

Development of Model for Shared Costs in the Event of Foreign Animal Disease Outbreak

Prepared For
Animal Health Canada

Prepared By
Serecon Inc.

May 18th, 2022



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RE: DEVELOPMENT OF MODEL FOR SHARED COSTS IN THE EVENT OF FOREIGN ANIMAL DISEASE OUTBREAK

We have attached a copy of the report you commissioned regarding the considerations for the development of a model that could be used to identify how costs of a disease outbreak could/should be shared. In conducting this research, we have relied heavily on the theory of public and private good and how this has been applied both in Canada as well as across other jurisdictions.

This is obviously a significant issue for Canada as disease management requires all stakeholders to be motivated to make appropriate decisions during a stressful time. All decisions are made under sub-optimal conditions at best. On the other hand, committing to funding prior to a disease event – especially when this relates to industry recovery and welfare slaughter - is also challenging. Hence, we have focused the efforts on building the basic structure on how these discussions could proceed starting with the fundamental drivers coming from economic theory.

As a result, our conclusions need to be taken in the context described. We are not suggesting the % allocation, but rather how the shift along the spectrum can be defined, discussed, and compared to what has happened in the past. Essentially it is hoped it provides a basis for the negotiations that will ultimately determine where the decisions land.

Thanks again for the opportunity to work together on this project.

Yours truly,
SERECON INC.



Enclosure

/da

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1.0 Conceptual Basis for Cost Sharing Model

Problem Statement in Foreign Animal Disease Management Context

There is a sense of desperation felt by the supply chain members of any industry during the first few days of a foreign animal disease (FAD) outbreak. During this time, the decision-making process becomes strained, with subsequent management strategies having the potential to have impacts on communities and stakeholders outside the specific supply chain including the local and larger Canadian economy.

It is essential to ensure that the motivation for appropriate behavior to manage the outbreak is clearly articulated. Consequently, the potential cost and compensation allocation across stakeholders should be understood and agreed to in advance of a disease event. Given this is not currently in place, the lack of clarity would have a negative impact on disease management activities and the potential return to the new market equilibrium.

This discussion essentially becomes a process of division of responsibility between public and private good. Understanding and addressing this distinction is the first element of a successful cost sharing model and will be the focus of this report.

Defining Public Good

In 1950, Nobel Prize Winner of Economics Paul Samuelson attempted to define the concept of “public good” in an economic light, and these were defined as:

- 1) Non-rivalry of consumption meaning that one individual’s consumption of a good does not subtract from the consumption of other individuals good
- 2) Non-excludability meaning that the use of a good cannot be reserved for some and the good is available to all¹.

Due to the globalization of the livestock and crop market, the United Nations Development Program has defined “global public good” into three different categories:

- 1) Natural public goods which include climate, natural biodiversity, natural resources
- 2) Global public goods of human origin including education and culture
- 3) Global public goods resulting from policy which include public health, financial stability, and economics⁸

The National Farmed Animal Health Strategy (2006) now formally known as the National Farmed Animal Health and Welfare Council, defined in their Statement of Principles that Animal health, like public health and food safety, is a public good for which responsibility is shared by federal, provincial, and territorial governments.

¹ Eloit, M. The global public good concept: a means of promoting good veterinary governance. 2012. Rev Sci Tech Off Int Epiz. 31: 585-590.

Conceptualizing the
Legal and
Economic Aspects
of Public Good

While the Government plays a role in protecting Canadians from potential risks of animal diseases, the Private Industry recognizes its role it plays in maintaining Animal Health standards².

It is important to understand there are cost driving activities associated with ensuring public good during a foreign animal disease outbreak. To help implement and provide policy suggestions to ensure reliable and sufficient compensation mechanisms are in place for farmers during a disease outbreak response, it is best to understand the difference between a public good and a private good – in some cases compensation itself can be thought of as a public good being used to help offset the costs for the benefit of all that are incurred by a private stakeholder.

Public goods and private goods are distinguished by two features: **excludability** and **rivalry**. Excludability meaning the ability for an individual who can access/use the good or service. Rivalry refers to joint consumption meaning a good or service that is non-rival can be used by more than one person without reducing its availability to others, e.g., livestock market data³. This can be further grouped into a Somewhat Excludable (Club) category which is more closely linked to livestock industry considerations.

In 2009, Hobbs et al., published a study which categorized the differences between public and private goods within the context of a National Livestock and Poultry traceability system. The report aimed to characterize public goods, private goods, and goods with mixed features, identify strategies commonly used to provide public and private goods and assess the proposed Canadian Livestock and Poultry Traceability system in terms of its provision of public and private goods. The table below, was recreated from the report to show the delineation between public and private good based on the tenets of excludability and rivalry. Toll goods are often funded through a blend of taxpayer subsidy and private user fees such as a toll highway. Club goods are also non-rivalrous but somewhat excludable. These are goods whose benefits are shared among a specific group of individuals (or firms) – the 'club'. The costs of providing the good are shared among the club, and the benefits are limited to club members. An example would be membership in a national livestock group such as the Canadian Cattleman's Society.

² Animal Health and Welfare Council. Statement of Principles National Farmed Animal Health Strategy. 2006. Accessed from: <https://www.ahwcouncil.ca/pdfs/background-materials/StatementofPrinciplesDecember52006.pdf>

³ Hobbs, J.E., Kerr, W.A., Yeung, M.T. PUBLIC AND PRIVATE GOODS: The Canadian National Livestock and Poultry Traceability Program. 2009. © Her Majesty the Queen in Right of Canada, 2009. A34-13/2009E-PDF.

Table 1- Classifying Goods Based on Degree of Rivalry & Excludability. Adapted from Hill et al. 2009

	Rivalrous	Non-rivalrous
Excludable	Pure Private Good <ul style="list-style-type: none"> - Product differentiation - Individual firm or supply chain competitiveness - Supply chain efficiencies 	Toll Good <ul style="list-style-type: none"> - Traceability Information
Somewhat Excludable (club)		Club Good <ul style="list-style-type: none"> - Livestock disease emergency management (non-zoonotic) - Increased market access for affected sector - Industry Competitiveness - Industry Reputation
Non-Excludable	Common Pool Good <ul style="list-style-type: none"> - NA 	Pure Public Good <ul style="list-style-type: none"> - Emergency management for zoonotic diseases - Safer food supply system - Consumer confidence

The authors noted that the challenging aspect of defining the “Goods” in respects to a National Traceability Program is its potential to deliver a blend of public, private, and near-public goods. The authors determined that the blend of public, near public, and private good features of a National Livestock and Poultry Traceability program indicate that a combination of industry and public funding is appropriate for achieving effective traceability³. They concluded that there is not a straightforward formula for quantifying cost-share payments for public and private goods.

On the other hand, employing tools such as economic analysis, including a quantitative benefit-cost analysis, provide information in guiding public policy decisions. Ultimately, the outcome is dependent upon the political process of negotiation among federal government, provincial and territorial governments, and industry stakeholders³.

The key points that arise when attempting to define Public Good during a Foreign Animal Disease Outbreak include:

- They focus on maximizing marginal societal benefit and minimizing marginal societal cost.
- There is typically justification for public intervention when there is a market failure and/or when the net benefit of intervention falls over into a “third party”
- Public policy can be implemented to promote positive externalities which in this case would be activities that promote public good through “disease management activities”

- This can also be thought of as “compelling” or motivating individuals to produce a service that generates external benefit – unfortunately, the public gain cannot be effectively charged for that gain, thus presenting the public policy rationale.

To be clear, the literature does not justify public involvement beyond that which reflects the extent of the positive externality associated with the situation. Further, the extent to which public and private benefit separate will vary by the disease status – prevention, control, recovery. What is still required during a Foreign Animal Disease outbreak, is to fully identify and quantify the extent of the contingent liability which potentially affects all stakeholders.

2.0 Precedence

With the global population forecasted to increase to 9.2 billion by 2050 (UN DESA 2015) and the increased demand for animal protein in emerging markets such as India and China, the volume and intensity of livestock production must increase. Increased livestock production and intensification causes adverse environmental impact and increases the risk of infectious disease outbreak. With increased livestock production intensity, more animals are being produced in closer proximity to one another, leading to conditions favorable for large-scale disease outbreaks.

As of January 2022, there are currently over 11 million cattle, over 14 million hogs and over 800,000 sheep reported in Canada⁴. Emergency management of animal mortalities can encompass situations involving natural disasters such as floods, tornados, barn fires, or epizootic and zoonotic disease. In the last two decades, major outbreaks of epizootic and zoonotic pathogens such as Influenza virus A (Avian Influenza), Foot and Mouth Disease virus (FMDV) and Porcine Epidemic Diarrhea Virus (PEDV) have occurred around the globe, forcing countries to manage mass livestock mortalities (Alexander 2007; Park et al., 2013; Carvajal et al., 2015). Large-scale emergency management situations (Table 2) dealing with disease requires the biosecure disposal of carcasses to prevent disease dissemination to other animals and humans, as well as preventing environmental contamination (Wilkinson 2006; Gwyther et al., 2011).

Table 2- Summary of Recent Global Foreign Animal Disease Outbreaks

Country of Outbreak	Disease	Year of Outbreak	Animals Culled and Destroyed	Cost (\$)
Netherlands	Classical Swine Fever	1997-1998	12,392,000 swine	\$2.3 billion USD – Welfare slaughters cause up to 36% of the outbreak management costs
United Kingdom	Classical Swine Fever	2000	256,223 swine	£ 17.7 million British Pounds – 75,000 animals slaughtered as potentially infected costing ~ 4.4 million British Pounds – 180,00 pigs were deemed “welfare slaughter” and costed over £ 13 million British Pounds

⁴ Agriculture and Agri-Food Canada. Red meat and livestock inventory reports. 2022. Government of Canada. Accessed from: <https://agriculture.canada.ca/en/canadas-agriculture-sectors/animal-industry/red-meat-and-livestock-market-information/inventories>

Country of Outbreak	Disease	Year of Outbreak	Animals Culled and Destroyed	Cost (\$)
Japan	Foot and Mouth Disease	2000	740 cattle	¥ 1,231,000,000 Yen – ¥899 million Yen expended on Welfare slaughter costs ¥332 million Yen cost for controlling disease
UK5	Foot and Mouth Disease	2002	6.5 million animals	£5 billion British Pounds
Japan ⁶	Foot and Mouth Disease	2010	290,000	\$934 million USD Direct cost of culling accounted for more than half of the costs for managing the disease outbreak
Canada	Bovine Spongiform Encephalopathy	2003-2006		~ \$4.9-5.5 Billion CAD

Australian Approach to Compensation

Due to the geographic nature of Australia, the necessity to control animal diseases and facilitate effective strategies for dealing with foreign disease outbreak is paramount for maintaining the future and health of the Australian livestock industry. Within Australia, Animal Health Australia (AHA) is the independent national animal health body, bringing together federal, provincial, and local government and industry groups to deliver animal health and biosecurity to the country. To effectively manage animal health and biosecurity within the Country, Animal Health Australia (AHA) manages the Emergency Animal Disease Response Agreement (EADRA), a unique contractual arrangement between Australia's governments and industry groups to collectively reduce the risk of disease incursions and manage a response if an outbreak occurs (Animal Health Australia 2021)⁷.

The Emergency Animal Disease Response Agreement (EADRA) has incorporated integral objectives within the agreement to develop a robust framework to ensure that there are numerous approaches to identifying, controlling, and eradicating Emergency Animal Disease (EAD) outbreaks. The Australian developed EADRA is based on fundamental principles which connect industry producers and government agencies and allow for a consorted and agreed upon course of action for compensation and payment during an Animal Disease Outbreak event. These principles include:

1. Participation and Cooperation
2. Risk Management
3. Detection and Response

⁵ Whiting, T. 2003. Foreign animal disease outbreaks, the animal welfare implications for Canada: Risks apparent from international experience. *Can Vet J* 44, 805-815

⁶ Hayama, Y., Osada, Y., Oushiki, D., Tsutsui, T. 2017. An economic assessment of foot and mouth disease in Japan. *Rev. Sci. Tech. Off. Int. Epiz.*, 36, 207-215

⁷ <https://animalhealthaustralia.com.au/eadra/>

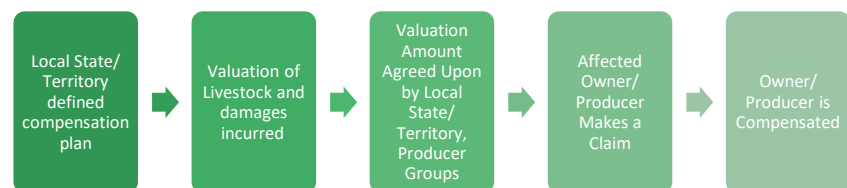
4. Cost Sharing
5. Training

Under the principle of cost-sharing, Animal Health Australia has defined that:

- Cost sharing is aimed at equitable contributions from all parties, commensurate with their respective resource base and status as a beneficiary of the response.
- The total amount of response costs that government and industry parties share in the event of an EAD is capped, depending on the size of the affected industry.
- EADs are categorised according to the impact they can have on livestock industry production (e.g., international trade losses, domestic market disruptions, production losses), human health and the environment. An EAD's category determines how much of the response costs are borne by affected industries in aggregate and how much by governments.
- A party that is not a beneficiary of the response is not required to share the costs, but neither does it have a say in determining the response.
- Compensation payable to an owner under state or territory legislation, which may vary from jurisdiction to jurisdiction, may be included in cost-sharing under the Agreement.

To determine the eligibility for compensation, there is legislation in each state and territory used to determine what animals and property are eligible for compensation. The EADRA is only activated when jurisdictions request cost sharing of the response cost, including eligible compensation. As stipulated in the Hazard Specific Plan, jurisdictions need to request the cost sharing of response costs, including compensation, by identifying in the Emergency Animal Disease Response Plan (EADRP) the response costs to be cost-shared as depicted in Figure 1 (Animal Health Australia 2017)³.

Figure 1:- Process Flow for Defining Animal Compensation in Australia



To determine the level of compensation a farmer/ producer will receive, a valuation is conducted to achieve an agreed upon amount between the producer and the state/ territory government that will be paid out in compensation during an emergency animal disease outbreak. Usually in valuation situations, "farm gate value" is the primary basis for valuation (Animal Health Australia 2021)⁸.

chrome-extension://efaidnbmnnnibpcajpcglclefindmkaj/viewer.html?pdfurl=https%3A%2F%2Fwww.animalhealthaustralia.com.au%2Fwp-

European Union Approach to Compensation

According to the Australian mandate, compensation under the auspice of an emergency animal disease outbreak costs associated with consequential losses which include but are not limited to loss of markets, loss of profit, loss of production and loss through damages paid for breaches in contract.

It is somewhat challenging to summarize the approach to compensation across the EU as they tend to deal with it both at the aggregate as well as the individual country level. In addition, the structure of the EU enables the restructuring of internal exports if necessary in order to reduce the pressure for welfare culling.

A review of the main documents suggest that there is little formal agreement on compensation arrangements other than that for disease control. The EU Regulation No 652/2014 clearly lays out the compensation for infected and related animals but there does not appear to be any guidance on how to deal with welfare or repopulation.

New regulation for EU – EU2016/429

There has been some recent changes to EU legislation regarding compensation. The bill EU2016/429 encompasses a more modern one health approach to animal disease management. As a consequence, it prioritizes and categorizes animal diseases of concern and links animal, human health, the environment and the link to economic wellbeing. Specific details on how compensation for recovery are vague but this is likely where that type of activity would be accomplished in the future.

An overview of the process

- I. European Commission Council Directive 2002/60/EC**
 - I. Legislation regarding general measures for the control of certain animal diseases
 - II. Establishes guidelines for protection and surveillance zones
 - III. Guidelines pertaining to disinfection, culling, eradication, testing and repopulation guidelines
- II. EU Regulation No 652/2014**
 - I. Defines compensation process
 - II. Co-funded by National Veterinary Programmes eradication, control and surveillance of animal diseases and zoonoses (veterinary program)
- III. Animal Health Law**
 - I. Disease Control Framework
 - II. Compensation Mechanisms
 - III. Detection and Response
 - IV. Defined roles for government, farmers and veterinarians
 - V. Adapt local regulations to larger Disease Control Mandate

Figure- European Union Approach to disease control, compensation and eradication adapted from Busch et al. 2021



Source: Busch et al 2021

United States Approach to Compensation

In the United States, the US Department of Agriculture (USDA) Animal Health and Plant Inspection Service (APHIS), are tasked with countering the spread of animal diseases within the United States, along with the monitoring and surveillance of these diseases. To effectively mitigate and control disease

outbreaks within the US livestock and poultry industry, it is encouraged for early reporting and culling, thus US farmers are compensated for animals which are euthanized referred to as "indemnity payments" (APHIS 2015)⁹. As defined by APHIS, indemnity payments are monetary payments made to a farmer for livestock mortalities more than the normal rate of mortality caused by adverse weather and animals and animal products taken/destroyed to control/eradicate a disease.

The valuation process employed by APHIS includes completing a total inventory of all livestock and livestock related materials i.e., feed, water, medications. According to APHIS, indemnity payments to farmers/ producers tend to be 100% of the amount to determine the amount of total indemnity, APHIS uses this formula:

$$\text{Market Value of Animal} \times \text{Number of Affected Animals}$$

In the case of an African Swine Fever (ASF) outbreak detected in the United States, under the *Animal Health Protection Act*, this provides the broad authority to the Secretary of Agriculture to control, eradicate and prevent diseases and animal pests¹⁰. Under this Act, this also gives the authority for the USDA to administer indemnity payments to producers and processors. The USDA must approve any depopulation and/or destruction activities before the depopulation and/or destruction occurs.

With the large poultry industry in the United States, the USDA and corresponding State Authorities provide response and protection against highly transmissible infectious diseases throughout the American poultry industry. Under the Animal Health Protection Act of 2002, the USDA is permitted to provide indemnity payments to producers for the destruction of birds and eggs during an emergency response situation.

In addition, APHIS will compensate farmers/ producers for costs associated with virus destruction, disposal, and depopulation activities (USDA 2017)⁵. Regarding compensation for virus destruction, culling and disposal activities, farms must have established Flock Plans (biosecurity and emergency preparedness guide) to receive full compensation for the activities noted above.

2.1.1 USDA Virus Eradication (VE) Cost per Bird

Following the 2014-2015 outbreak of HPAI in the United States, APHIS had established a program for table-egg layer operations which was implemented to allow for a more streamlined and quicker process for having farmers compensated for culled animals due to virus eradication activities. The payments to farmers are based on a "per-cubic-yard Virus Eradication Flat Rate" for table egg laying birds and based on a "per cubic yard for Virus Eradication for table egg storage and processing facilities." The first payment was made in 2016 and

⁹ https://www.aphis.usda.gov/animal_health/downloads/animal_diseases/ai/ER-Appraisal-Indemnity.pdf

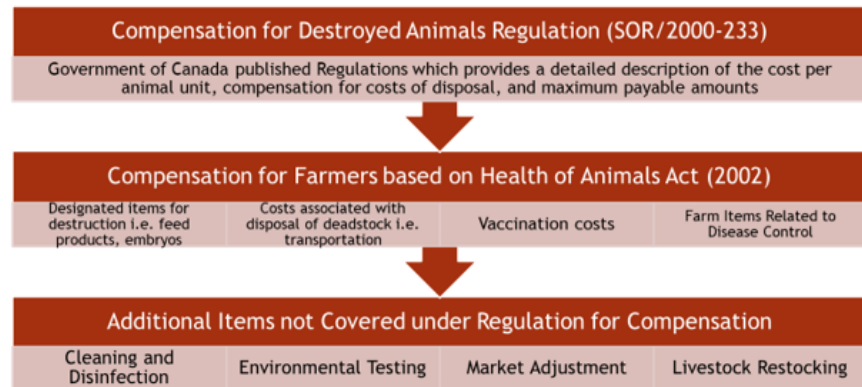
¹⁰ chrome-

extension://efaidnbmnnnibpcajpcgclefindmkaj/viewer.html?pdfurl=https%3A%2F%2Fwww.aphis.usda.gov%2Fanimal_health%2Femergency_management%2Fdownloads%2FASF-responseplan.pdf&clen=3092373&chunk=true

Canadian Approach to
 Foreign Animal
 Disease Management
 Compensation

following that, APHIS continues to reevaluate the Virus Eradication cost per bird based on current market trends. As noted above, the current per-cubic yard virus eradication flat rate for table egg laying birds equates to \$3.00 USD per bird and approximately \$0.40 per cubic yard of a processing and/pr storage facility (APHIS 2020)¹¹.

Figure 2- Illustration of the Various Compensation Mechanisms for Farmers and Livestock within Canada


 2.1.2 Compensation under
 Health of Animals
 Act

The Canadian government currently provides more than approximately \$5.5 billion dollars in support program funding to Canadian farmers to which much of the funding goes to various agricultural sector stabilization programs¹². Within Canada, any compensation paid to farmers during an emergency animal disease outbreak is compensated under the Health of Animals Act, under this act, the Canadian Food Inspection Agency is allowed to direct a farmer to destroy their animals under the pretences of disease control, and because of this culling, a maximum compensation amount is paid out and designated for various animal classes (Canadian Food Inspection Agency 2021). Under the Health of Animals Act, producers/ farmers may be compensated for:

- Slaughtered animals
- Other designated items for destruction including but not limited to feed or animal products
- Costs associated with disposal of deadstock including but not limited to transportation to and from the Infected Place to a Special premises for disposal
- Any equipment used for cleaning and disinfection
- Vaccination costs
- Fair market value of items required to be destroyed

¹¹ https://www.aphis.usda.gov/animal_health/downloads/animal_diseases/ai/hpai-elimination-flat-rate-laying-birds.pdf

¹² R Kröbel *et al* 2021 *Environ. Res. Lett.* **16** 055033 <https://doi.org/10.1088/1748-9326/abef30>

To determine the monetary value for compensation, the Government of Canada has published the “Compensation for Destroyed Animals Regulations” which provides a detailed description of the cost per animal unit, compensation for costs of disposal, and maximum payable amounts. A summary of the table derived from the Government of Canada can be found below.

Table 3- Compensation for Destroyed Animals Regulations adopted from the Government of Canada

Animal	Animal Family	Maximum Amount for Compensation per Animal Unit (\$ CAD)
Registered Cattle	<i>Bovidae</i>	10,000
Unregistered Cattle	<i>Bovidae</i>	4500
Registered Swine	<i>Suidae</i>	5000
Unregistered Swine	<i>Suidae</i>	2000
Chicken- Egg production	<i>Phasianidae</i>	30
Chicken- Parent Breeder- Egg Production	<i>Phasianidae</i>	60
Chicken- Grandparent Breeder- Egg Production	<i>Phasianidae</i>	120
Chicken- Parent Breeder- Meat Production	<i>Phasianidae</i>	60
Chicken- Grandparent Breeder- Meat Production	<i>Phasianidae</i>	100
Chicken- Primary Breeder- Foundation Stock	<i>Phasianidae</i>	1200
Turkey - For meat production	<i>Meleagridae</i>	70
Turkey - Parent breeder	<i>Meleagridae</i>	250
Turkey - Grandparent breeder	<i>Meleagridae</i>	700
Turkey - Primary breeder — Foundation Stock	<i>Meleagridae</i>	1050

Source: HofA Documentation

Canadian Set Aside
 Programs for
 Livestock

“Set-Aside” programs have been used within Canada to help cover increased costs of feeding and setting aside market-ready livestock due to emergency management situation related processing delays. These programs were designed to aid farmers and producers during emergency management situations including extreme weather events and Reportable Animal Disease outbreaks,

It is important to note that these “Set-Aside Programs” are not intended to compensate farmers for consequential losses due to fluctuations in market capacity and pricing. Their stated purpose was to help stabilize the market in order to maintain prices and prevent major swings in pricing (Canadian Cattleman’s Association 2004)⁷.

An example of the “Set-Aside” program being used was during the 2003–2004 outbreak of BSE in Canada. During emergency management situations including animal disease outbreaks, over-supply of market-ready cattle compared to the capacity at which processors can slaughter becomes very imbalanced leading to decreased cattle prices throughout the duration of these emergency management situations. During the BSE outbreak, two streams of “Set-Aside” programs were developed one for “Fed-Cattle” and “Feeder Cattle.”

Due to the on-going COVID-19 pandemic, the Government of Canada has committed funding to provincial agriculture and producer groups to help manage the costs of cattle being unable to go to slaughter, be processed and normally distributed due to the supply chain disruptions caused by the world-wide pandemic. In May of 2020, the Canadian government invested approximately \$50 million through AgriRecovery which is a disaster relief framework intended to work together with the core Business Risk Management programs to help agricultural producers recover from natural disasters¹³.

2.1.3 Fed Cattle Set Aside

The purpose of this program is to prolong the inventory of cattle until there is regained ability to slaughter and process animals back at normal rates prior to the development of the emergency management situation. Concurrently the program allows for market stabilization, while allowing for the maintenance of a stable slaughter rate of cattle throughout the duration of an emergency management situation (Canadian Cattleman’s Association 2004)⁷.

2.1.4 Feeder Cattle Set Aside

The purpose of this program is to assist the industry in managing the supply of fed cattle over a yearly period, as the ability to slaughter increases. This is different in comparison to the program described above in respects to the fact that farmers are paid a lump sum price under the conditions that their animals will not go to slaughter for at least one (1) year (Canadian Cattleman’s Association 2004)¹⁴.

Due to the COVID-19 Pandemic, provincial governments such as the Government of Saskatchewan have implemented “Livestock Set Aside Programs” to assist cattle and bison producers with managing the cost of holding back market-ready livestock while processing plants deal with the backlog of animals caused by COVID-19. Also implemented in 2020, the Government of Alberta in conjunction with the Government of Canada implemented the 2020 Canada-Alberta Fed Cattle Feed Cost Offset Initiative, which its main purpose was to first, provide a retroactive payment for cattle set aside from May 1 to June 30 and second, allow for producers to enter into a “Bid Set-Aside” process for cattle set aside starting June 29, 2020. In summary, the initiative compensates producers for the increased cost of keeping slaughter-ready cattle on maintenance rations. This initiative allows beef producers can hold on to market-ready cattle for several

¹³ Agriculture and Agri-Food Canada. 2021. AgriRecovery. Accessed from: <https://agriculture.canada.ca/en/agricultural-programs-and-services/agrirecovery>

¹⁴ <https://www.cattle.ca/assets/Uploads/BSE/94dae24e2f/173-bse-and-the-beef-cattle-industry-strategy-for-recovery.pdf>

Canadian Compensation
Mechanisms

weeks, allowing the supply of animals to match demand and processing capacity more evenly (Agriculture Financial Services Corporation 2021)¹⁵.

The Canadian government has been responsive and diligent to provide compensation and relief to livestock producers in emergency management situations through cost sharing programs. Direct program payments to producers include the amounts paid under government agricultural programs and agricultural programs funded by the private sector. These direct program payments are meant to cover costs and encourage production, funds to compensate lost profits due to low market return, payments to stabilize income, and payments to compensate producers for crop or livestock losses caused by extreme climatic conditions, disease, or other reasons¹⁶.

Most recently, following the 2021 British Columbia Flood Event, the Government of British Columbia along with Agriculture and Agri-Food Canada announced \$228 million dollars in funding using provincial funds along with Federal funds through the AgriRecovery Framework and Disaster Financial Assistance Arrangements (DFAA). This fund which was called the Canada-BC Flood Recovery for Food Security Program covered uninsured expenses such as cleanup, repair and restoration, repair of uninsurable essential farm infrastructure, reasonable repair of on-farm structures such as livestock containment fences, and animal welfare; replacement feed as well as livestock transportation, veterinary care, and mortality disposal¹⁷.

In 2021, Agriculture and Agri-Food Canada announced measures the Government of Canada was taking to aid farmers in the Prairie and West Coast provinces deal with drought conditions, which included the implementation of a Livestock Deferral Provision which allowed beef producers who were forced to sell a significant amount of their breeding herd due to drought conditions to offset the resulting revenues with the costs to replace the herd. In addition to this provision, the Government of Canada announced the allowance of drought damaged crops to be used as feed and raised the AgriStability compensation rate from 70% to 80%, providing farmers across the country an additional \$75 million per year¹⁸.

Table 4 shows the total amounts of direct payments made to farmers from the various compensation programs. Billions of dollars are paid on an annual basis directly to compensate and provide subsidies to farmers during unforeseeable circumstances.

¹⁵ <https://afsc.ca/news/the-2020-canada-alberta-fed-cattle-feed-cost-offset-initiative-includes-immediate-fed-cattle-feed-assistance-payment-and-a-bid-set-aside/>

¹⁶ Statistics Canada. Direct Payments to Agriculture Producers. 2021. Accessed from: <https://www23.statcan.gc.ca/imdb/p2SV.pl?Function=getSurvey&SDDS=5229>

¹⁷ Government of British Columbia. \$228M flood recovery program helping B.C. farms return to production. 2021. Accessed from: <https://news.gov.bc.ca/releases/2022AFF0004-000175>

¹⁸ Agriculture and Agri-Food Canada. Government of Canada taking action to support farmers facing extreme weather. 2021. Accessed from: <https://www.canada.ca/en/agriculture-agri-food/news/2021/07/government-of-canada-taking-action-to-support-farmers-facing-extreme-weather.html>

Table 4- Direct Payments and Rebates made by the Government of Canada to Farmers from 2016 to 2020

Direct payments and rebates (x \$1000)	2016	2017	2018	2019	2020
Total direct payments, gross payments	\$2,442,148.00	\$ 2,435,937.00	\$ 2,219,067.00	\$ 3,120,980.00	\$ 3,459,404.00
Total privately funded programs, gross payments	\$ 278,964.00	\$ 112,521.00	\$ 171,233.00	\$ 251,886.00	\$ 200,362.00
Private hail insurance, gross payments	\$ 276,387.00	\$ 107,574.00	\$ 166,043.00	\$ 246,371.00	\$ 194,855.00
Other private programs, gross payments	\$ 2,577.00	\$ 4,947.00	\$ 5,190.00	\$ 5,515.00	\$ 5,507.00
Total government funded programs, gross payments	\$2,163,184.00	\$ 2,323,416.00	\$ 2,047,834.00	\$ 2,869,094.00	\$ 3,259,042.00
Provincial Stabilization Programs, gross payments	\$ 329,567.00	\$ 222,995.00	\$ 320,967.00	\$ 268,730.00	\$ 408,488.00
Crop Insurance, gross payments	\$1,045,184.00	\$ 1,226,408.00	\$ 893,000.00	\$ 1,408,521.00	\$ 1,704,119.00
Livestock Insurance Programs, gross payments	\$ 32,271.00	\$ 3,685.00	\$ 10,157.00	\$ 57,765.00	\$ 122,148.00
AgriInvest	\$ 297,341.00	\$ 281,386.00	\$ 289,132.00	\$ 261,742.00	\$ 261,982.00
AgriStability	\$ 311,025.00	\$ 356,462.00	\$ 339,995.00	\$ 365,519.00	\$ 452,930.00
AgriRecovery	\$ 2,703.00	\$ 8,965.00	\$ 16,653.00	\$ 16,779.00	\$ 17,112.00
Agri-Québec	\$ 71,511.00	\$ 82,798.00	\$ 70,189.00	\$ 91,143.00	\$ 103,097.00
Self-Directed Risk Management (SDRM) Crop Loss Compensation	\$ 14,455.00	\$ 31,978.00	\$ 17,924.00	\$ 24,279.00	\$ 64,766.00
Waterfowl Damage	\$ 15,913.00	\$ 30,516.00	\$ 17,398.00	\$ 17,158.00	\$ 14,449.00
Wildlife Damage Compensation Program	\$ 4,547.00	\$ 4,636.00	\$ 6,023.00	\$ 5,692.00	\$ 6,342.00
Livestock Predation Compensation Program	\$ 3,257.00	\$ 3,258.00	\$ 4,218.00	\$ 3,863.00	\$ 4,491.00
Compensation for Animal Losses	\$ 5,488.00	\$ 41,527.00	\$ 2,756.00	\$ 8,842.00	\$ 9,292.00
Tree fruit grafting/budding and replant program	\$ 1,252.00	\$ 1,516.00	\$ 1,533.00	\$ 1,173.00	x
Porcine Epidemic Diarrhea Programs (PED)	\$ 21.00	\$ -	\$ -	\$ -	\$ 97.00
Lake Manitoba Flood Assistance Program	\$ -	\$ -	\$ -	\$ -	\$ -

Direct payments and rebates (x \$1000)	2016	2017	2018	2019	2020
Canadian Agricultural Income Stabilization (CAIS) Program	\$ -	\$ -	\$ -	\$ -	\$ -
Canadian Agricultural Income Stabilization Inventory Transition Initiative (CITI)	\$ -	\$ -	\$ -	\$ -	\$ -
Total government funded programs and rebates, gross payments	\$ 2,214,672.00	\$ 2,381,808.00	\$ 2,113,778.00	\$ 2,927,776.00	\$ 3,335,239.00
Total rebates reducing expenses 5	\$ 51,488.00	\$ 58,392.00	\$ 65,944.00	\$ 58,682.00	\$ 76,197.00

Source: Statistics Canada Table 32-10-0106-01

2.1.5 AgriStability

The AgriStability program is one of a suite of business risk management programs that is in place to help to provide whole-farm protection against large declines that threaten farm variability and operation. Under the Canadian Agricultural Partnership, which is a five year Federal- Provincial- territorial agricultural agreement, this business risk management program has been refined to allow for simplified participation, adjusted margin reference limits and easier accommodation for late participation¹⁹.

This business risk management program also covers additional costs associated with extraordinary disasters. Under the AgriStability program, allowable income includes the proceeds from agricultural commodity sales and the proceeds from production insurance. Allowable expenses include commodity purchases, along with direct input costs incurred in the farming operation. To be eligible for the program producers must meet these criteria:

- Farming business was carried out in Canada
- Conducted a minimum of six months of farming activity
- Completed a production cycle (in the case of livestock this is defined as rearing livestock, or the purchase and/or sale of livestock in the case of feeding and finishing enterprises)
- Reported farming income (loss) for income tax purposes to the Canada Revenue Agency (CRA)
- Met all Program requirements by the deadlines established by the Agricultural Financial Services Corporation (AFSC)

Defined under the program are allowable income and expenses which are allowed to be claimed and reported to the CRA. These are generally limited to the sale of agricultural commodities and production insurance payments. Allowable expense items are related to input costs directly related to the

¹⁹ <https://afsc.ca/income-stabilization/agristability/>

production of agricultural commodities. A summary of the allowable incomes and expenses are shown in the Table below²⁰.

Table 5- Allowable Incomes and Expenses under AgriStability Program

Allowable Incomes	Allowable Expenses
<ul style="list-style-type: none"> - Canadian Food Inspection Agency Costs - Agricultural Commodities Sales - Insurance and other proceeds for allowable expense items and commodities. - Wildlife damage compensation 	<ul style="list-style-type: none"> - Utility costs on the farm or production facility - Veterinary fees, breeding fees, medicine fees - Agricultural commodity purchases - Commodity futures losses & transaction fees - Livestock transportation and hauling to and from market - Capital equipment and operating expenses related to on-farm/ on-site machinery and equipment

Source: AAFC documentation

2.1.6 AgriInvest

This business recovery and management program is managed by the Federal administration (Agriculture and Agri-Food Canada). This is a self-managed producer-government savings account designed to help the producer manage small income declines and make investments to manage risk and improve market income.

This program provides the opportunity to farmers to deposit up to 100% of their Allowable Net Sales with the first 1% matched up the government up to a maximum of \$10,000^{21, 22}. Allowable net sales consist of the sales of primarily agricultural commodities except for commodities covered under supply chain management programs such as eggs, dairy, and broiler chickens¹⁰.

2.1.7 AgriRecovery

The AgriRecovery program is a part of the business recovery suite of programs offered by the Government to help manage Agri-recovery costs following natural disasters. The AgriRecovery program is a federal-provincial-territorial disaster relief program that helps agricultural producers with the unforeseen costs associated with recovering from natural disasters. Eligible costs will be supported on the 60-40 cost-shared federal-provincial basis outlined under the Canadian Agricultural Partnership²³.

2.1.8 AgriInsurance

The AgriInsurance program is apart of the business recovery suite of programs developed by the Federal and Provincial Governments. Under this program, this producer-federal-provincial based program helps stabilize the producer's income

²⁰ <https://afsc.ca/wp-content/uploads/2021/05/AgriStability-Handbook-2020-2022.pdf>

²¹ Ker, A.P., Biden, S. 2021. Risk management in Canada's agricultural sector in light of COVID-19: Considerations one year later. *CJAE*, 69: 299–305.

²² <https://www.agricorp.com/en-ca/Programs/AgriInvest/Pages/Overview.aspx>

²³ <https://afsc.ca/income-stabilization/agrirecovery/>

caused by severe but uncontrollable natural hazards. This includes but not limited to drought, flood, wind, excessive cold, and uncontrolled disease. The objective of the program is to mitigate the effects of production loss through the implementation and deliverance of affordable insurance and reinsurance programs²⁴. The AgrilInsurance program is delivered provincially and has been adopted in all ten (10) provinces of Canada.

²⁴ <https://agriculture.canada.ca/en/agricultural-programs-and-services/agriinsurance-program>

3.0 Defining cost Drivers and Qualifying Principles

Cost Sharing Principles

A cost driver is defined as the direct cause of an expenditure and its effect is on the total cost incurred during the production process. Due to the duration, complexity and interconnecting activities undertaken throughout a Foreign Animal Disease Outbreak situation, the ability to define every single cost driver becomes cumbersome and hard to present.

Any determination of who should pay for a given cost has to be established based on a set of pre-defined principles. Once the principles are agreed to by stakeholders, the division of responsibility becomes more structured and controlled. After reviewing a significant amount of material, it becomes apparent that some of the basic principles under which Cost Sharing of response costs include:

a. “No Surprises” Principle

To be eligible for Cost Sharing, the costs must be specifically identified and flagged for Cost Sharing in the associated Hazard Specific Plan (HSP) and approved by the National Producer Groups, Provincial and Federal Regulatory authorities. Using the HSP as the basis of this principle is critical since the HSP provides specifics on how the disease is to be addressed which ultimately identifies the activities that will be cost drivers.

b. Normal Commitments

To be eligible for Cost Sharing, the costs must be clearly identifiable as additional to normal commitments.

Costs eligible for Cost Sharing are over and above a government or industry Party’s normal commitments. Cost sharing does not apply to activities that are considered “normal” and that exist for or are required to be carried out under a government or industry Party’s normal biosecurity commitments. These are considered as a baseline above which other costs are to be shared.

c. Recovery Costs Principle

Costs associated with recovery from the outbreak are ineligible for Cost Sharing. Costs of recovery in a reportable Foreign Animal Disease outbreak, just as with other emergency incident management processes, are managed by processes outside of the disease control legislation and procedures. Recovery services during and after emergencies and business continuity are provided by recovery agencies from all levels of government and non-government organizations.

d. Hazard Specific Plan Principle

To be eligible for Cost Sharing a response cost must be clearly identifiable as contributing to the achievement of response objectives and/or improving disease control and biosecurity outcomes included in the Hazard Specific Response Plan.

e. Animal Welfare Principle

The primary responsibility for the maintenance of animal welfare standards during a response lies with the owner or the person in charge of the animal(s). However, everybody involved in a response holds some responsibility for the maintenance of animal welfare standards.

Response activities may result in risks to animal welfare. If these risks cannot be adequately managed, jurisdictional welfare legislation may require affected animals to be humanely destroyed – specifically in cases where density requirements are being exceeded in confined livestock operations. Compensation or financial assistance may then be available for the animal owner and such payments may be eligible for Cost Sharing if they meet the conditions outlined below:

- eligibility for compensation and Cost Sharing must be at the discretion of and agreed by the relevant Chief Veterinary Officer. In many cases there is currently no mechanism for compensation at the provincial level. This is one of the gaps that needs to be considered as part of this discussion.
- must be clearly identifiable as directly contributing to the disease management outcomes of the response or have arisen as a direct result of disease management measures in an approved Hazard Specific Plan
- must be included in the approved Hazard Specific Plan – while the CFIA HSP does not deal directly with welfare culls, the fact is that the actions taken under the HSP potentially results in the need to consider a welfare cull.
- all non-destruction options must have been considered.

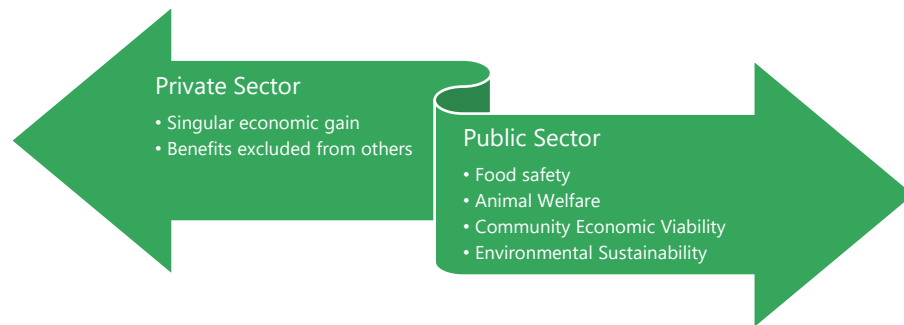
In the case of Australia – who use these specific principles - to be eligible for Cost Sharing, a response cost must have been incurred as a direct result of the response activity or regulatory process or be a direct result of achieving a response objective. It would also need to have been “reasonably foreseeable” and if it was not, then it would be considered a consequential loss, which is excluded from Cost Sharing. If the costs were generated by anything not directly related to the disease, the response, or the implementation of disease control measures, or caused by some unrelated factor or circumstances, then it would also be considered a consequential loss.

3.1.1 Public versus
Private Cost
Sharing

Cost Sharing principles can be split into the context of the public sector and the Private Sector. Within the Private Sector, all costs incurred take away from revenues and deflate margins, thus their main goal is singular economic gain with sole benefits pertaining to the respective company. The public sector on the other hand, is governed by defined regulations and public policy objectives (Figure 3).

Principles and
 Objectives

Figure 3- Depiction of the Objectives which Influence Cost Driving Activities During a Foreign Animal Disease Response



Based on Figure 3 above, there are polarizing objectives to which the Public and Private Sector aim to achieve based on their market positions. Nonetheless in defining the cost sharing principles from a public vs private sector perspective, Table 5 below will help delineate different activities based on the concepts of excludability and rivalry.

However, to help outline these cost drivers, this report has broken this down into three (3) general phases:

- i) Phase 1 "Preliminary Disease Response- Suspicion & Investigation"
- ii) Phase 2 "Control and Eradication"
- iii) Phase 3 "Demobilization and Recovery"

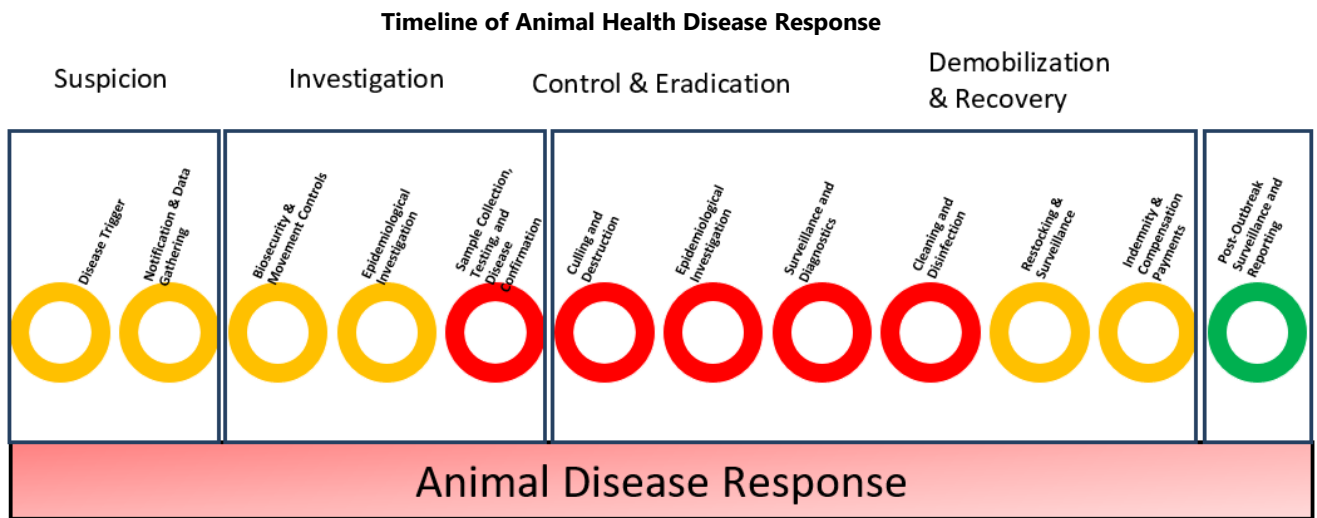
A more detailed description of the elements of each defined phase can be seen in Figure 4 below. Each element of the animal disease response phase has associated cost driving activities which can be grouped into larger Cost Drivers which summate to a total cost which is directly attributed to managing the disease outbreak.

Each element listed below, represents an activity to which a cost will be associated with. Further analysis of each element shows that there will be sub activities within those elements that are undertaken during a disease outbreak which will also have costs associated and thus contribute to the overall cost of the Animal Emergency Health management exercise.

To qualify as an eligible cost compensation activity, the cost driver must be directly associated with the management of the Foreign Animal Disease situation and can include equipment, infrastructure, and labour to manage the activity. Further explained below, there will be activities that though they are associated directly with

the management of the Reportable Disease Outbreak, they will be bored solely by the producer/ industry even though directed by the public sector.

Figure 4- Animal Disease Response Timeline and Associated Disease Management Activities



4.0 Understanding the Cost Driving Activities During Animal Disease Response

4.1 Cost Driving Categories

Cost Drivers stem from activities and functions undertaken during an emergency disease response and as such are an incurrence of expenses for public and private industries. To help manage and track costs and expenses during the emergency disease response, this report has defined aggregated cost drivers which include Capital Costs, Operational Costs, Costs of Labour and Business Interruption costs.

To define the activities which, qualify for Cost Sharing, the costs incurred during the animal disease response must fall into one of the following categories: capital costs, operating expenses, labour costs and Business Interruption. Please also note the examples of costs that are considered eligible and ineligible for cost sharing:

Capital Costs

- Essential equipment required for the immediate servicing needs of the Hazard Specific Plan are eligible for Cost Sharing
- Equipment which is deemed necessary which was not accounted for in the Hazard Specific Plan but is not normally expected to be used during normal business operations are eligible for Cost Sharing.
- Capital expenditure on major items used such as motor vehicles or buildings are not eligible for Cost Sharing. The working life of such capital items would normally be expected to extend far beyond any eradication effort funded under the EAD Response Plan, and there is every possibility they could be utilized in other ongoing programs.

Operating Expenses

- Operating expenses directly incurred by a party in the eradication program is eligible for Cost Sharing.
- For laboratory services provided internally by a provincial/territorial government agency, eligible costs are the cost of additional staff, operating costs and consumables incurred because of the emergency disease response.
- Compensation for destruction of animals or property is determined by jurisdictional legislation. Cost Sharing of response costs, including compensation, is determined by the regulations stipulated in the Health of Animals act.
- Response costs, including compensation, must be included in an approved Hazard Specific Plan, and identified for Cost Sharing.
- All stores and equipment purchased with funds which have been subsequently reimbursed from the Cost Sharing arrangements shall be valued at the time the Hazard Specific Plan is completed and sold.

Cost of Labour

- Salaries or consultancy fees for staff/consultants engaged by the party to assist directly with eradication and for staff/consultants engaged to backfill positions of existing permanent staff assisting directly with eradication are eligible for Cost Sharing.
- In contrast, salary or consultancy fees of staff/consultants who are, or would be, engaged by a government or industry party, irrespective of the disease emergency, are not eligible for Cost Sharing.
- Payroll tax, workers' compensation insurance, superannuation and leave for staff specially recruited because of the implementation of the Hazard Specific Plan will be eligible for Cost Sharing.
- Where normal employment conditions provide for payment of overtime, overtime incurred directly because of the implementation of the Hazard Specific Plan will be eligible for Cost Sharing.
- Fees and allowances to private veterinarians employed by the government Parties to assist with the implementation of the Hazard Specific will be eligible for Cost Sharing up to the level of fee and allowance's structure approved by the CFIA, or such other relevant fee and allowance's structure.
- Reimbursements to volunteer emergency service and defense personnel will be by negotiation with the service provider but should provide primarily for out-of-pocket or incidental expenses. If the basis of engagement of volunteer emergency service or defense personnel is other than primarily for out-of-pocket expense, then with express approval of National Producer Groups.

Business Interruption
(BII)

- Compensation for maintaining stock of live animals for breeding purposes however there is decreased market value cost
- Domestic and International Livestock Market Disruption and lost revenues
- Domestic and International Market disruption pertaining to animal by-products and feeds and lost revenues

As defined above, there are three main phases to which an animal disease response outbreak can be distinguished into three phases: Suspicion & Investigation, Control & Eradication, Demobilization & Recovery.

During an Animal Disease Outbreak in Canada, under the *Animal Health Act*, compensation is paid to farmers during an emergency animal disease outbreak as directed by the Canadian Food Inspection Agency. Under this Act, the CFIA has the Authority to direct a farmer to destroy their animals and associated materials under the pretences of disease control.

Nonetheless in an emergency disease response outbreak, and under the direction of the CFIA and other relevant regulations, there will be costs and activities which are not fully compensated under the *Health of Animals Act*, and which are still incurred by the Private Industry because of

the declaration of an emergency animal disease outbreak. Figures 5, 6 and 7 depict cost driving activities and elements which are “eligible” for compensation, but as well, activities and elements which incur cost outside the scope of eligibility for compensation but are still necessary for the animal disease response plan.

To model the cost drivers which influence the monetary expenditures during a Foreign Animal Disease outbreak in Canada cost, Figure 6, **Error! Reference source not found.**, and **Error! Reference source not found.** illustrate the respective cost driving activities which are then grouped into the defined Cost Driving Categories into the respective phase of the Animal Disease outbreak as defined in Figure 4- Animal Disease Response Timeline and Associated Disease Management Activities.

4.1.1 Defining Cost Driving Activities during Suspicion and Investigation Phase

Within the first 72 hours of a suspected Foreign Animal Disease, there are numerous management and control activities implemented on-farm and within the Control Zones to control the transmission of the disease. In this time-frame the main activities include but are not limited to:

- Field Epidemiology Investigation
- Establishing Biocontainment zones
- Animal Movement Restrictions
- Sampling and Laboratory Testing

These major cost driving activities can be further dissected to include other activities such as but not limited to capital expenditure for infrastructure for managing biosecurity zones, equipment for managing feral animal populations, expenditure costs associated with housing and restricting animals on-site while movement bans are defined, lost operation revenues from animal movement bans, costs associated with on-farm disease management activities, epidemiological investigation and laboratory testing.

Based on the information above, all these cost driving activities can be classified into a Cost Driving Category to delineate the cost aspects of managing the outbreak. This model is applied in Figure 5- Defining Cost Driving Activities under Defined Cost Drivers for Preliminary Disease Response Phase. It is important to note that during the Preliminary Phase of the Foreign Animal Disease Response which include Suspicion and Investigation, there are a lot of costs bore by the farmers and producers due to requirements to implement activities such as movement bans, quarantine zones, and livestock segregation.

The Public sector bears costs associated with field epidemiological investigations and diagnostics to confirm a positive disease situation. Within the diagnostic and laboratory activities, there are associated costs with laboratory equipment, laboratory testing analytics, data management staffing and personnel. This is not an extensive list of all the operational, capital and labour costs bore by the Public and Private sectors, however, provides a model to which supplemental management activities can be

4.1.2 Defining Cost Driving Activities during the Control and Eradication Phase

documented and categorized based on the activities already defined within the model.

Testing and diagnostics are undertaken by the Canadian Food Inspection Agency and once a presumptive positive case is confirmed by the CFIA National Centre for Foreign Animal Disease there is a set of activities which are undertaken to transition from the Preliminary Response Phase (Figure 4- Animal Disease Response Timeline and Associated Disease Management Activities) into the Second Phase defined in this document as Control & Eradication. During the Control & Eradication phase the main activities include but are not limited to:

- Implementing biosecurity procedures
- Destruction and disposal of animals within Infected Premises and Control Zones
- Welfare culling
- Cleaning and Disinfection
- Epidemiological Investigation
- Laboratory testing and site diagnostics
- On-farm/ on-site vaccination if applicable*

These major cost driving activities can be further dissected to include other activities such as but not limited to capital expenditure for cleaning and disinfection equipment, capital costs for equipment for destruction and disposal of infected and targeted livestock populations, operational expenditure costs associated with housing and restricting animals on-site while movement bans are enforced, operational costs associated for cleaning disinfectants and solutions, lost business revenues from animal destruction and disposal bans, and labour costs associated with epidemiological investigation and laboratory testing.

Based on the information above, all these cost driving activities can be classified into a Cost Driving Category to delineate the cost aspects of managing the outbreak. This model is applied in Figure 6- Defining Cost Driving Activities under Defined Cost Drivers for Control and Eradication Response Phase. It is important to note that during the Secondary Phase of the Foreign Animal Disease Response there are costs bore by the farmers and producers associated with but not limited to livestock destruction and disposal, disposal of contaminated equipment materials, livestock and deadstock transportation, movement restriction bans, and lost revenues from supply chain disruptions associated with livestock and feed due to the Foreign Animal Disease outbreak.

Some of the cost the public sector bears include epidemiological investigations and on-site management of premises during the outbreak, costs for vaccines if applicable, and compensation for farmers associated with the destruction and disposal of livestock. In addition, in some cases the Public Sector compensates farmers for equipment and supplies associated with cleaning and disinfection. This is not an extensive list of all the operational, capital and labour costs bore by the Public and Private sectors, however, provides a model to which supplemental management

4.1.3 Defining Cost Driving Activities during Demobilization and Recovery Phase

activities can be documented and categorized based on the activities already defined within the model.

After the declaration of disease free by the Canadian Food Inspection Agency, there is a period of Recovery and Demobilization which includes cost driving activities bore by both the Public and Private Sector. During the Demobilization phase Infected Premises quarantines and Restricted Zones are removed, and equipment associated with destruction disposal, cleaning and disinfection from infected premises and quarantine zones are removed. The Recovery phase starts during the Control & Eradication phase and precedes the Demobilization phase; however, the Recovery phase extends past the Demobilization phase. During the Recovery Phase, livestock markets attempt to recover through repopulation activities, reestablish both domestic and international markets, and counselling and psychological work for dealing with the outcomes of the disease outbreak.

These major cost driving activities can be further dissected to include other activities such as transportation costs associated with livestock repopulation, costs to manage livestock repopulation, personal protective equipment and other materials required to maintain biosecurity on-farm, operational expenditure costs associated with replenishing feed and managing restocked populations, and labour costs associated with post-disease epidemiological investigation and laboratory testing. Based on the information above, all these cost driving activities can be classified into a Cost Driving Category to delineate the cost aspects of managing the outbreak. This model is applied in Figure 7-Defining Cost Driving Activities under Defined Cost Drivers for Demobilization and Recovery Response Phase.

It is important to note that during the Demobilization and Recovery Phase of the Foreign Animal Disease Response there are costs bore by the farmers and producers associated with livestock transportation, cost of feed for managing growing livestock population, and costs for reentering domestic and international trade markets. Some of the cost the public sector bears include post-outbreak epidemiological investigations and on- costs for reviewing the management of the disease outbreak, final reporting, and public communications. This is not an extensive list of all the operational, capital and labour costs bore by the Public and Private sectors, however, provides a model to which supplemental management activities can be documented and categorized based on the activities already defined within the model.

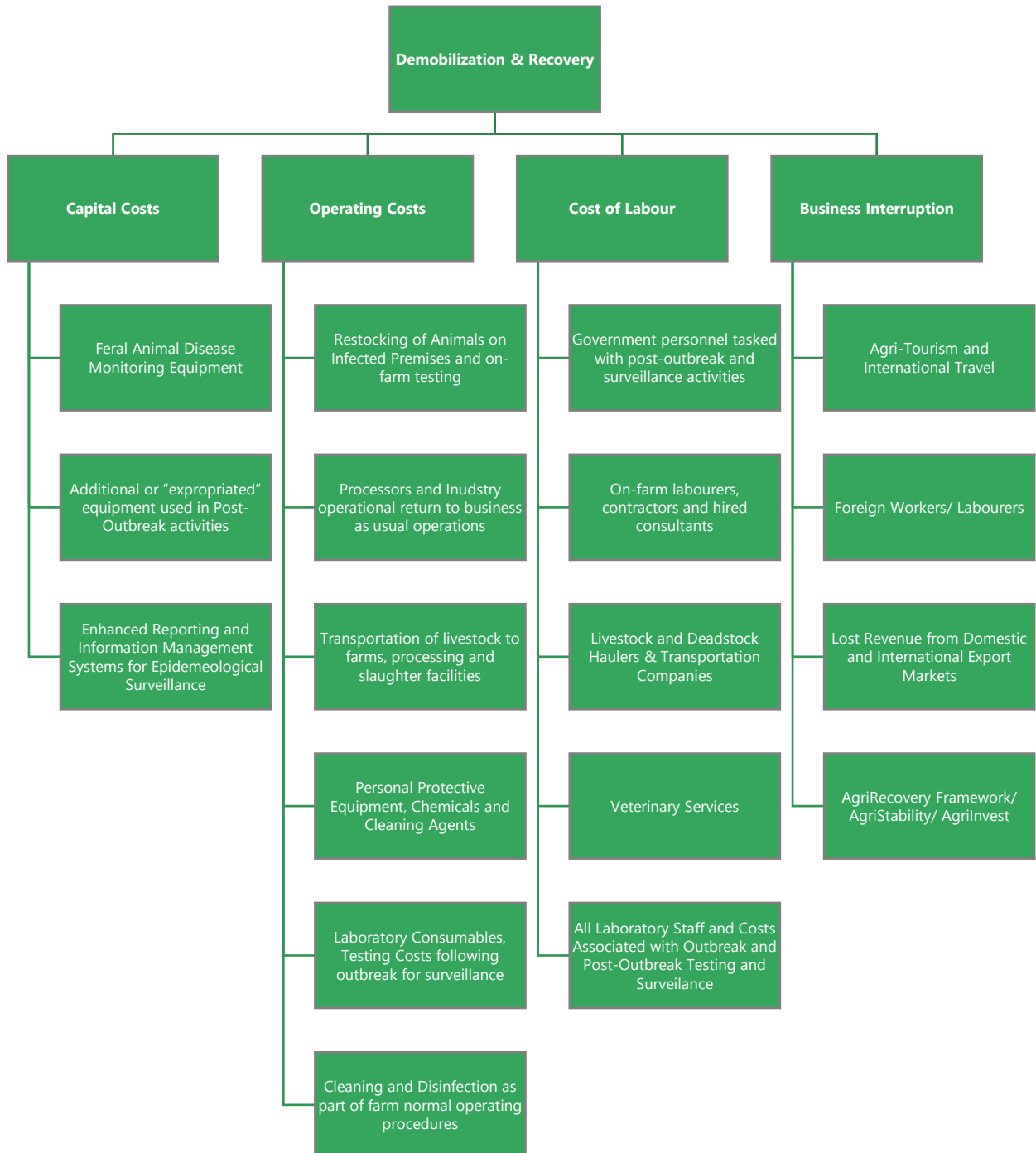
Figure 5- Defining Cost Driving Activities under Defined Cost Drivers for Preliminary Disease Response Phase



Figure 6- Defining Cost Driving Activities under Defined Cost Drivers for Control and Eradication Response Phase



Figure 7-Defining Cost Driving Activities under Defined Cost Drivers for Demobilization and Recovery Response Phase



Application of
Framework in a
Disease
Management
Setting

Based on the previous sections, there has been a lot of detail set forth outlining the fundamentals of a Foreign Disease Outbreak, the concept of establishing Public Good principles based on the tenets of rivalry and excludability, and for establishing defined cost drivers which require direct and indirect payments during a Foreign Animal Disease Outbreak. In respects to applying this framework during a disease outbreak management situation the following steps should be followed:

1. Identify the phase of the outbreak as defined in Figure 4- Animal Disease Response Timeline and Associated Disease Management Activities.
2. Identify the Cost-Drivers based on the Animal Disease Response Timeline in accordance with Figure 5- Defining Cost Driving Activities under Defined Cost Drivers for Preliminary Disease Response Phase, Figure 6- Defining Cost Driving Activities under Defined Cost Drivers for Control and Eradication Response Phase or Figure 7-Defining Cost Driving Activities under Defined Cost Drivers for Demobilization and Recovery Response Phase respectively



- Determine the extent of excludability and rivalry based on the cost driving activity.

	Rivalrous	Non-Rivalrous
Excludable	Private good	Toll Good
Somewhat Excludable		Club Goods
Non-Excludable	Common Pool Goods	Public Goods

- Determine and agree upon the cost sharing percentage associated with the cost driving activity based on the good category for the three respective phases. Based on Figures 11, 12 and 13 below.

4.1.4 Applying Fundamentals of Cost-Sharing Model: Example for Control and Eradication Phase

This section provides an example and explanation for applying the Cost Sharing Framework model for a specific phase during an Animal Disease Outbreak. Based on the section above there are four steps to applying the model to an outbreak management situation. As an example, the Second phase of the Foreign Animal Disease Outbreak "Control and Eradication" will be used.

Step 1

The phase of the outbreak is defined as Control & Eradication. Under this phase there are numerous cost driving activities including but not limited to welfare culling, depopulation, slaughter disposal, vaccination, implementation of biosecurity, and livestock producer compensation.

Step 2

This step involves determining the Cost Driving Activities associated with the Control & Eradication phase of the Animal Disease outbreak. To simplify this process, there have been Cost Driving Categories defined to help manage various activities under one umbrella term, which allow for easier summation of the total cost with that specific category during the respective phase of the outbreak. The bullets below provide an example of a list of the various activities associated in this phase:

- Destruction of contaminated materials
- Depopulation of infected animals
- Welfare culling of livestock to manage supply chain issues
- Cleaning and Disinfection
- Vaccination if applicable
- Epidemiological Investigation
- Disease Project Management
- Veterinary Services

Based on the bullets above, each of these activities can have sub events which occur that contribute to that phase of the Animal Disease outbreak situation. For example, during the Depopulation of infected animals, there may be specialized equipment required by the producers to carry out fast yet efficient

depopulation, or during depopulation there maybe infrastructure needed to temporarily store slaughtered animals until they are able to effectively be disposed of, and in addition there may be extra capital equipment required to facilitate on-site disposal i.e., excavators for animal burial.

Building on this framework model, Cost Driving Activities such as equipment for depopulation, storage of deadstock and for disposal can all be grouped under the “Capital” Cost Driving category while activities associated with Epidemiological investigation can be categorized under the “Operational” and “Labour Cost Driving Categories.” Cost driving activities associated with vaccination can have subevents which include vaccine transportation, vaccine storage, vaccine administration, Quality Assurance and Control which can be categorized as “Capital” “Labour” and “Operational” Costs which are bored by the public sector to manage the flow and administration of vaccines to reduce and better control the outbreak.

Step 3

This subsequent step involves determining the type of “Good” which results from the Cost Driving Activities undertaken during the respective phase of the Animal Disease Outbreak. In this example during the Control and Eradication phase, there are many Cost Driving Activities undertaken during this period. To ensure disease destruction and control, activities including but not limited to animal depopulation, welfare culling, carcass disposal and epidemiological surveillance and investigation are undertaken to reduce disease transmission and keep it localized to a specific Control Zone for easier management. Using the principles of rivalry and excludability, and the definition of Public Good the specific cost driving activities associated with this phase of the outbreak can be grouped under the different types of “Goods” as defined in Table 6 below.

Table 6- Defining Goods during Control & Eradication Phase of Foreign Animal Disease Outbreak

	Rivalrous	Non-rivalrous
Excludable	<i>Pure Private Good</i> <ul style="list-style-type: none"> – <i>Product differentiation</i> – <i>On-site and off-site storage for infected livestock and culled species</i> – <i>Equipment for managing infected livestock on-farm i.e., slaughter/ depopulation equipment, disposal equipment, PPE</i> – <i>Supply chain efficiencies</i> – <i>Private veterinary services</i> – <i>Biosecurity protocol implementation and equipment/ personnel necessary to enforce biosecurity measures</i> 	<i>Toll Good</i> <ul style="list-style-type: none"> – <i>Traceability Information</i>
Somewhat Excludable (club)		<i>Club Good</i> <ul style="list-style-type: none"> – <i>Livestock disease emergency management (non-zoonotic)</i>

	Rivalrous	Non-rivalrous
		<ul style="list-style-type: none"> - <i>Infected livestock destruction and disposal</i> - <i>Increased market access for affected sector</i> - <i>Public awareness and industry communications</i> - <i>Management of Animals during livestock standstill/ movement bans</i> - <i>Cleaning and Disinfection Equipment/ Materials</i>
Non-Excludable	<i>Common Pool Good</i> <ul style="list-style-type: none"> - <i>Pasture/ stock yard management</i> 	<i>Pure Public Good</i> <ul style="list-style-type: none"> - <i>Emergency management for zoonotic diseases</i> - <i>Safe food supply system</i> - <i>Vaccination procurement, storage and distribution</i> - <i>Public laboratory diagnostic and testing services</i> - <i>On-site management to ensure National and Provincial regulatory requirements are being adhered to</i>

Step 4

Based on the exercise in Step 3, Cost Driving Activities will be classified based on their excludability and rivalry and thus deemed as "Pure Private", "Pure Public", "Club Good", "Common Pool Good" and "Toll Goods." Once this is done, and based on the discussions had between the Public and Private entities involved in managing the disease outbreak, a cost-sharing percentage can be assigned to the specific "Good" category based on the contributions required from the Public Sector, Private Sector, and combined Private/ Public effort.

Pure Private Goods will be assigned with 100% cost bore by the Private sector while *Pure Public Goods* will be assigned 100% of the costs bore by the public sector. *Toll goods* which are goods that can be excluded, and the consumption of the toll goods and services are not reduced if someone else uses it such as public grazing land/ pasture, are split in a fashion where the Public and Private sector both bear costs but one sector may bear more costs than the other due to the excludability and nature of the Cost Driving activity. This may result in cost-sharing splits of 60-40, 70-30, 80-20 between the Public and Private sectors respectively.

Club goods on the other hand will tend to be split more evenly in a 50-50 like manner since these types of Goods can affect both the Private and Public sectors equally. Based on the above summary, the Cost Driving Activities and associated Goods resulting from the activity can be assigned a cost-sharing percentage as noted in Figure 11, Figure 12, and Figure 13. Once the cost-sharing has been agreed upon, each phase of the outbreak can inputted into the mathematical models displayed in **Error! Reference source not found.** **Error! Reference source not found.** and **Error! Reference source not found.** respectively. The

values generated from this can be applied to the model noted in **Error! Reference source not found.**

Figure 8 notes the equation which defines the total costs incurred during a foreign animal disease outbreak. To further break this down, the Cost of Disease Management Activities and Recovery Activities are defined in Figure 9 and Figure 10 respectively.

Figure 8- Compensation Model Equation defining Overall Cost of Disease Outbreak

Overall Cost of Disease Outbreak

f (Disease Management Activities & Recovery Activities)

Figure 9- Compensation Model Equation defining Cost of Disease Management Activities

Cost of Disease Management Activities =

$\Sigma(\text{DM Capital Costs, DM Operating Costs, DM Labour Cost})$

Figure 10- Compensation Model Equation defining Cost of Recovery Activities

Cost of Recovery Activities =

$\Sigma(\text{RA Capital Costs, RA Operating Costs, RA Labour Costs, RA BII Costs})$

Figure 11- Mock Model - Cost Driver Sharing Framework during Suspicion and Investigation Phase

Preliminary Disease Response - Suspicion and Investigation

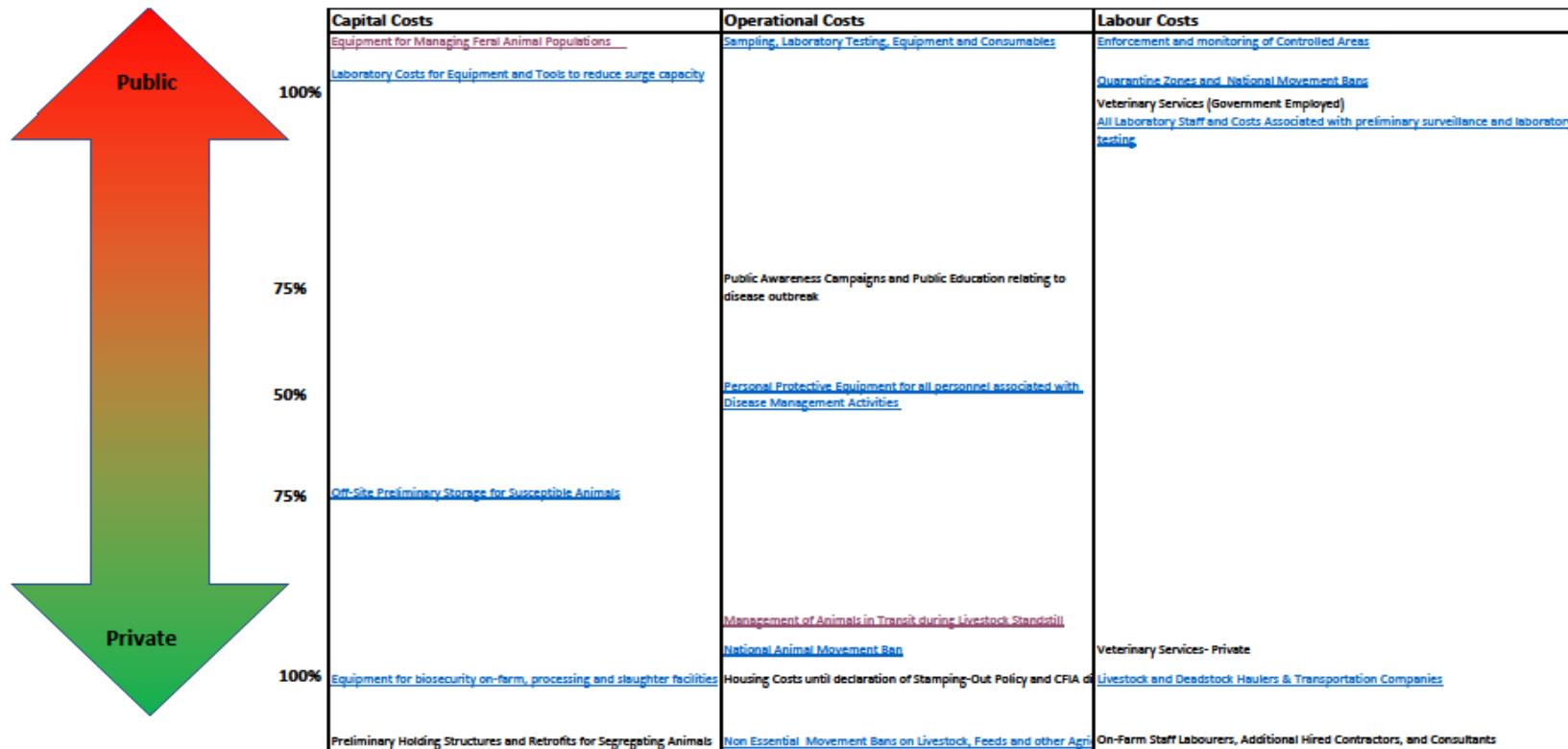
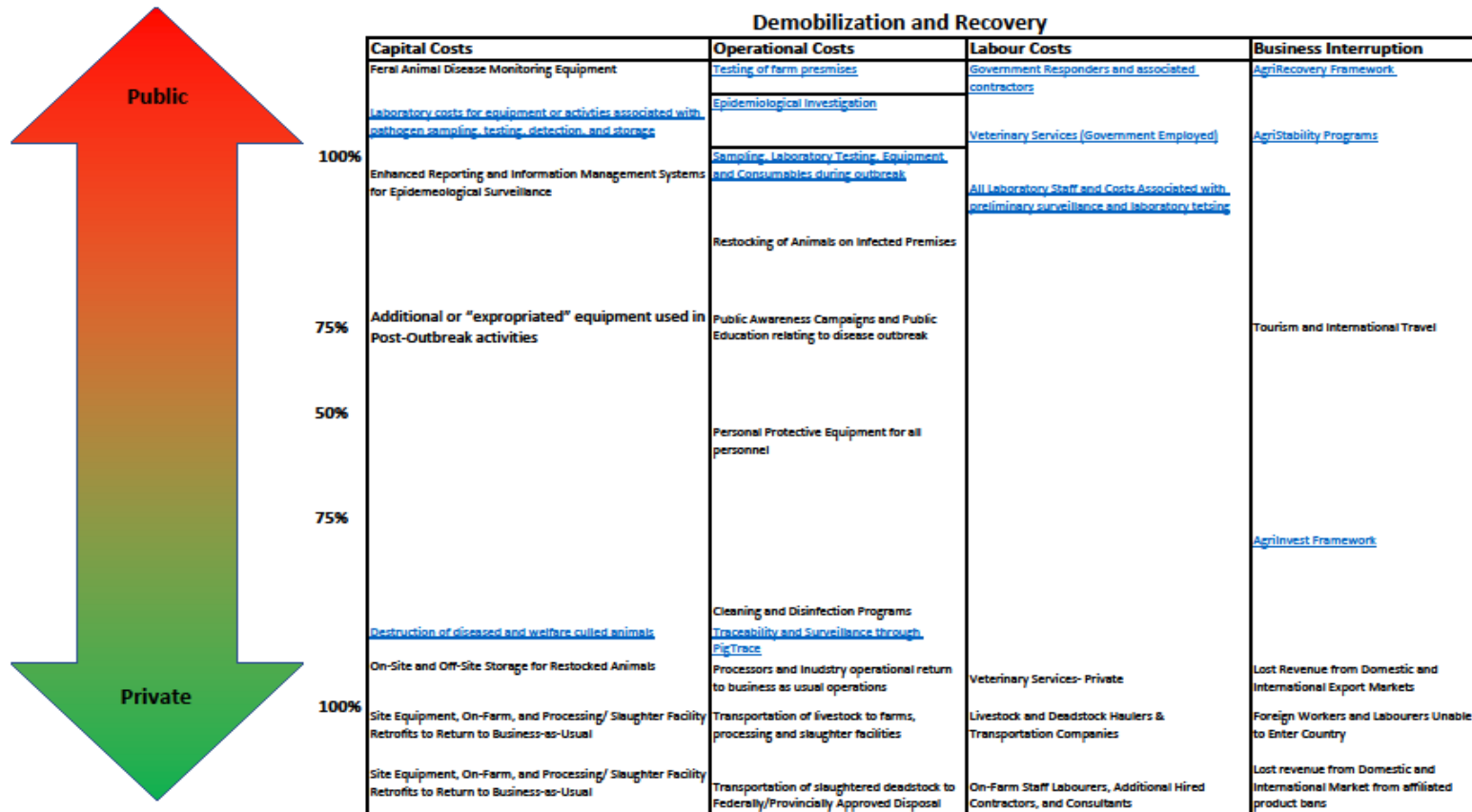


Figure 12- Mock Model -Cost Driver Sharing Framework for Control and Eradication Phase



Figure 13- Mock Model - Cost Driver Sharing Framework during Demobilization and Recovery Phase



5.0 Conclusions

Ultimately this framework is only the starting point for negotiations between public policy makers and private interests. Risk does not care if the allocation of roles and responsibilities are established – contingent liability exists regardless to public and private industries. There is an established theoretical framework that can be adapted to establish the parameters of shared costs when dealing with animal health issues. There is an existing library of work with Animal Health Canada & FMD Working Groups that can help inform the extent of and nature of the costs that would have to be incurred to deal with ASF – can be applied to other diseases. Input and Output and resulting multipliers could be a potential source for quantification of downstream effects – this can help delineate the cost of public and private benefits.