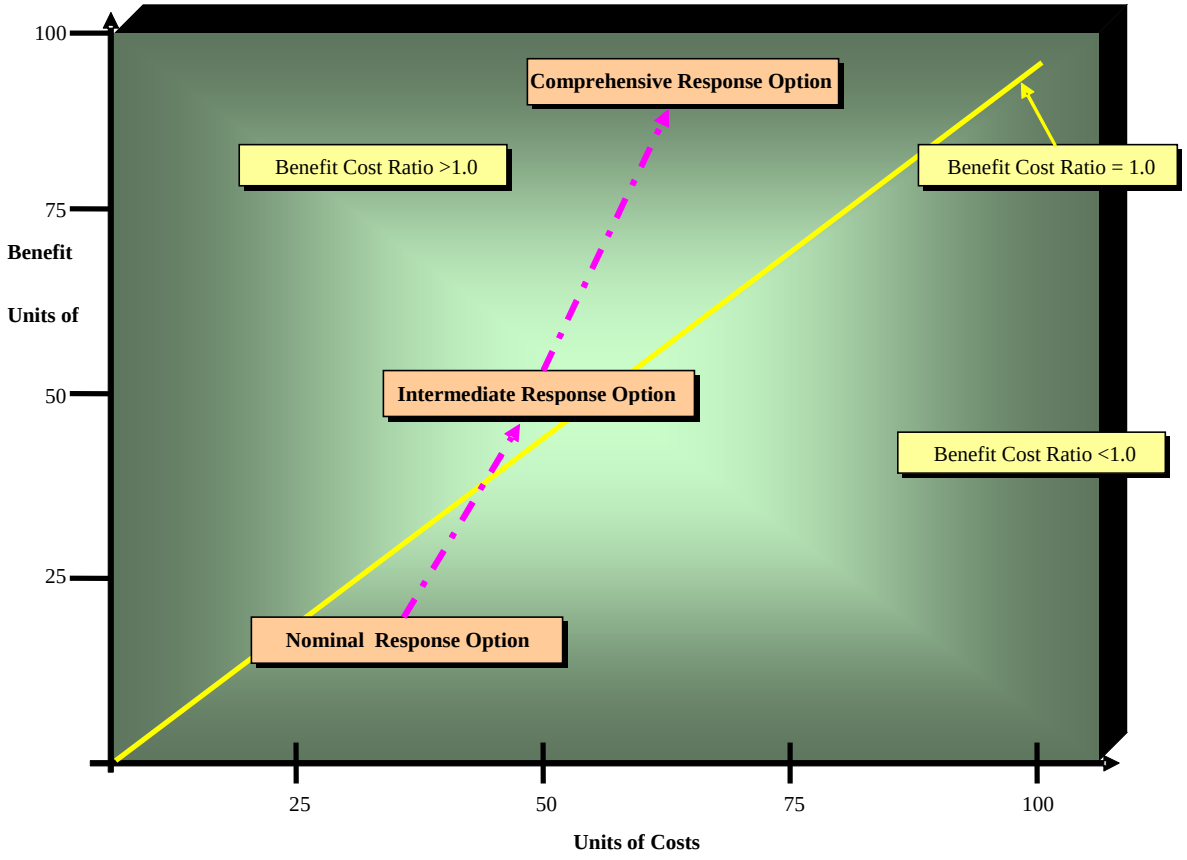
[1] Where the vertical and horizontal axis are given the same scale, the unitary benefit-cost line (Benefit-cost =1.0) would be a diagonal line at 45 degrees from the origin.

The intermediate response option, would demand higher implementation and operating costs, but could result in a higher level of benefit, which may result in a benefit-cost ratio greater than one.

The comprehensive response option, would demand a much higher level of costs, but may result in a level of long term risk reduction and sustainable higher industry revenue and profit, that more than pays for these costs. It is recognized, that the industry may as well develop a strategy which would accept beginning with a low response option, but with the plan to graduate to a higher level of performance.

It is emphasized that this is thrown out as a conceptual framework only for attempting to build a process and methodology for the benefit-cost and selection of risk management strategies of this study.

Figure 7: Conceptual Overview of BC Poultry Risk Management Options Evaluation Process



Industry And Government Benefit Analysis

A major challenge of analyzing the different possible risk management options and alternatives for the development of a BC risk management strategy, is to develop an objective approach of measuring costs and benefits. In the January Interim report to the RASP, a number of scenarios were developed with respect to the possible future of the BC poultry industry if it remains healthy, and if it is subject to either a series of low pathogenic, and high pathogenic disease outbreaks over the next ten years. This analysis sets one boundary of possible economic and financial impacts, which viewed in this context of risk management, represents a possible range of "benefits" to the industry, if they could be partially mitigated or reduced.

The following logic is developed to develop a possible benefit-cost framework. This framework is applied in the final strategies and recommendations report.

The historical and future management of the BC poultry industry must be considered and evaluated in the context of an economic and social welfare model. The economic and financial sustainability of the industry is a complex partnership and interaction between the industry (viewed as a complete value chain) and of government (federal, provincial, and municipal). The introduction of animal health risk and its' management, has introduced a major complexity and cost in the management of livestock industries (both in poultry and other livestock industries). This "new" cost has created major issues with respect to the level of these costs, how they affect the respective components of the industry, who is responsible for them, and how can they by jointly managed between government and industry.

Societal economic welfare, focused on the BC poultry industry, can be viewed as the accumulation and optimization of the net benefits between the private and the public sectors[2].

Societal economic welfare *= sum of the* ***net benefits within the private sector****, and the* ***net benefit of the public sector***

This economic welfare balance equation is expanded for each sector.

1) **Industry Net Benefits** = (Gross Industry Revenue[3] – Operating and Overhead Costs- federal and provincial corporate taxes) – Net Animal Health Risk Costs[4]

   The industry net benefits are the summation of the net benefits with respect to the primary production, value added processing, and the retail and distribution sectors.

[2] The public sector is defined as the different levels of government, and of society to the extent they are the beneficiaries of tax revenues generated from industry, and are provided with a safe and reliable food supply.
[3] Inclusive of government transfer payments and subsidies.
[4] Net animal health risk costs are industry costs related to developing and operating animal health risk management practices (biosecurity, etc.), less the benefits received from government in terms of financial disaster risk support, safety net, and CFIA disease control compensation.

2) **Public Sector Net Benefits** = Sum of Net Corporate Tax Receipts (Federal and provincial) + Income Taxes From direct and Indirect Employment Created by the Industry – (Transfer Payments and Subsidies to the Sector + Federal and Provincial Animal Health Risk Costs).

The net public sector benefits are similarly accumulated within each segment of the industry value chain – primary production, value added processing and final distribution and retail.

Expanding on the two above relationships, the total societal benefits of a industry such as the poultry are in simplified form:

3) **Net Society Benefit** = Industry Net Profit After Tax + Government Corporate Taxes + Government employment taxes – Transfer Payments – Animal health care costs.

As of 2005, the net society benefit of the BC poultry industry has been estimated. The tables below provide an estimate, based on 2005 industry revenue data, of the industry net profit, after tax profits, and corporate taxes. In addition, the added tax revenue from employment income generated from the poultry sector has been calculated. For the analysis at this point, animal health care costs are not included. This is addressed later.

The results of this analysis, using the data and assumptions in the tables is as follows:

- Net industry benefit: net profits (64.4 million)
- Net government benefit: corporate tax ($14.1 m) plus employment income tax ($89.7 m) less transfer payments ($10.0 m) = $93.8 million.

Therefore the net society benefit of the BC poultry industry, under these assumptions is $158.2 million. Of this, $93.8 or 58% of the benefit is to government, and the balance or 42% is to industry. The relative government to industry benefit ratio of a viable poultry industry, using these crude assumptions, is approximately 1.5 ($93.8/$64.4).

Table 3: Estimation of BC Poultry Industry Profits, Taxes, and Net Income After Tax, 2005

Industry Sector	$ Millions	Profit Rate (%)	Profit ($m)	Corp Tax ($m)	Net After Tax ($m)
Retail Value Added	291	5%	14.6	2.6	11.9
Value Added Processing	453	8%	36.2	6.5	29.7
Primary Sector	397	7%	27.8	5.0	22.8
Totals	**1,141**		**$78.6**	**$14.1**	**$64.4**

Table 4: Estimation of BC Poultry Industry Wage Costs and Employment Tax Revenue, 2005

Industry Sector	$ Millions	% Labour Cost	Labour Costs ($m)
Retail Value Added	291	0.2	58.2
Value Added Processing	453	0.22	99.66
Primary	397	0.13	51.61
		Direct Labour Costs	209.47
		No. Direct Labour	5,512
		Indirect Labour Multiplier	1.20
		No. Indirect Labour	6,615
		Total Direct and Indirect Labour	12,127
		Total Wages and Salaries	$448.7
		Average Marginal Tax Rate	0.20
		Total Employment Tax	$ 89.7

There are several points to this analysis. These include:

1) Under a positive industry growth scenario, in which the industry is profitable and growing, there will be a positive net economic gain to society, of which the greater proportion will be in favour the government, and society in general, due to the level of both corporate taxes collected, and taxes on employment income of people directly and indirectly employed by the industry.

2) With the positive gain to society, in addition to the gain to the industry itself, there is a value for both government and industry to jointly invest in proactive risk management system to protect their respective investments.

Benefit-Cost Analysis Framework

The above analysis of the 2005 industry has been developed primarily for illustration purposes. This analysis is now expanded to develop a framework for the analysis and benefits and costs.

Figure 8 provides an analysis of the possible benefits to government and industry interdependently, and combined, using the societal benefits equations from the previous section. This analysis begins to show how benefits accrue, as the combined net profits of the poultry industry vary from the minus area, to strong levels of profits. At negative levels of profit, there are little or no benefits to industry. There are net benefits to government at these low profit levels, generally due to the direct and indirect employment taxes that an industry will generate. As industry profits rise, generally the benefits to government of having this industry in place will exceed the net benefits achieved by industry. This analysis has included both assumptions on subsidy transfers to the industry, particularly

at the low profit areas, as well as including an allowance for general government costs to administrate sector specific policies and programs.

The distribution of societal benefits between industry and government hinge primarily on the average rate of corporate and employment income taxation. As this rate increases, the transfer of benefit is in favour of government. As the average of taxation falls, the benefit balance shifts back to industry.

Figure 9 provides one estimate of an industry profit multiplier. This multiplier, is the ratio of the total societal benefit divided by the net profit of the industry, for a range of levels of combined industry profit. This multiplier is positive, where net income is zero (due to employment tax income to government), and in the early stages of growth, generates a high level of net societal benefit, but then drops off and stabilizes at higher levels of income.

Figure 8: Industry, Government and Total Society Benefits for Varying Industry Profit Levels

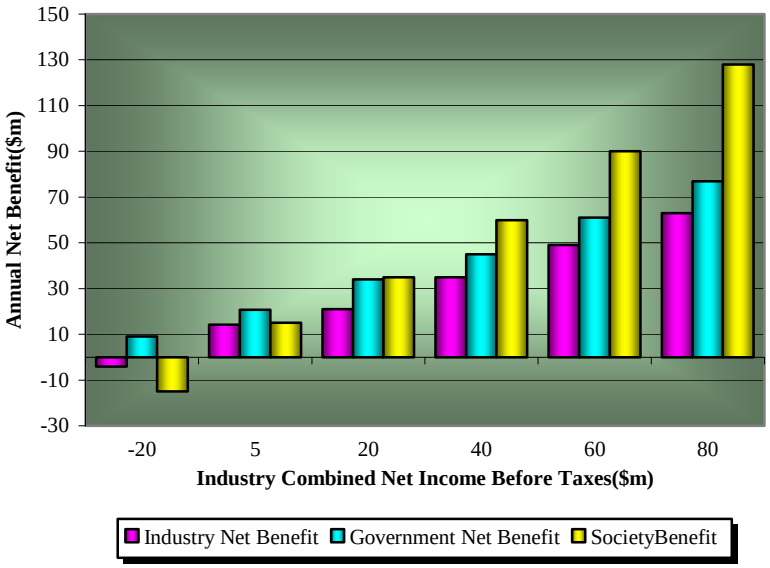
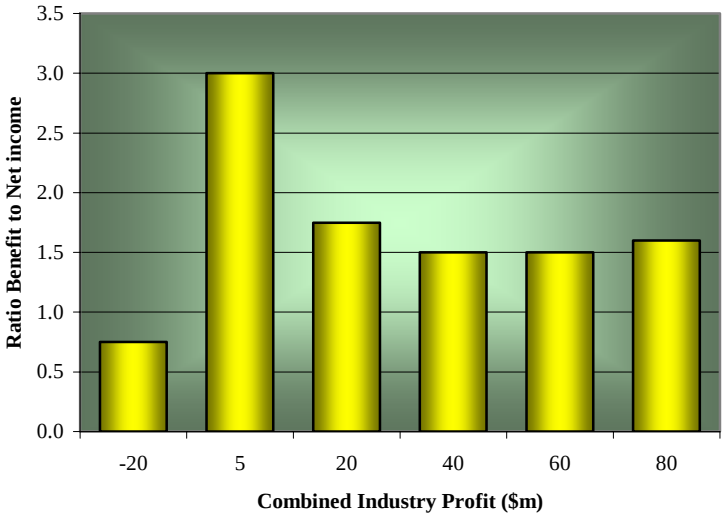


Figure 9: Industry Society Benefit Multiplier



This analysis can be applied to the evaluation of the selected response options, each treated and evaluated as a package. The three response options, could in effect be considered as having the effect of producing an outcome reflecting the economic results in the high and low pathogenic animal health futures as evaluated in the January interim report. The impact on reducing the potential of future annualized net industry income could be as indicated below. The benefit cost ratio would be evaluated relative to the level of annualized risk cost the industry and government is prepared to make, and the societal impact or benefit it may generate. The possible range of outcomes, for each risk response strategy is given in the table below. For the nominal response, the benefit cost ratio is less than one, and therefore considered not feasible. Either of the other two under these assumptions would be acceptable.

Risk Management Strategy	Risk Costs	Change Industry Income	Societal Benefit	Societal BC Ratio
Nominal Response	12	5	8	0.67
Intermediate Response	30	30	45	1.50
Comprehensive Response	55	80	110	2.00

Appendix
Considerations For Risk Transfer Options

Considerations For Risk Transfer Options

Risk Management

Risk management can be thought of as a process to measure the risk associated with a particular event (the frequency or likelihood and the severity or impact of an event) and to then develop strategies to manage that risk. Risk management strategies generally fall into four primary categories that include: ***risk reduction*** – taking action to reduce the impact of the cause of the risk to a manageable level within the business operation; ***risk avoidance*** **–** taking action to avoid the cause of the risk, thereby eliminating its impact; ***risk transfer*** – transferring the risk through a negotiated agreement to a third party willing to accept the risk transfer and ***risk acceptance*** – retaining the risk and accepting its potential impact within the business operation.

In most instances, those interested in transferring risk want to remove as much of the negative impact of a potential event as possible. Those who are willing to accept a risk transfer do so if the potential reward they receive is commensurate with the risk they will accept and, if they are profit motivated, that there is a realistic expectation the transaction will generate positive returns over time. This is similar to other business propositions and each party needs to find value in the transaction before it will proceed. In this way, risk becomes an item to be traded, not unlike a computer, a vehicle, a livestock herd or a farm. The greater the value and complexity of the item, the more information is sought by the parties to the trade. Those who are in the business of accepting risk want as much information as possible about both the risk and those who are initiating the transfer (the agricultural sector impacted by the risk).

Insurance Risk Transfer

In general, for a risk to be transferred ***through insurance*** it should be:

- *quantifiable* – it must be possible to assess the likelihood of an event occurring (frequency) and the extent of its impact (severity);
- *identifiable* – an insurance loss needs to be tied to or identified with a specific event, an insured peril and a time period;
- *random* – the timing of an insured event should not be predictable or influenced by the insured; and
- *priced appropriately* – the insurance transaction must be able to generate a premium commensurate with the risk being transferred and accepted.

The insurance concept is based on a principle of "pooling" premiums among insurance participants to cover losses due to specific risk events. In exchange for the premium, risk is transferred or spread to other insurance participants (the pool) over both time and geography. Annual surpluses accumulate in good years to pay for losses that could exceed annual premium in bad years and provide a return on investment where profit is a

motivator. Each individual producer, through the insurance policy, is transferring or spreading their risk geographically and over time (between years) to other producers and to the insurance industry.

In Canada, provinces regulate the insurance industry, and private firms that back the insurance policy must ensure they have sufficient capital reserves to honour their insurance commitment. To manage their exposure to widespread losses and preserve their capital position, many firms will diversify to other lines of insurance business or, more often, transfer a portion of the risk that they have accepted from producers to the reinsurance sector. Reinsurance is essentially "insurance for insurance companies" and many reinsurance firms operate globally and in multi-lines of insurance business (e.g. life, home, auto, marine, aviation, workers' compensation, agriculture, etc.). As a result, reinsurance provides an opportunity to spread risk and acts as a diversification strategy for insurance companies. In addition, reinsurance firms will often spread their acquired risk even further to other reinsurance/insurance providers known as "retrocession" or to capital markets known as "securitization".

Uniqueness of Agriculture Risk

The agricultural sector is unique to other insurance markets in that many forms of agricultural risk are highly correlated among insured farms. For example, commodity price risk affects most farms simultaneously. When prices are low for cattle or hogs they are generally low for all producers of these commodities. A downward trend in wheat prices often coincides with a similar decline for many other grains and oilseed commodity prices. An outbreak of avian influenza on one poultry farm can quickly spread to others or result in the quarantine of farms in a defined area and the destruction of flocks as well as loss of markets and reduced consumer confidence for the industry as a whole. This potential for impacts affecting many insured farms is in contrast to other forms of risk like house fires or vehicle accidents. The likelihood of a wide segment of insured vehicles being impacted simultaneously is remote to non-existent and specific events like war or conflict which might generate such losses are usually excluded from the insurance policy.

The unique aspects of agricultural risk often limit the participation of the private sector insurance industry in this market due to:

- the nature of the risk(s) in the agricultural sector and need for financial capacity to cover widespread and accumulated losses;
- the role of the public sector in risk management within the agricultural industry both in a planned fashion and in ad hoc assistance;
- the ability to derive sufficient and consistent premium income over time that is commensurate with risk exposures; and
- the ability to spread risks outward to the reinsurance industry in order to reduce risk exposures.

While agricultural risk presents many challenges to the insurance industry, it is not without opportunity. The risk facing farms in Canada are often not

correlated with agricultural risks in other regions of the world and with other insurance markets. In other words, a global reinsurance portfolio that contains exposure to drought in South America may not be correlated to weather in Canada. Insurance lines with exposures to aviation or marine losses are likely not correlated to agricultural risk in Canada. So this means that agricultural risk can be attractive as an offset to other forms of portfolio risk within the insurance/reinsurance industry.

Insurance Components

Developing an insurance program to cover any peril requires consideration of some basic components. The extent these components are evidenced within certain insurance designs may vary but a review is valuable in this preliminary stage and includes:

- Regulatory and contractual framework – insurance is a legally binding document and any insurance policy needs to conform to any acts and regulations in jurisdictions governing the insurance program. Parties transferring risk must honestly identify and present their risk exposures to those accepting the transfer. Parties accepting the risk transfer must demonstrate sufficient financial capacity to honour their commitment to the insurance policy and effectively communicate technical aspects of the policy in a clear and concise manner.
- Defined risk perils – the perils being insured should be clearly defined along with any specific risk exclusions or limitations in insurance coverage in certain situations. Defined perils ensure a clear understanding of the risk transfer arrangement and ensure that premium accurately reflects the risk exposure and coverage offered in the insurance policy.
- Value of benefits – the value of benefits (potential indemnity payments) within an insurance policy should reflect the actual losses incurred by the insured. Coverage should be based on a pre-defined, practical interpretation of the value of production or expenses.
- Eligibility and underwriting provisions – the insurance policy needs to define who is eligible to access the insurance coverage and under what conditions. In most agriculture insurance policies, farm management can have a bearing on the likelihood and/or severity of risk exposures. Underwriting provisions define minimum standards of insured behaviour and establish the basic parameters under which the insurance policy will be effective.
- Loss adjustment – procedures should be established to recognize and define the magnitude of an insurance loss under the policy. Loss adjusting procedures should be documented and carried out in a similar fashion so that a loss in one situation will be identical to another of similar magnitude.
- Data management – accurate data is important to estimate the aggregate losses and premium costs for an insurance design at inception. Procedures to ensure the ongoing and unbiased recording of losses (loss adjustment) relative to coverage offered under the insurance policy is required to refine premium cost estimates and reflect current risk exposures.

- Actuarial integrity – premium rates need to be adequate to reflect expected future losses under the insurance policy. Premium rate methodologies should be based on guidelines consistent with the Standards and Practice of the Canadian Institute of Actuaries Assessment and include: an estimate of loss experience and premium loads for catastrophic loss situations, an uncertainty margin, operating expenses, reinsurance costs and adjustments to ensure the insurance fund will be viable (self-sustaining) overtime.
- Moral/Morale Hazard and Adverse Selection - Moral hazard exists when the insured person deliberately takes action to cause a loss to occur. Morale hazard represents the inclination of an insured person to minimize their care of a crop/livestock once a loss situation has begun. Adverse selection occurs when participants attracted to the insurance program feel they can predict program loss outcomes or that premium rates charged for the insurance program underestimate their own risk exposure. While usually minimal, insurance policies and operating procedures should include provisions and procedures to reduce the occurrence of these negative impacts that if left unabated can result in higher losses and increased premium costs to all participants.
- Time – time is of the essence in an insurance option and parties to the insurance policy must ensure that time commitments are identified clearly and adhered to especially for things like: sign-up for insurance, payment of premium, notice of insurance acceptance and coverage, initiating a notice of an insurance claim, "in-field" loss adjustment, notice to appeal and final claim settlement.
- Segmenting the insured population – if segments of the insured population (ex. proximity of poultry barns, management practices) are known to exhibit higher or lower risk from the average, adjustments to coverage and/or premium can be made within the insurance policy to allow eligibility for insurance but recognize risk profile differences within the insured population.
- Communications – insurance is a technical risk transfer tool involving a negotiated transaction between parties and should be communicated in a clear and concise manner.
- Appeal mechanism – the insurance policy should define an appropriate appeal mechanism whereby parties to the insurance policy can identify issues of dispute and have them resolved in a unbiased and timely fashion within the parameters of natural justice.

Common Themes in Risk Transfer Options

There are common themes among all the risk transfer options identified in this paper whether: insurance with the private sector or government participation, a producer-based levy system or compensation. In each case, producers with a risk exposure wish to transfer this risk to others and, in all cases, the transfer has to be accepted before the transaction will occur. Each risk transfer option bears some cost to producers either in direct premium, conforming to on-farm management or bio-security standards, complying with information transfer procedures and/or time related aspects imbedded in the risk transfer.

Under each solution insurance or "insurance-like" principles may be able to guide the development process. For example, in a producer-based levy system, the levy should reflect the exposure brought to the program (premium assessment). Producers are responsible to ensure they provide accurate information about there farm, perils have to be specifically identified, procedures established to abate moral hazard and so on. So, the components of insurance previously identified will certainly apply to a producer-based levy system.

With respect to compensation, poultry producers expect government involvement. However, if they participate, governments will expect something in return for accepting the risk transfer and, even in the absence of a premium, a program design will likely adopt components of an insurance design. This is true with Wildlife Damage Compensation where specified species of wildlife are identified, the value of crop loss is relative to revenue from current production and commodity prices, a consistent "in-field" loss adjustment procedure is in place to identify the extent of damage, procedures to abate moral/morale hazard are established and time is of the essence in reporting damage.

Summary

Any risk transfer solution is based on a negotiated agreement between parties to identify, transfer and accept risk exposures. Essential information is required to design an appropriate risk transfer tool for all parties and insurance principles or an "insurance-like" platform may offer a technically sound basis on which to build an appropriate risk transfer solution or combination of solutions for the poultry industry in British Columbia.

Risk Analysis Of The BC Poultry Industry
Second Interim Report – Part 2
Benefit Cost Analysis

Prepared For

Risk Analysis Steering Committee

On Behalf Of The Poultry Advisory Management Committee

Investment Agriculture Foundation

Victoria, BC

Prepared by

Serecon Management Consulting Inc.

Calgary, Alberta

April 23, 2007

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List Of Figures And Tables

List Of Acronyms

AAFC	Agriculture and Agri-Food Canada
AI	Avian Influenza
BCA	Benefit Cost Analysis
BCMAL	BC Ministry of Agriculture and Lands
BCMOH	BC Ministry of Health
BCR	Benefit Cost Ratio
CAFI	Canadian Agriculture and Food International
CAIS	Canadian Agriculture Income Stabilization
CCWHC	Canadian Cooperative Wildlife Health Centre
CFIA	Canadian Food Inspection Agency
COP	Cost of Production
FAD	Foreign Animal Disease
GMP	Good Management Practices
HOA	Health of Animals Act
NPV	Net Present Value
PSRMP	Private Sector Risk Management Partnership
PVB	Present Value of Benefits
PVC	Present Value of the Costs
SPFG	Sustainable Poultry Farming Group
TRQ's	Tariff Rate Quota's
WTO	World Trade Organization

Conceptual Framework Of Analysis

Introduction

This is the second part of the second interim report. This analysis builds on the risk mitigation options and gaps that have been identified in part one of this second interim report.

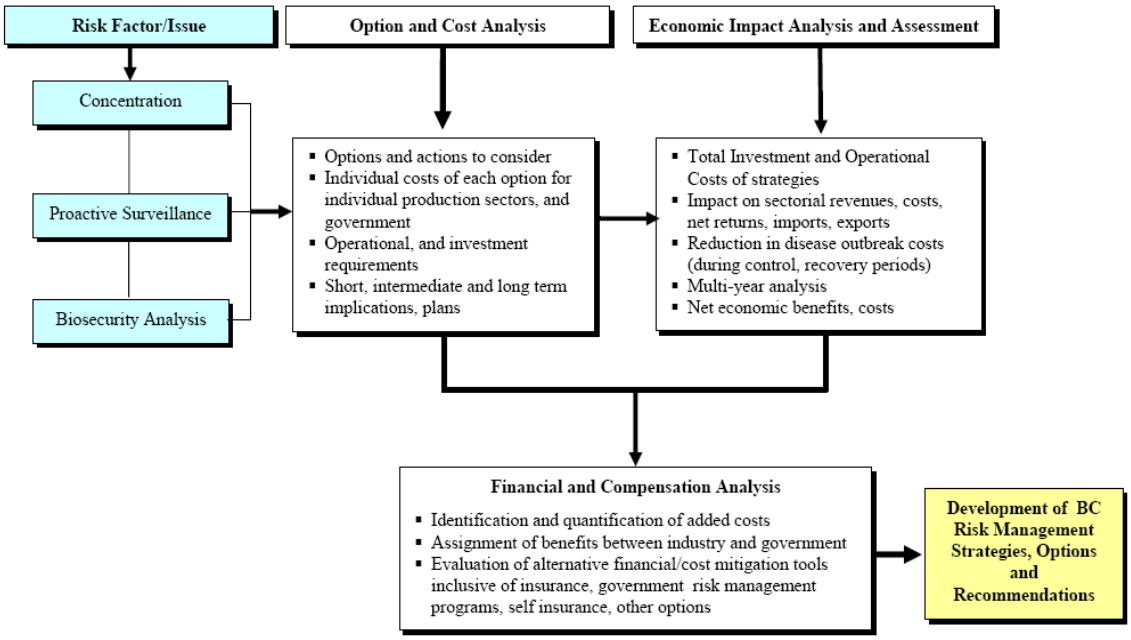
In consultations with the RASC, the analysis is now focused on four main areas: industry concentration, active surveillance, universal biosecurity, and compensation and financial issues.

The structure of the analysis in this section of the report can be best described in the schematic below.

From the major risk factors, the immediate steps are to first develop and cost out the different risk mitigation strategies. This leads to the benefit cost analysis of these options, which will be done in the context of an investment analysis model. The financial and compensation analysis will be included in the next report on strategies and recommendations.

The next major stages of this study to be addressed in the projects next phases, will be the integration of all the analysis and results into a comprehensive risk strategy and recommendations for the industry.

Figure 1: BC Risk Management Cost and Impact Assessment Model



Analysis Framework

A fundamental aspect of the development, evaluation, and implementation of a risk management strategy for the BC poultry industry, is to assess the financial reasonableness of undertaking such a comprehensive and integrated approach to poultry animal disease risk management.

The previous phases of this study have identified a number of risk gaps, leading to the selection of a set of integrated infrastructural and operational actions, policies, and changes that could be made to position this industry to better manage the financial and economic consequences of future poultry animal disease outbreaks. The important questions are what these proactive changes will cost, and will there be a net benefit in undertaking these actions.

One conventional way of answering such questions is through the use of benefit cost analysis (BCA) tools.

BCA is relatively simple to conceptually illustrate, but in practice is much more complex to apply, particularly as related to animal health disease situations. A BCA approach is a comprehensive analysis tool that compares all the benefits (both private and public) of a desired action or investment, and compares them to all the direct and indirect costs of the undertaking. The costs and benefits are measured over the appropriate time horizon for the investment, and express these costs and benefits in constant value terms. Constant value in the context of this analysis, is defined as removing the impact of all expected inflation from future cost and revenue.[1] The constant value of the costs (PVC) and constant value of benefits (PVB) are compared to establish the net present value of the project or investment:

Net Value (constant $)	=	**Value of Benefits (constant $)**	-	**Value of Costs (constant $)**

The BCR is expressed as the ratio of benefits to costs, or:

BCR	=	**Value of Benefits**	/	**Value of Costs**

The investment decision of any major course of action or investment is made in the context of the balance of the value of benefits and of the costs to achieve these benefits.

[1] The constant value of $100 expected to be received one year from now is given by the formula V = FV/(1+r)^t, where V is constant value, r is the discount rate used(in this case the rate of inflation) and "t" is the number of years before it is to be received. In this example the constant value of $100 received one year from now is $98.04, for an expected inflation rate of 2%. This analysis does not utilize an investment hurdle rate which would be applied in standard investment analysis, which employs a desired rate of return and considerers both the relative risk of the investment, and inflation.

The major decision rules are:

If net value > zero, the investment has a benefit cost ratio (BCR) of greater than 1.0, and generally is an acceptable investment;

If net value < zero, the investment has a BCR of less than one, and generally not an acceptable investment;

If net value = Zero, the investment will have a BCR of 1.0, and typically one is indifferent toward the investment;

If BCR > 1.0 – 2.0 the investment or action is considered barely feasible; and

IF BCR > 2.0, the investment or action is strongly recommended.

It is noted that the BCA approach is closely analogous to a standard investment analysis. It is within this context, that the BCA analysis has been developed and applied to this risk assessment.

The development of a risk management strategy for the BC poultry industry is considered as an investment opportunity for the industry and government. The investment proposition is framed between how the industry and government can invest in a series of proactive structural and operational risk reduction initiatives, and what benefits will these actions have in reducing the costs of future animal health outbreaks on the industry.

Description Of Costs And Benefits

The basic model for this BCA analysis is to evaluate the value of the costs and benefits (expressed in present day, 2007 dollars) of industry and government proactively investing in structural and operational changes to reduce the frequency and intensity of future animal disease outbreaks in the BC poultry industry. As has been indicated above:

Net Value (constant $'s)	=	**Value of Benefits (constant $'s)**	–	**Value of Costs (constant $'s)**

Where the benefits are determined by:

- The difference between the expected financial and economic returns of the poultry industry given a proactive risk management response strategy undertaken by the industry, and the financial and economic returns for a future where no significant action is taken, and the industry faces continued animal disease outbreaks.
- These benefits are inclusive and measured at the level of the primary production industry, the value added processing sector, and at the consumer level, inclusive of the impacts of changing exports and imports.
- The benefits are inclusive of indirect impacts of the industry on allied and secondary industries.
- The benefits are measured over a reasonable and relevant time period.

The costs are determined by:

- Identification of the set of structural and operational mitigating actions which collectively will have a significant impact on risk reduction for the industry.
- Identifying and costing out the investment costs (usually one time), and the on-going operating costs of each mitigating option.
- Aggregating of the costs.

The net benefits are determined by comparing the present value of the costs and the benefits to establish a net present value, benefit cost ratio, and rate of return to the animal health risk management strategy.

The steps that were followed in the BCA included:

- Development of the overall investment/BCA model for the analysis.
- Quantifying the expected net benefits of the expected future income growth of the BC poultry industry expected under three alternative risk management responses.
- Describing, and quantifying each of the structural and operations mitigation strategies to be applied.
- Integrating the costs and benefits in a benefit cost analysis.
- Determination of the net benefits and costs, and benefit cost ratios for alternative strategies.

Risk Strategy Investment And Benefit Cost Analysis

A comprehensive investment/economic analysis model has been developed for the analysis of the costs, benefits, and economic consequences of mitigation options. The model has a number of components that include:

- estimate of sector revenues, costs, profits for the retail, value added processing, and production sectors over a fifteen year planning horizon;
- development of a first set of costs with respect to the mitigation options for dealing with industry concentration issues, active surveillance, and universal biosecurity;
- determination of the net benefits of alternative strategies; and
- estimation of the overall benefit cost ratios, and individual cost benefit ratios for each risk response area.

The following sections outline the major elements of this analysis. The first sub-section targets on the description of the risk mitigation response options, and the estimate of their costs. This is followed by an assessment of overall benefits, followed by an assessment of the net benefits, and benefit cost assessments.

Risk Mitigation Response Strategies

Overview of Strategies

Based on the analysis provided by Serecon and input from RASC, three level of intervention or risk management response has been evaluated and become the basis of the risk management strategies industry and benefit cost analysis. It is recognized, that the risk mitigation options necessarily need to be considered as a cohesive package, that there is a degree of connectivity and complementarily that must be maintained between the options to make them effective. The three strategies are termed **nominal, intermediate**, and **comprehensive** risk management responses. What distinguishes these three response options is with respect to the levels of intervention than could be taken with respect to addressing infrastructural issues that primarily relate to industry concentration management. The operating practices and changes with respect to bio-security, surveillance, and a responsive financial management and compensation system, remain constant across the three levels of risk management response.

The description of the risk mitigation options are explained immediately below, and in more detail following Table 1. As described in the table, there are three possible options identified in this analysis each of the which are similar, except for the degree to which various infrastructural risk management strategies are utilized.

Nominal Response Option: No infrastructural changes contemplated, but with universal bio-security and active surveillance programs in place.

Intermediate Response Option: Some investment in infrastructural changes, and with universal bio-security and active surveillance programs in place as in the other options.

Comprehensive Response Option: Significant infrastructural changes, and with universal bio-security and active surveillance programs in place as in the other options.

Table 1: Overview of Risk Management Response Options

Risk Management Option	Infrastructural Changes Proposed	Operating Changes Proposed (equivalent for all response options)
Nominal Response	No significant changes proposed	1) Universal biosecurity system 2) Active surveillance program 3) Responsive financial management and compensation system
Intermediate Response	Segregation of high risk/high value flocks and policies and programs in place to arrest further concentration	1) Universal bio-security system 2) Active surveillance program 3) Responsive financial management and compensation system
Comprehensive Response	Industrial compartmentalization and segregation of industry into bio-secure clusters, and policies and programs in place to reduce further concentration.	1) Universal biosecurity system 2) Active surveillance program 3) Responsive financial management and compensation system

Detailed Description of Strategies

The specific and more detailed elements of the risk management actions that are proposed are detailed in Table 2. This first table distinguishes the different levels of infrastructure interventions proposed. Following the table, the detailed description of what is proposed with respect to biosecurity, surveillance, and financial management and compensation are outlined

Table 2: Detailed Risk Response Options Description - Infrastructure	
Category and Response	**Mitigation Options Description**
Infrastructure Response Options	
Nominal Response Option	➡ Current government policies with respect to the citing of facilities, proximity of poultry establishments to one another, and the integration of different types of poultry operations and non-poultry livestock operations remains and continues. ➡ The interface of rural and urban establishments, transportations systems, and competition for resources continues.
Intermediate Response Option	➡ Focus on policy, operating and management changes to deal gradually with issues that currently contribute to concentration – forward looking versus looking at major structural change of existing industry. ➡ Enterprise management polices, such as tree barriers, policies established for distance between barns, facilities, venting, etc ➡ Future facilities siting, subject to strict separation, set back policies ➡ Pro-active policies and strategies put in place to prevent location of incompatible livestock enterprises being located in close proximity to poultry operations which lead to cross species transfer of disease. ➡ All future buildings, new operations, subject to industrial risk segregation policies ➡ Existing high risk operations identified (limited to 6to 8), removed and re-established away from center of FV. These would include a number high risk, high valued production and breeding operations.
Comprehensive Response Option	➡ Segregation of high risk enterprises, high valued breeding flocks geographically separated, as indicated in intermediate response option ➡ Desired future industry structure model designed – stand alone poultry value chains established within FV, the Island, and Interior, each with breeders, hatching, growing, processing , and allied supply systems in order to decrease financial risk of domestic operations and to mitigate future export bans ➡ Geographic separation of regulated from unregulated and small flocks, ➡ Polices established for all future investment to achieve desired future industry model ➡ European model reviewed as to color zoning – supply, service, allied industries maintained within zones, by use of color coding, to restrict movement across unique bio-secure and separable zones (compartmentalization) ➡ Incentive system established to encourage industrial reorganization, and change ➡ Conflicts with existing policies that encourage uncontrolled, small scale livestock operations within concentrated areas removed. ➡ Segregation between poultry and other types of livestock production established ➡ Anticipated the aggressive movement of up to 57 broiler hatching egg producers, with 3 barns per producer in addition to the movement of the previously identified high risk, high valued flocks. ➡ Clearer policies developed between agricultural and non-agricultural/ urban investment, location, and practices.

These three items remain constant across all three scenarios.

- An universal bio-security system
- Active surveillance, and
- A responsive financial management and compensation system.

These are elaborated upon below.

Active Surveillance

Active surveillance program designed within existing CFIA policies, with compliance policies established for industry, and fully communicated to all stakeholders.

- Program designed with identification of surveillance triggers, with respect to factors such as mortality rates, feed, water consumption levels, etc., which would result in active testing, surveillance. With effective triggers, frequency of surveillance can be minimized.
- Initial surveillance "sweep" conducted and recognized to likely lead to at least low pathogen detection, temporary industry shut down, limited depopulation, and negative consumer market reaction – financial implications quantified and anticipated.
- All members of regulated and unregulated industry would be part of the active surveillance program.
- Incentives, compensation and cross compliance policies established and in place to ensure compliance and success of the surveillance program.

Universal Bio-Security System

- Full and comprehensive biosecurity programs established, and enforced within the regulated poultry sectors (mandatory, audited)
- The allied industries are provided incentives, compliance protocols to follow biosecurity protocols (required)
- Non-regulated poultry industries are influenced to participate in biosecurity programs through incentives, the ability to participate in compensation programs, insurance programs
- Non-regulated industry as a minimum to be part of premises ID system, and nutrient management protocols
- Comprehensive and proactive communication, reporting, system established for animal health management issues between all participants in poultry industry – regulated, non-regulated, small flocks, speciality, processing, government, etc.

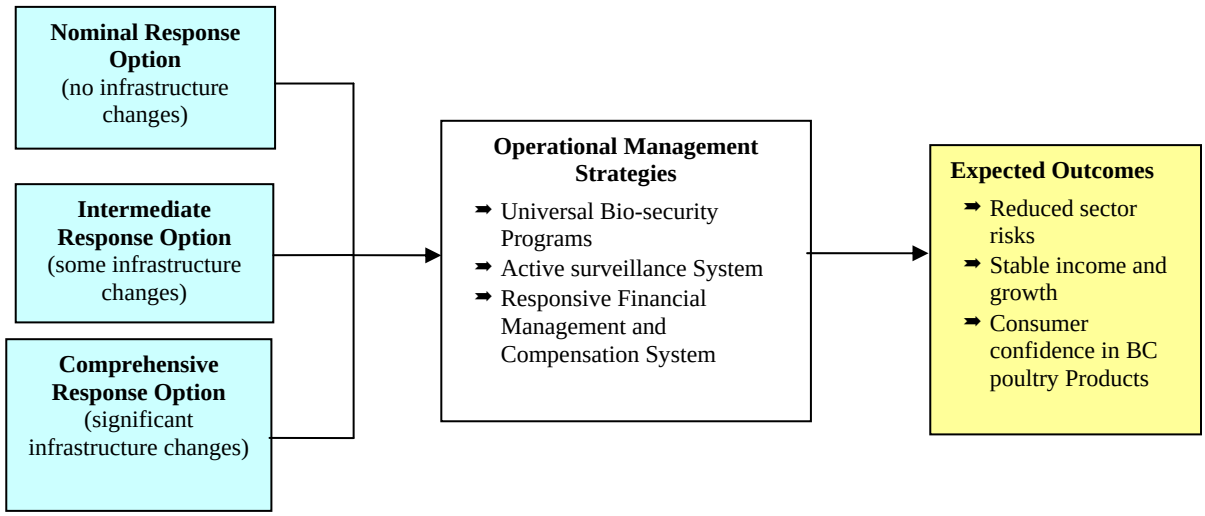
Responsive Financial Management and Compensation System

- Incentive based, integrated insurance, compensation, investment, risk management system developed and implemented (insurance risk management would need for other provinces to be included)
- Participants in system would practice acceptable level of GMP's, inclusive of enhance biosecurity, premises ID, traceability, surveillance, etc. The practice standards would be necessary insurance standards, and required for inclusion.
- System would be through a single (likely not-for-profit) agency, integrate the existing CFIA, AAFC, private insurance, and industry self insurance support systems
- Cover risks of reimbursements for affected/destroyed animals, attendant costs of named perils disease, business interruption, legal liability risks, export markets risks
- Inclusive of a "investment" component to facilitate response of industry in making the operating and structural changes recommended in this strategy paper.
- System would be designed as a PPP (public private partnership), and likely attractive to government as it integrates their animal risk management responses (both federally and provincially), reduces costs of administration, and market responsive.
- Potential to integrate new federal government proposals to introduce new NISA like government income stabilization programs.

The responsive financial management and compensation system will be further elaborated on in the final strategy report.

Figure 2 illustrates the poultry risk management options for clarity

Figure 2: Overview of Risk Management Response Strategies



Risk Response Cost Analysis

Each of the individual risk responses areas has been costed by major activity. The model has evaluated these annually over the fifteen year planning horizon. The summary results are shown below. In each, costs are considered to be borne by industry and governments. Future allocation of costs can be determined by the stakeholders. In most categories, the costs are inclusive of those that are for the planning and policy development functions, the investment that would be required, and on-going operating and administration costs.

Where possible research and data has been used from other jurisdictions, from consultations with industry and RASC, and in some cases, estimates have been made. These costs should be considered a first approximation. Further more detailed work outside the scope of this project would need to be done, to better quantify these costs, after a decision is made on a preferred option.

The costs are discussed by category below. A table summarizing these costs follows the description.

Infrastructure Investment and Operating Costs

The three identified levels of action that could be taken with respect to the management of infrastructure risks, define the differences between the costs of the three risk management response options proposed: nominal, intermediate, and comprehensive responses to risk.

Nominal Response Option: Under this option, there are not anticipated to be any comprehensive policy or program actions taken to change the actions of industry with respect to how it manages concentration issues. As such, no incremental costs are budgeted for this option with respect to infrastructural adjustments.

Intermediate Response Option: The major costs are with respect to industry and government making a number of structural changes, but without proactively and aggressively dealing with the larger issues of existing concentration. This option does see however, the removal of a selected high risk, high valued poultry operations. These will be limited to some 6-8 high risk production and breeding operations, whose costs of re-location to lower risk areas would be subsidized. The existing land would not be allowed to come back into poultry operation. This costs of removal of these operations (excluding land costs) is approximated at $6-7 million, reflecting a unit cost in the order of $900,000 to $1 million, and for an estimated 6-8 operations. Other possible action in this option, is to require the covering of outdoor flocks (as is done in Quebec) as a risk reduction option, requiring an allocation of an additional $5.0 million. In addition, the costs of policy design, implementation and management are included.

Comprehensive Response Option: This option envisions the allocation of a considerable amount of money for proactively reducing or mitigating the risk impact of the existing level of concentration in the Fraser Valley. This option looks at the design of, and the development of a strategy whereby the BC poultry industry is gradually compartmentalized, or segregated into independent economic value chains, or bio-secure clusters. This strategy and plan would include the possible aggressive movement of up to 57 broiler hatching egg producers, with 3 barns per producer in addition to the movement of the previously identified high risk, high valued flocks. The costs of the added flock movement is estimated at $51 million to $102 million. This cost is estimated on the depreciated value of existing barns estimated at $300,000 and $600,000 per barn.

An allowance is made for increased operating costs due to the new location, and for the movement of related infrastructure (feed mills, hatcheries. This added cost is $8 million and $15 million added to the two estimated costs of moving the barns.

Active Surveillance Costing

This related cost with respect to the design, on-going field sampling, initial sweep cost, as well as on-going laboratory costs are included. This cost is inclusive of the existing costs of passive surveillance. Costs were estimated as practical, based on unit costs of surveillance per farm, and expected frequency of surveillance. It should be recognized these are inclusive of both government and private sector planning and implementation costs over a fifteen year period. This cost in nominal terms is about $1.6 million per year.

This system is again based on the provision of resources to assist in compliance and recognizes the need for a compensation backup system.

Universal Biosecurity Costs

It is anticipated the costs of biosecurity are and will be one of the greater cost areas over the fifteen year projection period. The costs included here, are inclusive of the producer and processors costs of implementing and maintaining a bio-security. The other main costs are for auditing, and for bringing in the allied industries into an industry wide bio-security system. It is recognized that the industry is currently moving toward a system of bio-security. These costs are inclusive of these costs and of the broader costs of extending the bio-security system to allied industries, and bringing in the non-regulated industry under the program. These costs for both government and industry amount to about $1.9 million per year in nominal terms.

The costs for the three options are detailed in Table 3. Following this table, the individual costs are combined to single total costs for each option.

Table 3: Detailed Risk Management Response Cost Options, by Category (nominal dollars)

Description	*Costs $ millions*	*Total Costs $ millions*
Nominal Response Option (Infrastructure Costs Only)		
No Costs Allocated, Total	0.0	
Total for Option		0.0
Intermediate Response Option (Infrastructure Costs only)		
Policy development	0.1	
Tree shelters, other structural modifications	4.9	
Movement high risk enterprises, outdoor flock covers	12.0	
Total for Option		17.0
Comprehensive Response Option (infrastructure Costs only)		
Design and policies	0.1	
Implementation and mgt	1.4	
Movement of high risk enterprises, covering of flocks	12.0	
Movement of 57 producers, 3 barns each cost range	51.0-102.0	
Movement of other enterprises ($51 and $102 m)		
Related operating and infrastructure costs	8.0-15.0	
Total for Option		73.0-131.0
Active Surveillance		
Design	0.5	
Sampling/collection cost	4.0	
Laboratory cost	4.0	
Initial sweep costs	1.5	
Compliance Costs	15.0	
Total Surveillance Cost		25.0
Biosecurity Programs		
Implementation producers	3.5	
Implementation, processors	4.0	
Implementation allied industries	1.5	
Auditing and compliance	12.0	
Implementation Costs, for non-regulated	7.0	
Total Biosecurity Costs		28.0

Summary of Response Option Costs

The total costs for each of the three response options are summarized below. It should be noted the costs here are expressed in nominal terms in millions of dollars. The subsequent use of these costs in the benefit cost analysis will be adjusted for the impacts of inflation. In summary, the 15 year costs are estimated at $53 million for the nominal response option, $70 million for the intermediate response option, and to range between $126 and $184 million, (depending on barn movement costs) for the comprehensive response option.

Nominal Response Option:

Infrastructure Adaptation Costs:	$00
Active Surveillance Costs	$25
Bio-security Program Costs	$28
Option Total	$53

Intermediate Response Option:

Infrastructure Adaptation Costs:	$17
Active Surveillance Costs	$25
Bio-security Program Costs	$28
Option Total	$70

Comprehensive Response Option:

Infrastructure Adaptation Costs:	$73-131
Active Surveillance Costs	$25.00
Bio-security Program Costs	$28.00
Option Total	$126-$184

Benefits Of Risk Management Strategies

Conceptually the benefits of investing in a proactive risk management strategy relate directly to the degree to which the strategy can reduce future animal health disease financial and economic risks. The benefits have been estimated using an economic model which has been developed for this purpose.

The benefits to the industry and government of investing in a proactive risk management strategy are defined by what economic difference the chosen strategy could make, relative to the industry not having a risk management strategy.

The non-response option, termed the "baseline" in this analysis, reflects a situation where the industry does not make an investment in a universal bio-security program, no active surveillance is put in place, and no efforts are undertaken to arrest or to reduce the issues of poultry livestock concentration facing the industry. This baseline situation is expected to lead to continued outbreaks of indeterminate frequency over the next 15 years, and likely of an increased l intensity of each outbreak as well.

This baseline measure of future industry expected profits is inclusive of all levels in the industry value chain (production, processing and retail sector) and becomes the benchmark against which the possible benefits of undertaking one of the proposed options are measured.

The baseline scenario sees the industry profits continuing to decline on a regular basis, punctuated on occasion by animal disease outbreaks, of an intermediate nature. The expected frequency is modelled at once every three to four years.

The assumptions used in the economic and risk analysis model for the alternative scenarios and strategies are indicated in Table 4.

The frequency is a critical assumption in the analysis. The evidence is growing to support increasing frequency of outbreaks in Canada and other countries. In BC, there has been two AI (one high pathogenic and one low pathogenic) in 2004 and 2005. In addition in 2006 the industry has been affected by other outbreaks such as ILT. Evidence from the US (and reported in the first interim report) indicates that in the last three decades, the incidence of AI outbreaks has doubled (four outbreaks between 1975-1984, five outbreaks between 1995-94, and ten outbreaks between 1995 and 2004)[2].

The other important assumption is with respect to intensity. One reference point the industry has is with respect to the impact of the 2004 AI outbreak. In this outbreak an estimated 17 million birds were destroyed. Assuming

[2] US Department of Agriculture Low Pathogenic Avian Influenza Voluntary control Program and Payment for Indemnities, Sept 2006.

Table 4: Risk Impact Variables for Alternative Scenarios			
Risk Option Scenario	**Frequency [1]**	**Intensity [2]**	**Post Outbreak Recovery Rate[3]**
Baseline Scenario	3-4 years	5%	1%
Nominal Response Option	6-7 years	4%	1.25%
Intermediate Response Option	6-7 years	3%	1.75%
Comprehensive Response Option	6-7 years	2%	2.5%

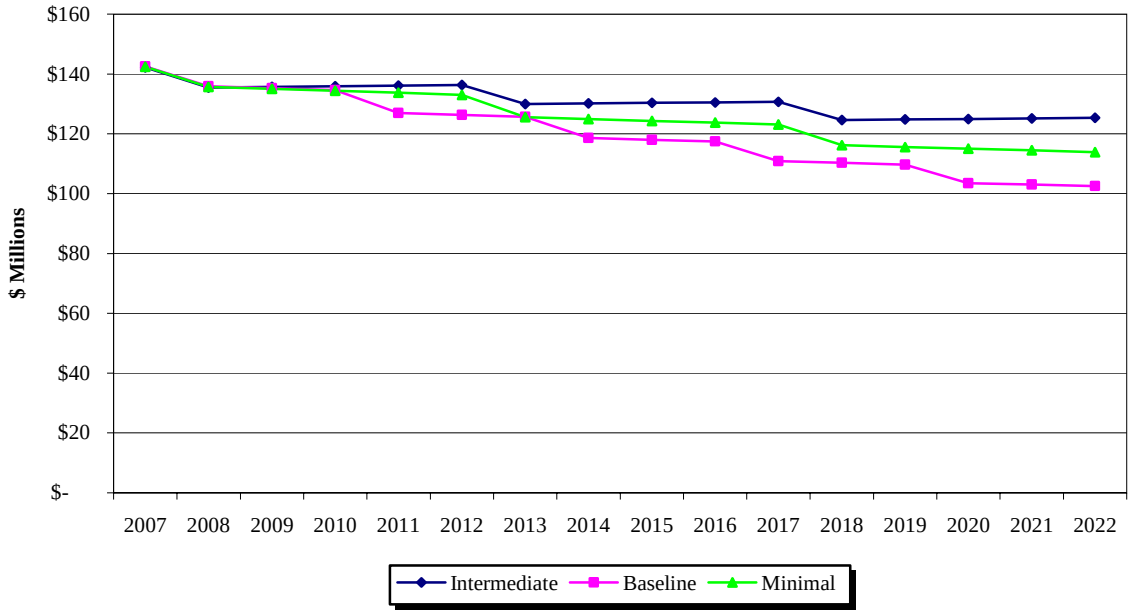
[1] Estimated number of years between animal disease outbreaks. Note that the frequency between the nominal, intermediate and comprehensive options are not significantly different as all have the same level of expected biosecurity and surveillance, only different infrastructure management policies
[2] Intensity is a measure of the degree to which net incomes are reduced in the BC poultry industry within a single year.. This is the same as depopulating, or the removal of the income of that proportion of the industry for a whole year.
[3] The annual post rate of recovery is the rate a which the industry is able to recover the lost income, after an outbreak

an annual gross bird production of over 110 million, this represents about 15.0% impact or intensity for that outbreak. This level of impact or intensity is considered to be a one time event, and would not likely be repeated in another similar outbreak. As such, significantly lower intensity impacts are used in the analysis.

Figure 3 below, projects the industry net profits (in 2007 dollars) for the baseline, and for the three possible risk management response options. As illustrated, without undertaking any proactive risk management strategy, the frequency, but more importantly, likely the intensity of each resulting animal disease outbreak will increase, leading to a decline in the profitability of the industry.

The other three response options results in gradually improving levels of income performance relative to the baseline scenario. The comprehensive response option results in the industry at least being maintained at its current level of income and investment over the next 15 years. This implies that in nominal terms, the industry would be growing at approximately the rate of expected inflation, or 2%.

Figure 3: Projected Industry Profits (Retail, Processing, Farm Level) for Alternative Risk Management Response Strategies ($2007)



The net benefits (without any consideration of costs) of undertaking this risk management strategy are calculated by the difference in the net returns between the baseline scenario, and of the returns of each respective response strategy that may be chosen. The net benefits are inclusive of the projected net incomes of the primary, secondary processing, and retail sectors.

The irregular nature of the projected net benefits of each scenario relate to the expected frequency in which future disease out breaks may occur. The net benefits of any scenario or response option are anticipated to be very low in the first few years of the projection period. One reason for this is the anticipated impact of an initial "sweep" under an active surveillance program and its likely triggering of the detection of an animal disease virus. This would result in an immediate limited industry shutdown, some depopulation, and a potential backlash in consumer perception and reduced product demand.

However, in the future, the anticipation would be that the magnitude and frequency of disease outbreaks would decline under the proactive strategies. The net benefits would gradually grow under each of the scenarios, with the responsive option achieving the greatest net benefits.

Figure 4: Annual Net Benefits of Alternative Risk Management Responses ($2007)

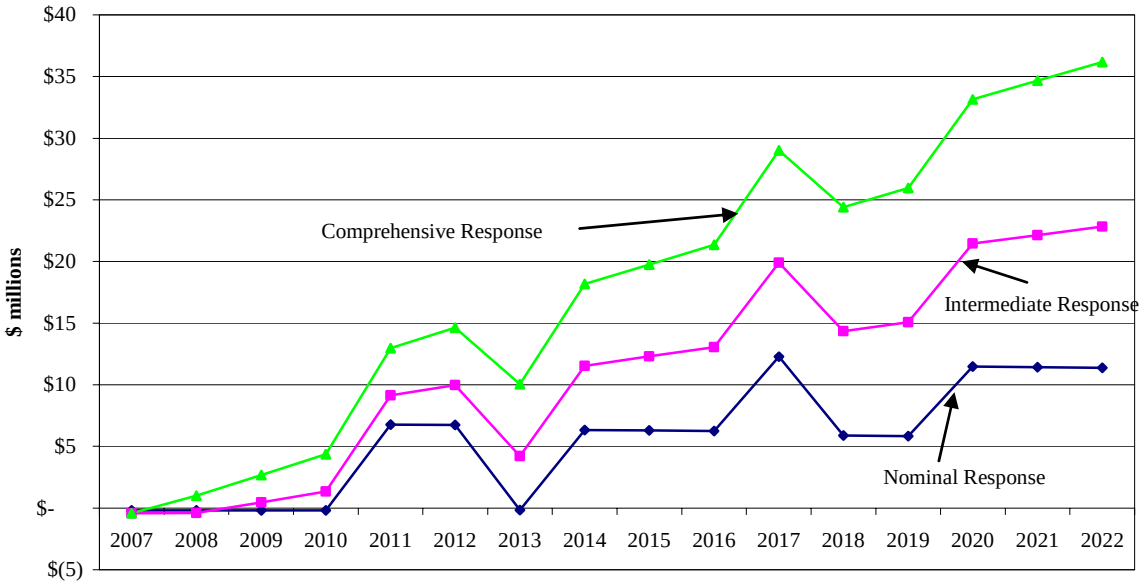
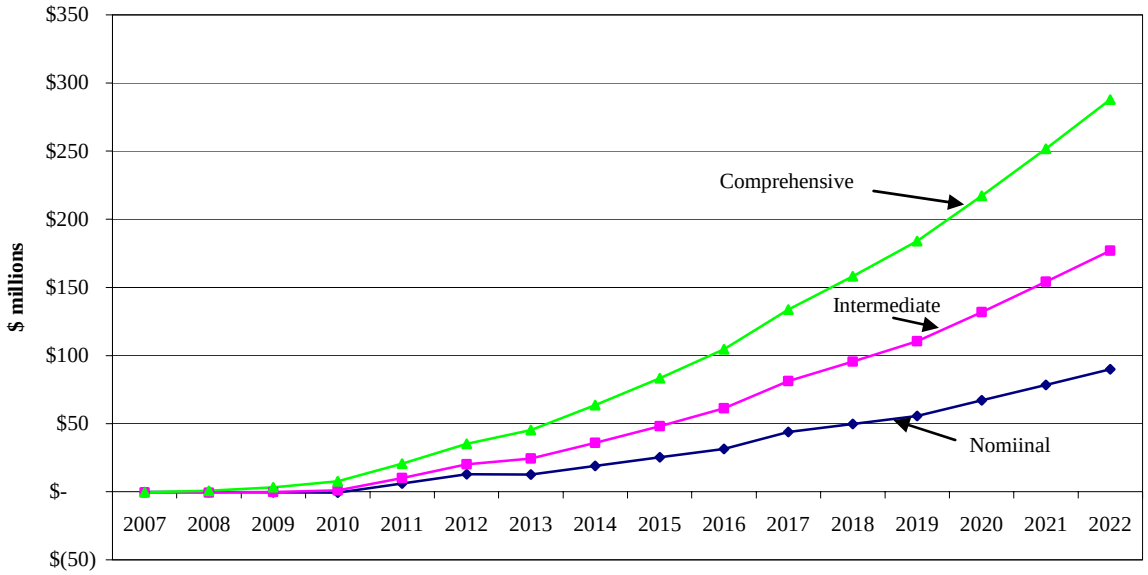


Figure 5 expresses the net benefits anticipated within each strategy on a cumulative basis over the fifteen year planning period. The cumulative net benefits (in 2007 dollars) of the nominal response option are estimated at $90 million. For the intermediate and comprehensive response options, the cumulative net benefits are expected to reach $177 and $288 million respectively.

It should be noted these are net benefits with respect to gains in net income expected between the baseline scenario and each of the response strategies. They are not yet reflective of the costs that will need to be incurred to achieve these benefits. This is developed in the next section.

Figure 5: Cumulative Net Benefits of Alternative Risk Management Response Strategies ($2007)



Integration Of Costs And Benefits Of The Risk Management Strategies

This section combines the expected net benefits of each possible risk response strategy, with the costs and investments that need to be made to achieve these expected results. The costs that need to be made have been included in the economic model and allocated to the period in which they are expected to be incurred. These costs are those that were estimated in the earlier section of this report by response option.

Figures 6, 7, 8 and 9 provide an illustration of the costs and net benefits for each of the response options, on a cumulative basis. Presented in this way, it is possible to visualize when the benefits of a particular strategy would be sufficient to cover the costs and investment of that strategy.

With respect to the nominal response options (Figure 6), the benefits of the strategy are expected to cover the costs (or breakeven) about nine years into the future, or about 2016. For the intermediate response strategy, the breakeven point is reached first, in about seven and one-half years, or between 2014 and 2015.

For the comprehensive option, two scenarios have been prepared, given two levels of costs that could be incurred in the removal of the 171 barns

from the 57 possible broiler operations. Note that the comprehensive option include the potential removal of some 171 barns (three barns per premise), plus the removal of a limited number of high risk, high valued operations as indicated in the intermediate option. The breakeven point for the lower cost alternative is reached at about the same time as the nominal response option, or in about seven years. For the higher cost comprehensive option, the break even is not reached until the year 2018, or not for 11 years.

Figure 6: Nominal Response Cumulative Costs and Benefits ($2007)

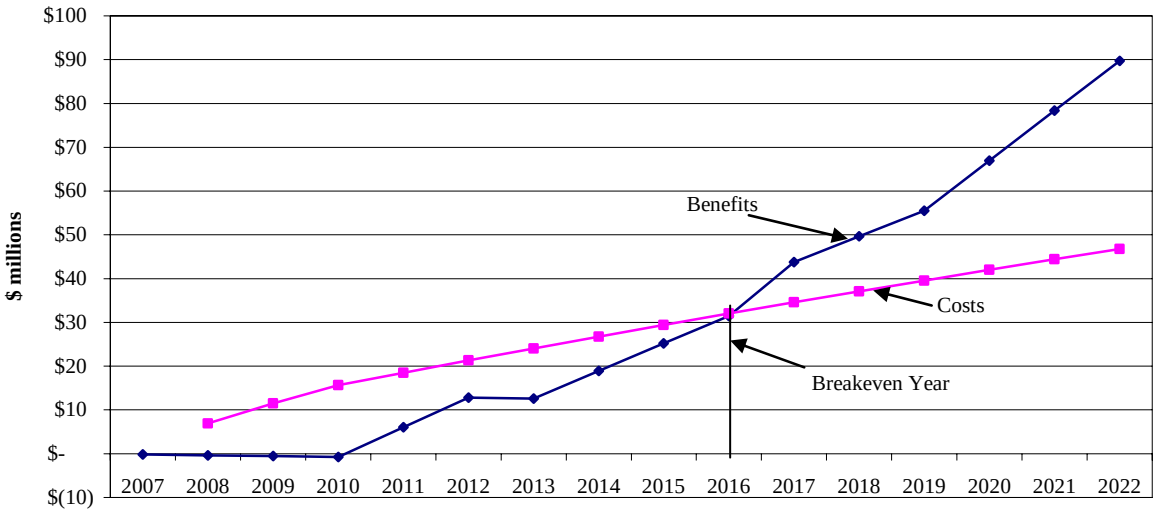


Figure 7: Intermediate Response Strategy Costs and Benefits ($2007)

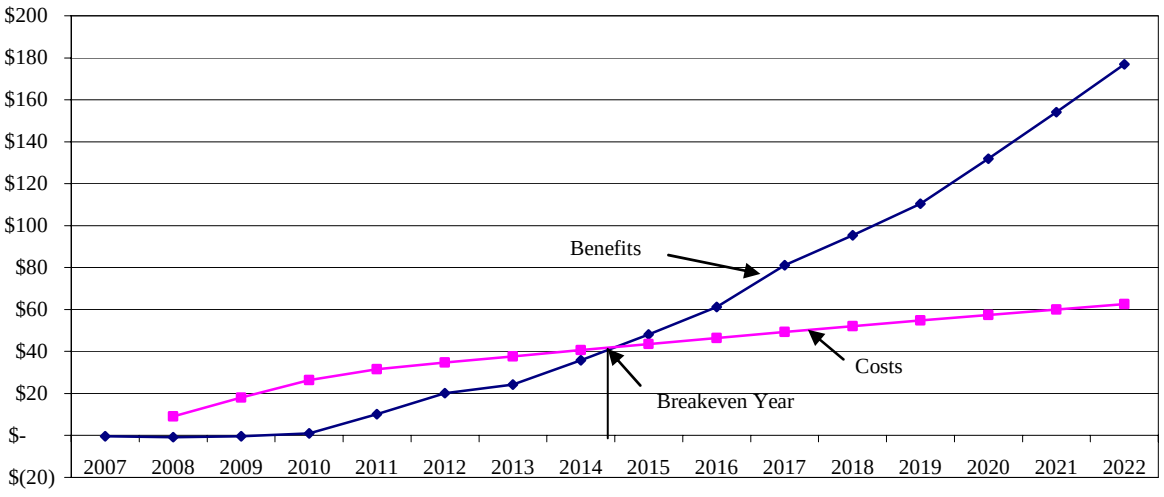


Figure 8: Comprehensive Response Strategy Costs and Benefits ($2007), Lower Cost Scenario

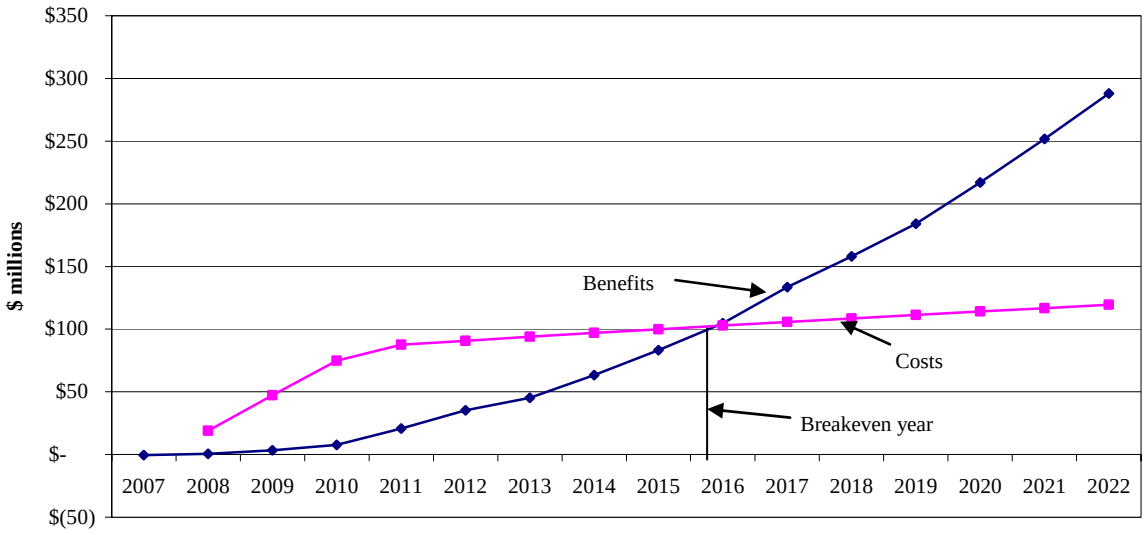
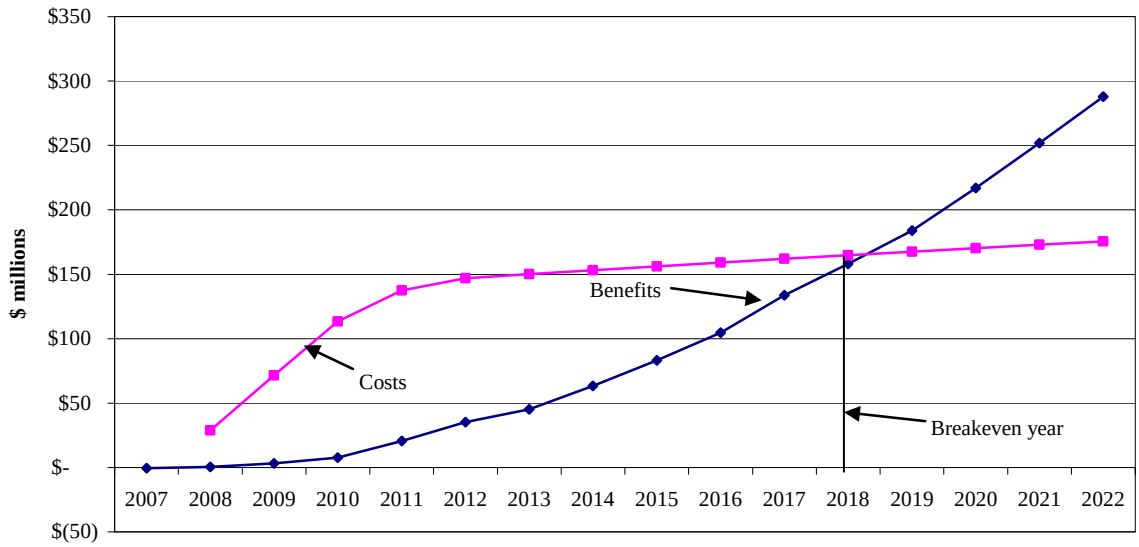


Figure 9: Comprehensive Response Strategy Costs and Benefits ($2007), Higher Cost Scenario



Benefit Cost Analysis

The benefits and costs of the various strategies are further integrated into a more formal analysis of the benefit cost ratios expected for each risk management response option. This is done in a step by step process to help the understanding of the method and the end results.

Table 5 provides the detail for the calculation of the net benefits for each of the possible response options. The net benefits are, as indicated earlier, the difference between the cumulative industry profits of each response option, relative to the baseline no response scenario. The net benefits range from $90 to $288 million for the three response options.

Table 5: Summary of Economic Impacts of Alternative Strategies
($millions, 2007 $'s)

Risk Management Response Options	Cumulative Profits	Change From Baseline
Comprehensive Response Option	2,209	288
Intermediate Response Option	2,098	177
Nominal Response Option	2,011	90
Baseline, No Response	1,921	0

The second part of the benefit cost analysis is to summarize the costs with respect to each major risk activity and for each suggested option. These costs, based on the cost estimates determined earlier, are summarized in Table 6. These have been adjusted for inflation, and expressed in 2007 dollars.

Table 6: Summary of Costs by Response Option and Risk Activity
($ millions, $2007)

	Infrastructure	Surveillance	Bio-security	Total
Comprehensive Option, High Cost	128	23	25	176
Comprehensive Option, Low Cost	71	23	25	119
Intermediate Option	15	23	25	63
Nominal Option	0	23	25	48

The benefits and costs from Tables 5 and 6 are integrated on Table 7, from which an overall estimate of the benefit cost ratios for the three suggested responses can be approximated. The benefit cost ratio for the nominal response option is estimated at 1.91. This infers that there is, based on the fifteen year planning period, $1.91 of benefit for each dollar of cost or investment made to achieve this result. For the intermediate option, the benefit cost ratio is expected to be 2.81, the highest of all options. For the high cost comprehensive option, a benefit cost ratio of 1.64 was determined, the lowest of all options. The lower cost comprehensive

option, results in a benefit cost ratio, of 2.42, slightly lower than for the intermediate response option. This analysis suggests a fairly substantive improvement in the expected improvements in risk reduction and net income gains, for investing in either an intermediate or a reduced scale comprehensive risk management strategy.

Table 7: Cost Benefit Analysis ($ millions, $2007))

Response Option	Cost	Benefit	Benefit/Cost Ratio
Comprehensive – High Cost	176	288	1.64
Comprehensive – Low Cost	119	288	2.42
Intermediate	63	177	2.81
Nominal	47	90	1.91

The last section of this benefit cost analysis is to develop an estimate of the benefit cost ratios with respect to the investment made with respect to the different elements of the risk management strategies – infrastructure, surveillance, and bio-security programs.

Table 8 provides the first step in this process, which is the allocation of the expected benefits by risk activity. In consultation with RASC, an allocation ratio was developed. This ratio was applied to the benefits of each of the three response options. A high weight is placed on surveillance, as if a H5/H7 low pathogenic virus can be detected and removed proactively, then the chances of having a high pathogenic outbreak are much reduced. Further, a strong and universal bio-security program is a very effective tool for reducing the spread, and reducing the intensity if an outbreak should occur.

Table 8: Allocation of Benefits by Risk Activity ($2007)

	Infrastructure	Surveillance	Bio-security	Total
Benefit Allocation	15%	50%	35%	100%
Comprehensive ($ millions)	43.19	143.97	100.78	288
Intermediate ($ millions)	26.53	88.44	61.91	177
Nominal ($millions)	13.46	44.88	31.41	90

The last stage of this analysis is to integrate the benefits as determined in Table 8, with the costs of each risk strategy. The final results are shown in Table 9. As indicated, the higher benefit cost ratios, and therefore impacts, appear to be related to a surveillance program, followed by bio-security program investments.

Table 9: Benefit Cost Ratio by Response option and Risk Management Activity

Cost Benefit Ratio	Infrastructure	Surveillance	Bio-security	Total
Comprehensive Option – High Cost	0.33	6.37	4.08	1.64
Comprehensive Option – Low Cost	0.60	6.37	4.08	2.42
Intermediate Option	1.72	3.91	2.51	2.81
Nominal Option	N/A	1.99	1.27	1.91

SUMMARY

This interim report has developed three major risk management response strategies to be considered by the BC poultry industry.

The three possible options[3] identified in this analysis are similar, except for the degree to which various infrastructural risk management strategies are proposed to be utilized.

Nominal Response Option No infrastructural changes contemplated, but with an universal bio-security and action surveillance programs in place.

Intermediate Response Option: Segregation of high risk/high value flocks and policies and programs in place to arrest further concentration, and with an universal bio-security and action surveillance programs in place as in the other options.

Comprehensive Response Option: Industrial compartmentalization of industry into bio-secure clusters, and policies and programs in place to reduce further concentration., and with an universal bio-security and action surveillance programs in place as in the other options.

It is critical to note that the universal biosecurity system and active surveillance are constants in all suggested response options.

Summary Analysis of Risk Management Response Options

Possible Response Option	Expected Total Long Term Benefit ($m,$2007))	Expected Total Costs	Time to Breakeven (years)	Benefit Cost Ratio
Comprehensive (High Cost)	$288	$176	11	1.64
Comprehensive (Low Cost)	$288	$119	9.0	2.42
Intermediate	$177	$63	7.5	2.81
Nominal	$90	$47	9.0	1.91

[3] These obviously are not the only options possible. These three give a useful and distinctive range of possibilities for decision makers to consider.