Prepared for Canadian Canola Growers Association

Risk Assessment and Feasibility Analysis Regarding Alternatives for a Producer Payment Security Program Under the Canada Grain Act

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1. Letter of Introduction

AIRM has been operational for more than a decade, with core business organized into three divisions, including 1) AIRM Consulting, 2) AIRM Research and Development, and 3) AIRM Digital Solutions. AIRM has a team of approximately 35 highly skilled technical professionals, including PhD's and MSc's, providing knowledge and expertise in actuarial science, engineering, computer science, data science, and agribusiness. AIRM aims to leverage the power of large datasets and computationally demanding algorithms to bring AI into the heart of day-to-day operations. AIRM has a successful track-record working with both private and public-sector entities in Canada, and internationally.

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2. Overview

The Canadian Grain Commission (CGC) is an agency of the Canadian government, overseeing regulation for the grain-handling industry in Canada, playing an important role in protecting producers' rights to ensure the reliability of grain transactions. Grains regulated under the Canada Grain Act, include barley, beans, buckwheat, canary seed, canola, chick peas, corn, fababeans, flaxseed, lentils, mixed grain, mustard seed, oats, peas, rapeseed, rye, safflower seed, soybeans, sunflower seed, triticale, and wheat. The following report provides a Risk Assessment and Feasibility Analysis regarding the development of an alternative mechanism for Western grain producers to mitigate risk related to payment default. For more than a decade, grain sector stakeholders have called for enhancements to the current security-based payment protection program operated in Western Canada, which provides protection to producers when they sell their crops in the case where a licensee defaults on payment. Mandatory protection is provided under the *Canada Grain Act* (CGA) and the program is administered by the CGC, which requires licensed primary and process elevators and grain dealers to provide security to cover outstanding liabilities to producers. Licensees tender security based on their monthly outstanding liabilities to producers. If a licensee fails to pay for the grain that they purchased (usually due to bankruptcy or receivership), producers can apply for compensation from the program, which then uses the licensee's security to compensate eligible claims.

There are several stakeholders involved in the program, including producers, licensed buyers, government, including the CGC, and private sector security providers, such as banks and insurers. Given the multiple viewpoints, an enterprise risk management (ERM) framework is used in this report to take a holistic viewpoint to identify, measure, and respond to key risks that could impact the sector. The intent is to ensure this important producer payment security program and the strength of the grain sector is upheld, and that program delivery maximizes the value to stakeholders. ERM is important in helping to guide decisions and balance the risk versus reward trade-offs and improve the allocation of resources, which is critical in the context of examining an alternative producer payment security program for Western Canadian grain producers.

Given the multifaceted viewpoints amongst the various stakeholders, there has been a mixed perception of the current producer payment security program. While some stakeholders have indicated support for the program, several shortcomings and challenges have been identified. For example, producers have been calling for enhancements to the program to address current concerns around predictability and transparency, as well increased cost-effectiveness. As well, there have been instances where a producer has not been provided with 100% protection in the case of nonpayment when a licensed buyer becomes insolvent. Other issues identified with the current program include:

- Relatively costly to maintain, including high operating costs related to administration and reporting.
- Inaccuracies in reporting for some licensees, due to reporting lags, errors, etc., leading to a mismatch in security relative to liabilities.
- Relatively inefficient use of capital through the posting of capital-intensive bonds.
- In the case of insurance, relatively high premiums given that premium is calculated based on the risk level of an individual licensee, rather than the combined risk of the sector, which is likely lower due to pooled risk.
- Lack of coverage and limited flexibility of the program including smaller or non-licensed buyers, such as feed mills, that are not included.

- Non-risk-based approach for determining security levels, where the licensee posts security based on their liabilities and not their relative risk of default.
- Timeliness of payments to producers, and overall lack of bankability.

Regarding transparency to producers, many producers feel the cost of the program is passed back to them in the form of lower prices for their grain. The overall cost of the program is unknown both in terms of its administration and cost of the security to the larger grain system. Additionally, once a default occurs, it can take significant time before it is known how much of the claim will be paid (based on there being sufficient security to cover all eligible claims that are reported) creating uncertainty.

These challenges have led to requests to further explore potential enhancements and to examine alternative delivery mechanisms for producer payment security. Of specific interest in this study is the feasibility of a fund-based system.

3. Context

This section provides the context to understand the different stakeholder objectives, considering both the internal and external environment, as well as the key linkages that may impact the risk management of the program. The focus was to conduct a Risk Assessment and Feasibility Analysis in the context of an ERM framework regarding alternatives for the producer payment security program. The intent is to contribute to the discussion and provide a deeper understanding of alternative mechanisms to protect Western Canadian grain producers when a licensee defaults on payment.

In general, four viable producer payment security models have been identified including 1) Enhancements to status quo security-based model, 2) Fund-based model, 3) Fund-based model supported by an insurance/reinsurance model, and 4) Private insurance/reinsurance model. However, a fund-based model has been identified by CCGA and other stakeholders[1], as the alternative of most interest. Prior to endorsing this particular alternative to move forward with further research and possible implementation, it is helpful to undertake a current feasibility assessment of the risk of such model, and explore qualitative and quantitative considerations regarding estimated costs, protection timeframes, coverage levels/deductibles, etc., which is the focus of this work. A brief overview of the four types of frameworks is provided next.

a. Enhancements to Status-Quo – Security-based Program

To address some of the above issues with the current producer payment security program, one alternative is to enhance the existing security-based model. There are a number of elements of the current system that have been identified as a source of dissatisfaction amongst various stakeholders. Below is an overview of possible changes that could be considered to improve the overall satisfaction of the program, however, within the current framework some may be difficult to adequately address.

- Investigate a mechanism to 'back-stop' the security-based system to fill the gap in coverage in the event that security is not sufficient to pay all claims. A back-stop generally covers more catastrophic risk, and can include reinsurance, a government sponsored fund, etc. This will ensure that producers are always paid 100% of money owing.

[1] The last attempt to modernize the *Canada Grain Act* was in 2014 under Bill C-48, which proposed the creation of a Producer Compensation Fund.

- Strengthen the authority of the CGC to manage the sale of grain in inventory should a licensee become insolvent, and a receiver is appointed (to ensure the receiver cooperates with the CGC to maximize the financial outcome). Producers who are owed money should have the right of first refusal of the grain and should have the option of taking similar quality grain back in-store. Otherwise, the receiver should work with the CGC to ensure the grain is sold for market value. However, this may be quite challenging and may require changes to the CGA/Canada Grains Regulations (CGR), as well as the Bankruptcy and Insolvency Act regarding stocks in store.
- Increase risk auditing and investigate alternative methods to more accurately measure and report liabilities to ensure licensees are not operating without sufficient security.
    - In the event that the CGC spots financial problems, having additional authority would be helpful to step in and help manage future buying, liabilities, grain sales, etc.
- Investigate alternative approaches for licensees to more efficiently report liabilities to lower the burden and administration cost.
- Gain a better understanding of the costs of the producer payment security program, particularly the costs to obtain security. Some producers have concerns over program costs, which they believe are indirectly passed to them through lower prices for their grain. A more holistic view of the cost to the sector would better enable benchmarking for exploring alternative cost-effective approaches.
- Assess the eligibility period of coverage, in general, as well as for different commodities, which would require a CGR regulation change. It may be appropriate to have longer coverage periods for some speciality crops due to the payment cycle being longer For example, the current program has limits of coverage of 90 days from the date of delivery (or 30 days of the date of issuance) for primary elevator receipts or grain receipts.
- Assess the eligibility period of coverage for transactions that take place with international companies, which may be longer and more complex.
- Implement a more sophisticated method for measuring the credit default risk of licensees. Consider introducing a rating system that can be shared with licensees. Further, consider using the rating system to help determine the amount of required security that must be posted.
- Assess credit risk exposure from other grain buyers (i.e non-licensed buyers) currently exempt from the program and determine what would be required for their inclusion to broaden the coverage of the current program (given the current language of the Act and Regulations, there may be confusion with who is licensed and who is not and restrictions).
- Address the number of unlicensed buyers operating in Western Canada. Consider the application of CGC licensing to these buyers and add penalties for those operating without a license.
- Improve the timeliness of claim payments which are impacted by logistical issues involving receivers, court proceedings, and security providers. Further, consider allowing CGC to issue cheques directly, rather than through SAP, which then directs the Public Services and Procurement Canada (PSPC) to issue cheques to producers, which adds time and effort.
- Increase producer education to better communicate the key elements and important eligibility criteria for the current program. In particular:
    - The program does not guarantee that 100% of claims are paid if security is insufficient.
    - There is no coverage 30 days after the date the payment was issued, and 90 days after grain was delivered.
    - Producers are encouraged to look at the CGC website to see whether or not a grain buyer is licensed and should recognize the increased risk of selling to an unlicensed buyer.

- Understand that the CGC processing of licensing does not provide a rating of licensees, and instead a licensee is either 'in' or 'out' (licensed or unlicensed). Of those who are licensed there can still be a considerable range of financial stability and risk levels.

b. Insurance-Based Model

With a group insurance policy, all payment default risk can be transferred to a third-party private insurance company, providing full coverage apart from the unlikely event the insurance provider becomes insolvent. This would differ from the current model where an individual licensee can purchase insurance coverage to meet its security requirements (as one of the three current alternatives to provide security, in addition to a letter of credit or bond). Instead, an insurance-based program would provide an over-arching umbrella policy to cover the aggregate risk exposure of all licensees. Each licensee would be assessed a premium based on their individual risk profile, however, this approach would take advantage of an industry-wide view of risk exposure to reduce the overall cost of payment protection coverage to the entire grain industry.

An insurance-based program presents a number of challenges, therefore, this alternative does not appear to fully align with the goals of stakeholders, including for reasons such as:

- Cross-subsidization of premiums: There is concern that lower risk licensees may pay too high of premium, while higher risk licensees may pay too low of premium, creating inequity.
- Higher premium cost for lower risk licensees compared to status quo: For some lower risk licensees the insurance they purchase under the current system may be relatively inexpensive compared to the premium required under an insurance-based system with an aggregate umbrella policy (which considers a licensee's risk level). Conversely, higher risk licensees may be denied insurance, or the premium may be prohibitively expensive (which may also disadvantage smaller licensees in particular).
- Transparency: Participants may have concern over the investment strategy of the insurer, transparency over how premiums are calculated, and whether the risk of the payment security program is being pooled with other products offered by the insurer.
- Coverage: Typically with insurance, a deductible is built into the design of the product. In general, maximum coverage levels are set at 90% or 95%, and some producers may find coverage less than 100% unacceptable.
- Profit Structure: Premiums should be set at the actuarially fair value, and private insurance includes a provision for profit, which can increase costs to the program (compared to an industry fund-based approach).
- Design and Flexibility: Purchasing insurance from a third-party provider may not provide sufficient flexibility in the design and coverage. Depending on what features the insurer is willing to provide for an acceptable price, the result may be challenges regarding coverage, price, etc.
- Reduced choice and accessibility: Given that insurers use a risk-based approach for underwriting, it is likely that some licensees would not be eligible and denied coverage. Under the current system, licensees have three choices for security so in the event that they are not eligible for insurance coverage, they could seek security via a letter of credit or bond (which in general are more costly options and perhaps easier to obtain relative to insurance).

Changes to the *Canada Grain Act* in 2012 gave the CGC more flexibility in administering an insurance-based producer payment security model. As a result, the CGC undertook negotiations towards a master insurance policy agreement (combining the exposures of all licensees with the aggregate risk covered by

1 or more insurers)[2]. The changes wre never declared in force, and the concept was eventually dropped by the CGC and reasons related to cost and equity were cited.

c. Fund-based Model Without Insurance:

With a fund-based approach, the financial risk is retained by a pooled producer compensation fund. The fund assumes the risk and covers producers should a payment default occur, as opposed to individual security posted by the licensee. There are several structures to administer a pooled fund such as being held privately, by a crown corporation (similar to Ontario) or, as present, by the CGC. A fee (or premium) is normally collected to maintain a fund balance and to ensure available funds to pay a claim if a default arises.

Key considerations regarding a fund-based approach include:

- Funding would be required to populate and to maintain the fund balance both in terms of its administration and in the case of a default. Approaches that could be considered may include the following or a combination:
    - Financed from licensee contributions based on expected risk of failure and volume of grain purchases (liability).
    - Producer check-off fee determined by each producer's volume and grain-type.
    - Administration fees could be financed by licensing fees.
    - Excess revenue generated by the CGC.
    - Initial government contribution.
- Since the fund provides protection from a licensee defaulting, there is typically a risk-based approach for fees and participation so that a higher-risk licensee cannot disproportionately impact the fund balance and create a concern regarding cross-subsidization.
- A major challenge with a fund-based approach is ensuring there is sufficient funds to pay claims should a default occur.
    - While the minimum fund balance would be determined based on actuarial approaches, a higher-than-expected number or size of defaults may occur in a given year, exceeding the market value of the pooled funds. The result would be that producers receive less than 100% coverage, dividing all claims amongst the available funds (similar to the approach where the security is not sufficient to cover claims), and the fund is depleted and not in a position to cover future claims.
    - An approved investment strategy would be required to inform the investment of pooled funds to maximize its value and performance. The fund will be invested in various assets that can depreciate in value, or default, resulting in inadequate assets to make payment claims to producers.
    - A common concern is related to asset/liability mismatch related to the investment strategy of the fund, which relates to liquidity risk. If claim payments are concentrated in a single year, assets will need to be sold sooner than expected to make payment to producers. Since the time frame used to bring assets to market impacts their sale value, there would be a negative impact on the fund surplus.
- Another main concern with a fund-based model is that this approach can be relatively costly to capitalize initially, and in some cases if funds are not available it may be viewed as an inefficient

[2] Available at: https://www.grainscanada.gc.ca/en/about-us/org/initiatives/2021/canada-grain-act/producer-payment/alternatives.html

use of capital. For example, the cost of creating a fund to provide adequate coverage for all grain licensees in Western Canada is likely to exceed the cost of the current program or using private insurance in a given year or the short-term.

- Another main concern with a fund-based model is the inability to deal with several credit default events occurring simultaneously, commonly referred to as catastrophic risk. This follows from limitations in the initial fund balance relative to the volume of annual grain transactions; however, this risk can be mitigated with the inclusion of reinsurance, as explained in the subsequent section.

d. Fund-based approach with insurance/reinsurance:

Building off the previous fund-based alternative presented above and the challenges regarding initially capitalizing the pool and ensuring the fund is sufficient to cover unexpectant frequent and/or large claims, a hybrid approach that utilizes insurance, reinsurance or an alternative back-stopping approach could overcome these difficulties. Therefore, in addition to the points raised above key considerations with a fund-based approach with some form of back-stopping/risk transfer includes:

- To account for the possibility of extreme losses, at times, a relatively large amount of capital may be needed in the pool to provide a high degree of certainty and coverage. However, if insurance or reinsurance (such as a stop-loss treaty), or other backstopping (such as government) is used, the required capital could be reduced as the risk transfer contract could cover the catastrophic risk. Therefore, adding back-stopping may be the recommended approach to meet the needs of all stakeholders.

4. Risk Assessment

The Risk Assessment process of the ERM framework consists of three main steps, including Risk Identification, Risk Analysis, and Risk Evaluation. The outcome is an improved understanding of risk exposures, which serves as a critical foundation to assessing the feasibility of a fund-based program and the other design elements necessary to meet stakeholder needs. The three main steps are presented next.

a. Risk Identification

The focus of this section is on developing a Risk Inventory, which is an important step centered around the belief that unidentified risks can pose a major threat to a successful producer payment security program. Therefore, it is important to ensure that a comprehensive range of risks are identified, including a focus on both opportunities and threats. Given our scope focused on the producer payment security system in Western Canada, our initial step focuses on compiling a Risk Inventory for both the current security-based model, as well as the alternative proposed fund-based approach (with back-stopping). These inventories highlight important considerations in comparing the two approaches, as well as in assessing key features and functionalities to meet the needs of all relevant stakeholders.

It is noted that a producer payment security program does not reduce or eliminate the risk of payment default in the grain industry. Rather the program is focused on providing protection to producers through the transfer of risk via an efficient program. It should also be noted that the risk inventories relate to the actual risk of the program model itself (its ability to perform as expected), not to the risk or the likelihood

of a payment default event to producers. This information is helpful when considering the design of the various components of the proposed fund with insurance/reinsurance.

i. Risk Inventory and Risk Analysis

The development of the Risk Inventory is largely based on interviews conducted with different stakeholders, including producers (wheat, canola, pulses and specialty crops), industry associations, licensees, and government. Given the confidential nature of the interviews, the names are not provided. In addition, research was conducted using *publicly* available literature on the current payment default security program and analogous programs operating in other jurisdictions. The risks identified are not limited to those that had resulted in previous shortcoming of the program, and consideration was also given to emerging risks that are not always recognized by stakeholders.

Consistent with an ERM framework, risks are categorized and identified in the broadest sense. Identifying risks as general as possible helps with consistency for ranking their impact and overall importance for deciding which model is most efficient at meeting the objectives of all stakeholders. This increases the usefulness of the Risk Inventory for comparing the strengths and weaknesses across the two models. Some identified risks are only considered relevant to the fund-based model. Thus, an additional Risk Inventory is created, which is still useful for comparing the two models.

The Risk Definition provides a more detailed explanation of the relation and impact that each identified risk would have on the respective program model, given the assumption if the risk event were to arise. Examples of realistic scenarios that would drive each risk event follow. For many of the important risks identified in the inventory, there is insufficient data available for analysis of a meaningful probability of occurrence. For these risks, the scenarios provide valuable qualitative analytical insight that can be used to prioritize risks in term of frequency and severity between each considered program. The final column of the Risk Inventory compares the impact of each risk event on the two different programs. The analysis also compares the different mitigation strategies available to both programs.

Included within the Risk Inventory is the Risk Analysis. This considers the extent that potential risks might have an impact on achieving a successful producer payment program, with a focus on analyzing the likelihood (frequency) of the risk occurring, as well as the severity if it occurs. The analyzed risks are documented in the Risk Inventory below.

Risk Inventory

A key step within the ERM process is the creation of a risk inventory. Risk inventories were created for both the current and proposed fund-based model to illustrate the difference in risk exposure unique to each program. Further, the risk inventory can be used to inform the decision process that relates program design to the multi-faceted views of the various stakeholders involved.

The two risk inventories are presented as a heat map, which categorizes risks by their frequency and severity. The benefit of using a heat map is to help rank and prioritize risks when comparing the current and proposed program. The cells in the map are colour coded, with those risks coloured in red indicating higher importance. A more detailed and comprehensive risk inventory is provided in the Appendix of this report. The risk inventory in the Appendix provides a more detailed definition of the risk, common scenarios that drive the risk event, and analysis on the relation of the risk between the two programs (Current Security-Based Program and Potential Fund-Based Protection Program).

Risk Inventory Heat Map: Current Program

SEVERITY →

FREQUENCY ↓	Low	Medium	High
Low	• Administration requirements surpass the workforce capability (Strategic) • Lower than expected participation if the program was not mandatory (Strategic)	• Increases in fees charged externally (Financial)	• Credit Default for Asset(s) backing coverage (Financial) • Assets used for coverage do not meet program requirements (Operational)
Medium	• Longer than expected duration between default and producer receiving payment (Operational)	• Underestimation of payment credit default risk (Strategic) (risk of payment default)	
High		• Failure to adequately educate producers/licensees on responsibilities and eligibility criteria (Strategic)	

Risk Inventory: Proposed Program

FREQUENCY ↓ / SEVERITY →	Low	Medium	High
Low	• Underestimation of payment/credit default risk (Strategic) • Longer than expected duration between default and producer receiving payment (Operational) • Assets used for coverage do not meet program requirements (Operational) • Increases in fees charged externally (Financial) • Administration requirements surpass the workforce capability (Strategic) • Failure to adequately educate producers/licensees on responsibilities and eligibility criteria (Strategic)	• Lower than expected participation if the program was not mandatory (Strategic) • Asset-Liability Mismatch (Financial)	• Credit Default for Assets Backing Coverage (Financial) • Reinsurance Failure (Financial)
Medium		• Modelling Error (Strategic) • Unable to obtain Third Party Insurance/Reinsurance Coverage (Strategic) • Lower than expected return on Fund (Financial)	
High			

ii. Risk Evaluation

Building upon the Risk Inventory and Risk Analysis, the underlying risk profile is developed for the sector, considering the multiple stakeholder viewpoints. In evaluating risks for prioritization to assess the current program relative to the proposed fund-based program (with back-stopping), consideration is given to the degree of control over each risk, the cost impact, as well as benefits and opportunities presented by the risks. To begin, we identify key guiding principles from the perspective of the various stakeholders to guide the design and analysis.

Key Guiding Principles of Stakeholders

The primary objectives and needs of identified stakeholders concerning the mitigation of payment default risk is presented in the table below. The objectives and key principles listed below are general and apply to any proposed program model addressing payment default risk. The information below is gathered primarily from Western Canadian grain stakeholder interviews conducted throughout the project.

Stakeholder	Principles
Producers	• The cost of the program should be as low as possible. Regardless of which stakeholders contribute financially to the program, all fees/premiums impact the profitability of grain producers. • The underlying mechanics of the program, including rules applied to licensees, should be clear and transparent. This requirement, as well as more information on risk exposure, will help producers incorporate the risk of payment default into their farm marketing decisions. • Any claim settlement process needs to be efficient. This includes reporting requirements, so they are not overly burdensome, as well as timelines of payments to provide payment certainty and to avoid undue hardship. • Any claim settlement process needs to be fair in terms transparency, timeliness and efficiency. Producers should not be concerned with legal issues arising from the licensee's default, and sufficient protection/processes/authority should be in place to allow a producer to take back available grain of similar quality if available (rather than wait for a financial payment later). • The program must adequately handle catastrophic losses. Producers should not be concerned that multiple credit default events will compromise their coverage from the program. This includes increased assurance of the amount of coverage they will receive (rather than how much is available to split amongst producers claiming). • The competitiveness of the Western Canadian grain system should be maintained. This means carefully balancing the hurdles for higher-risk licensees against ensuring sufficient buyers in the market to ensure competition to maintain strong market prices for commodities and support crop rotations. • Increased transparency of the program to generate better understanding of risk and to create more certainty in coverage and payment. • Most producers interviewed would like to see payment protection extended to non-licensed buyers such as large feed mills and lots.
Licensees	• Any program should not result in market advantages for selected companies or commodity over one another (i.e. it should not encourage the use of grain elevators over grain processors, etc.). • The cost of the program should not be a barrier for small or newer companies entering the market. • The cost incurred by licensees should be proportional to their individual level of risk. This means lower risk companies should not subsidize higher risk companies. • There should be a mechanism in place to protect program stability from the additional risk posed by extremely high-risk licensees participating in the program. • Participation should be relatively straight forward, and the requirements of licensees communicated clearly. • The regulations of the program should not inhibit business growth. • All licensees should have the ability to participate in the program (with fees/requirements dependent on their individual risk profile). • In general, licensees should not face substantially increased costs with a new program relative to the cost of security under the current program.

Government and/or CGC	• The program should uphold the high standards and quality of the grain quality system in Western Canada. • The program should be fair and foster market competition, and it should not make entry into the market extremely difficult for smaller companies. • The program should actively monitor the market behaviour of licensees (risk auditing), to ensure oversight and stability of the grain system. As well, active monitoring and risk auditing will help the government to continually scan and assess overall market risk. • The program must be reliable in preventing credit default events from adversely impacting the growth of the grain sector. Producers must be able to count on a predetermined level of coverage. • Mechanisms such as back-stopping must be in place to address the possibility of a catastrophic credit default event, protecting the stability of the program and ensuring producers are fully compensated. • The program should be cost-efficient if government sponsorship is required.
Private Sector (Reinsurance, any out-sourced administration, which includes required actuarial valuations)	• The mechanism of the program should not make the quantification of program risk exposure impossible. This is a necessary requirement for the transfer of any risk to a third-party (reinsurance). • The program should obtain highly accurate actuarial valuation of liabilities, to further assist with any potential risk transfer. • Adequate data collection and experience (such as that available through licensing) must be available to ensure accurate risk profiling and actuarial analysis. • Outsourcing of any program function/requirement should seek the most cost-efficient option, conducted within legal frameworks, avoiding conflicts of interest.

Fund-based program design

The two preceding sections provide a framework to initiate product design and develop a fund-based system with reinsurance. This section provides the specific features and components that would address the objectives of each stakeholder in Section III. Further, the analysis considers the constructed Risk Inventories in Section II.

Program Element	Proposed Design Characteristics	Relation to Stakeholders Objectives

Cost Structure – Initial capital	There are three possible stakeholders that can contribute to the costs of the program, including:
	• Producers
	• Licensed and unlicensed grain buyers
	• Government
	  ○ The CGC
	  ○ Provincial/Federal Government
	
	Recall that the cost structure of the current program delivered by the CGC is cost-neutral such that:
	• Licensees pay a licensing fee that helps support administration of the program.
	• Licensees purchase/provide private security from one of three options (letter of credit, bond, insurance).
	• There are some perceptions amongst producers that they indirectly pay for a portion of the program, which is passed on to them via lower grain selling prices.
	
	As a comparison, the cost-structure of the Ontario fund-based model structure works where:
	• Producers pay a 'check-off' fee as a form of premium for the fund, based on the volume of grain sold and the commodity type.
	• Licensees pay a licensing fee that helps support the administration of the program.
	• Licensees are assessed for risk based on analysis of financial metrics. Buyers who 'pass' can participate in the fund based on their licensing fee. Buyers who 'fail' are deemed too high of risk and are required to purchase additional 3rd party security (letter of credit, insurance, etc.). This serves as a risk classification technique to help avoid cross-subsidization of claims.
		Lower cost: The Fund's cost structure is likely a lower-cost alternative than the current approach of purchasing 3rd party security. The main reasons are due to:
		○ Pooling of risk pertaining to credit-default risk across the sector, and
		○ Not-for-profit structure (with the exception of the portion of insurance/reinsurance, if used).
		
		It should be noted that different considerations could be given to managing higher than expected surplus levels (within the Fund), such as providing premium rebates to producers and/or pausing check-off fees for a period of time while the balance exceeds a predetermined minimum threshold.
		
		A check-off applied to producers for each transaction could address the issue of transparency regarding the cost of mitigating payment default risk, as well as a fee to licensees. This transparency is important given the uniqueness of the stakeholders within the value chain. For example, producers benefit from the protection of the fund, as they receive the claim payment in the event of a default. However, licensees drive the risk to the fund as their financial stability and decisions they make determine whether they become insolvent and default on payments. As such, this approach helps to balance the different perspectives of the stakeholders and adds incentives for licensees to adhere to program guidelines, as they provide capital to the fund through fees (i.e., administration, additional security), making the structure more equitable and helping to avoid issues with moral hazard.
		
		From the perspective of government, a main interest is helping to ensure the growth and stability of the sector. Initial investment of the capital requirements to establish the fund would provide an important opportunity for the government to be an invested stakeholder in the program. This may also improve the legitimacy of government in terms of implementing rules and regulation regarding the operation of the fund and the licensing framework. Further, it emphasizes the unique viewpoint of government in helping to manage competing positions of producers/licensees at times, optimize the right balance of risk and return for the fund-based system, etc.
		
		There has been some discussion that the current CGC surplus could be used and tied to the cost structure. Some stakeholders believe that producers have full, or partial, claim to the $147 million surplus (as of December 31, 2020), as they perceive services fees are ultimately passed back through grain prices. As such, it may be mutually beneficial to transfer a portion of this surplus to provide the initial capitalization of the fund.

	• To help reduce the required fund balance, the provincial government 'back-stops' the fund[3]. This means that less capital is needed initially to start the fund as large, unexpected losses are insured (back-stopped) by the government. This type of arrangement is in place for the current AgriInsurance program across Canada (via the provincial and federal reinsurance funds), where the government essentially guarantees that they will step in to pay for any claims beyond a certain threshold.
	• All considered stakeholders should contribute to the cost of the fund. The required contribution of each stakeholder to the fund should be made transparent.
	
	Therefore, in the case of a fund-based model, a fee structure that includes some combination of producers, licensees, and government may be desirable. One example may include:
	• Government: Initial capitalization of the Actuarial Reserve (seed funding, allocation of surplus held by Treasury, etc.)
	• Licensees:
	  ○ Annual license fee to help support administration
	  ○ Additional fee paid to the fund (or perhaps a separate 3rd party coordinated risk transfer policy) based on a risk score/classification to address concerns of cross-subsidization
	• Producers pay a 'check-off' fee as a form of premium or the fund, based on the volume of grain sold and the commodity type
		In addition to the surplus, it should be noted that the government may also play a role in providing a back-stop to the fund, serving as a lower-cost, potentially more stable, alternative to insurance/reinsurance and protecting the fund from unexpected losses that may otherwise exceed the available fund balance. A government back-stop also helps to reduce the amount of initial capital needed to establish the fund (as an example, with government back-stopping the fund reserve may be able to be established based on holding sufficient reserves for a 1 in 10-year event, compared to no government stopping, which may require holding sufficient reserves for a 1 in 50 or 1 in 100 year event, which is much more capital intensive.

[3] Ontario's actuarial approach to determining the fund balance is based on a 10-year forward-looking stochastic model. This means that the government back-stops the fund for events that are expected to occur less frequently than 1 in 10 years (based on the 99.5 percentile).

Program Element	**Proposed Design Characteristics**	**Relation to Stakeholders Objectives**
Cost structure – Fees	It may be that different commodities have different risk profiles, which contributes to different risk levels in the fund. When this occurs, there is a risk of cross-subsidization of premiums, which refers to higher risk stakeholders paying too little premium and lower risk stakeholders paying too much premium, relative to their true risk. Therefore, a separate fee structure may be needed to differentiate between commodities and their risk profiles (corresponding to higher premiums/fee for commodities that have a higher probability of default). As mentioned above, there are different structures for determining payments to the fund. One approach is via a 'check-off fee,' where premium is collected for each transaction based on the volume of grain sold and commodity type. Further research and discussions with stakeholders should occur to determine the fee structure that is best-suited in creating alignment.	A common concern noted throughout the interview process was related to cross-subsidization of premiums, where producers who mainly sell low risk crops may subsidize the cost of mitigating the risk of producers dealing primarily with high-risk crops. For example, commodities without a futures market, such as lentils and speciality crops may be higher risk for credit default. In addition to cross subsidization of low versus high risk crops, the same can be considered for low versus high risk licensees. More research is needed to determine default rates by commodity type, as well as licensee risk characteristics to better understand risk classifications and associated fee structures. The proposed fund-based model could address concerns over cross-subsidization in a number of ways, including: • Managing separate funds for each commodity (or likely more reasonable for groupings of commodities), designed to match the unique risk exposure of each corresponding grouping. • Fees that are assessed on a risk-based basis, where higher risk crops pay a higher fee. Similarly, since licensees drive the risk to the fund, higher-risk licensees should also pay a higher fee (or be required to purchase extra security). An additional consideration is that the fee structure should not unfairly penalize small or new grain buyers entering the market, such as unrealistically high fees for program participation (i.e. cost-prohibitive premiums). Reducing barriers to entry in this regard will help to ensure a competitive market and grain prices. In addition to a 'check-off fee' structure, licensing fees currently paid to the CGC could be allocated to help with the administration of the fund (according to the governance structure put in place). Further, a risk-based approach could also be implemented to ensure that licensees with higher-risk contribute more premium (or provided additional security) to help ensure the stability of the fund and ensure equitability amongst participants. This has the benefit of all stakeholders having a stake in the financial viability of the fund. In summary, there are several alternatives regarding fee structures that could be further explored: **Alternative 1**: Similar to the current program, licensing fees could be used for administration. Instead of licensees purchasing 3rd party security, similar fees (determined on a risk-assessed basis and giving consideration to the type of commodity) could be assessed and contributed to the fund. The fund could then be protected against catastrophic loss via insurance/reinsurance or government back-stopping. **Alternative 2**: Rather than the perception of producers indirectly paying for a portion of the current program, producers could contribute a 'check-off' fee to the fund, based on crop type and the volume of grain sold. At the same time, the licensing fees paid could be used for administration of the fund. As

		a third layer, licensees could be risk-classified and charged an additional 'risk' premium based on the assessment of their financial ratios, etc. The risk premium could be paid directly to the fund (with the liability managed directly within the fund), or a combination of 3rd party risk transfer alternatives could be explored to help manage this higher risk. The fund could then be protected against catastrophic loss via insurance/reinsurance or government back-stopping.
Program Element	**Proposed Design Characteristics**	**Relation to Stakeholders Objectives**
Risk - Governance Framework	The fund should implement an official Risk Governance policy. The aim of this policy would be to establish limits on individual risk exposures from licensees. The policy would typically include i) the framework for assessing and identifying whether the grain buyer has surpassed established thresholds for financial risk exposure, and ii) a mechanism to allow licensees to retain their licence if they pass this threshold. If a licensee's risk exposure exceeds established limits, the program should require that they post collateral that can be used to partially cover any future default on payments owed for delivered grains (such as a letter of credit, 3rd party insurance, etc.). Alternatively, licensees who surpass risk exposure limits may pay an additional risk-based fee directly to the pool (where the pool manages the increased exposure directly and then on the back-end protects from extreme losses via insurance/reinsurance). Additional objectives of the risk governance policy would likely include the availability of information collected by the program on licensees, as an example. This would have the benefit of i) helping producers make better informed decision on who they engage with (i.e. sell their grain to), and the health of the program. This in turn would enhance the financial strength of the grain market in Western Canada. ii) Act as an incentive for licensees to improve their risk profile as the program increases the transparency of the financial strength of individual licensees. This may indirectly favour large, and lower risk licensees.	Multiple objectives were identified during the interviews with stakeholders, which are dependent on setting limits of individual contribution of risk. These objectives include: - fair and equitable sharing of the costs of the program. - Long-term sustainability of the fund with the aim of being self-sufficient. Further, setting limits on individual risk-exposure decreases the likelihood of the following unfavourable scenarios arising: - The minimum required fund balance is unrealistically high which makes program implementation unfeasible. - Refusal of reinsurer from issuing a policy. Requiring the posting of additional collateral for licensees identified as high risk for credit default is an element of the Ontario program that mitigates credit default risk in addition to coverage provided by the fund. Alternatively, or additionally, the introduction of a risk classification system could also be provided as a mechanism to ensure equity across licensees with different default probabilities. This may also help to bring more awareness to the program and understanding regarding risk profiles. A program that is proactive in helping producers manage credit default risk was indicated as a desired trait for a proposed payment security program.

Program Element	Proposed Design Characteristics	Relation to Stakeholders Objectives
Risk – Fund oversight	The fund should also have independent oversight to ensure transparency through a board governance model. The board could be responsible for setting the investment strategy and the risk governance policy, as well as approving design parameters and financial statements and actuarial assessments. An administrator, such as CGC, could be responsible for managing and administering day-to-day operations of the Fund.	The proposed fund-based model should establish a risk governance board, comprised of appointed members representing the diverse stakeholders that are involved with the program (producers/licensed buyers of varying operational size, working with differing crop varieties). The primary objective of the board would be providing strategic direction that reflects the conflicting objectives of all considered stakeholders. An example would be reviewing the reasonableness of charged fees. Responsibilities could also involve providing advice when considering changes to program structure or investment policy. Further, the board can be involved with resolving disputes between the program and its participants. It should be noted that much work would be required to confirm or establish authorities and rules associated with holding a fund and investing it. The board could be similar to the Grain Financial Protection Board, a component of the Ontario program, whose mandate involves oversight of the fund. Further, the board aims to be a risk management tool, ensuring participants in the grain market remain competitive. The board members are appointed by the provincial minister to a term of no longer than 3 years. Members are chosen from various backgrounds (current board members include farm managers, farm administrators, Agronomists, self-employed farmers, grain feed dealers).
Program Element	**Proposed Design Characteristics**	**Relation to Stakeholders Objectives**
Fund integrity - Investment Strategy	Through the creation of an investment strategy, the proposed fund would provide the required flexibility to respond to unexpected market/industry developments in a manner that reflects the objectives of various stakeholders simultaneously. One example is through the selection of assets in the fund, balancing liquidity requirements and investment income.	There is flexibility in devising an asset portfolio of the fund that considers the needs of all stakeholders. Investment income would contribute to the cost of funding future liabilities with the ultimate benefit of decreasing the costs associated with premiums/fees, administration, etc. of managing the fund sustainably to mitigate default risk. The current model ties up large amounts of capital in bonds and letters of credits; or is unnecessarily costly, like fees charged for insurance policies that do not provide a return to stakeholders. Furthermore, it is unknown what the total cost of the current program is from the perspective of licensees obtaining 3rd party security, which makes evaluation of alternatives more difficult. However, based on the principles of pooling, it is assumed that substantial efficiencies could be gained in a fund-based approach, amongst other benefits from increased transparency, timeliness of payments, guaranteeing 100% of program benefits owed to producers in the event of a claim, etc. Note that this reference of guaranteeing 100% of payments owed from the program does not necessarily equal 100% of losses due to a credit default event. In many insurance instances, it is desirable when the insured has 'skin in the game,' and accepts some risk, which means that program coverage is less than 100% (also resulting in lower costs associated with risk mitigation of the program). In this context, the fund can be designed to guarantee 100% of program benefits, whatever the coverage level.

		Liquidity measures how quickly assets can be converted to cash; along with any associated decrease in their market value when brought to market. Actuarially sound liquidity requirements would increase the probability that benefits are paid out faster over the current system. Other considerations involve the cost relating to the purchase of financial derivatives recommended by an investment committee/Fund oversight or actuarial valuation. Derivatives are a type of insurance product that guarantees cash payments if the market value of an asset were to depreciate beyond a pre-determined threshold. Derivatives may be recommended or required if market/credit risk exposure is greater than established risk tolerance levels.
Program Element	**Proposed Design Characteristics**	**Relation to Stakeholders Objectives**
Fund integrity -- Actuarial Valuations	Actuarial valuation will need to be performed periodically, which will determine the actuarially present value of the liabilities. This will be used in part to set and maintain the target fund balance, as well as to help ensure the fund is adequate to meet future payments with a high degree of confidence.	Actuarial valuations are the primary mechanism for identifying changes in the frequency and severity of default risk. They would also provide insight into changes in market risk as it relates to the viability of the fund. Periodic valuation (typically reviewed annually as part of the fund management and a comprehensive valuation every 5 years) conducted with appropriate actuarial expertise would enhance the efficiency of the fund through a forward-looking approach that could: • Revaluate reinsurance needs with the possibility of reducing coverage • Guide investment policy and indicate when opportunities emerge to seek more aggressive investment strategies that are within established risk tolerance levels Over time, if surplus builds up to exceed a predetermined threshold, rebates may be returned to stakeholders and/or contributions to the fund could be paused temporarily. This gives full transparency and flexibility to the various stakeholders.
Program Element	**Proposed Design Characteristics**	**Relation to Stakeholders Objectives**
Fund integrity - Inclusion of a back-stopping component, such as Insurance, Reinsurance, or Government	This will help to ensure that catastrophic losses are covered and that the fund balance isn't compromised (i.e. it will stay sustainable). Also, it helps to ensure that producers impacted by the credit default will get paid.	A stop-loss type reinsurance treaty could be put in place to cover the extreme fund risk at higher layers (where severity increases). Additional design work, pricing, and actuarial analysis will need to be conducted to facilitate negotiations with insurers/reinsurers in terms of coverage terms, price, etc. The main advantage of having a back-stop for the fund is that it will ensure that the fund is not depleted by large unexpected claims. This will also provide protection to producers so that in the event of a default they get paid. This can also provide benefits in terms of cost-efficiencies by reducing capital requirements. An alternative to insurance/reinsurance is a government back-stop. There is precedent in Canada in the agriculture sector regarding government back-stopping of funds. For example, each provincial crown corporation in Canada maintains a crop insurance fund balance, and many provinces also purchase a stop-loss reinsurance policy to cover the next layer of loss (up to a certain point). After this point, in the event of large, unexpected losses the provincial government provides a back-stop paying claims when the surplus of the provincial crown corporation is depleted, and beyond this level there is a federal back-stop via the Reinsurance Fund of Canada. The Ontario Government also provides a back-stop to the equivalent of their producer payment security program.

Actuarial Analysis Requirements

The focus of this section is on an initial actuarial analysis to better understand some of the key risks under the proposed Fund-based (with back-stopping) model. A high-level and preliminary Loss Model is developed to explore quantitative considerations regarding estimated costs, protection timeframes, coverage levels/deductibles, etc.

A preliminary model for pricing the Fund-based program was constructed as part of our analysis, which is used for:

- Illustrating the process involved with determining premiums and the initial fund target
- Estimation of initial fund balance
- Providing a framework for the further investigation of the required assumptions needed to proceed with the implementation of an actuarial sound model that can be used in practice
- Sensitivity analysis: understanding the impact of product design and assumptions related to the cost of the program

Note that the results provided below are for **illustrative** purposes only. The additional components required to enhance the model to perform actuarial sound calculations that could be used for real-world pricing are described below.

4.1 Model Design

The model presented below, which is built in Excel, applies stochastic methods to determine an initial target balance for the fund: 5,000 plausible future scenarios of program experience is projected 5 years into the future. For each scenario, projected cashflows are discounted to time 0 using the rate of return of the fund's assets in each corresponding scenario. These values are then used to create a probability distribution of the fund balance (at time 0) required for the program to be solvent at year 5.

The target fund balance is calculated as **VaR 95**: The amount that is required for the fund to fulfill all payment obligations over the next 5 years with a **probability of 95**. This value is equal to the 95th percentile of the distribution of future outcomes generated from the simulated scenarios. Other VaR assumptions can be implemented in the future.

Cashflows for each projected scenario consist of benefit payments, expenses and premiums. In each scenario, the cashflows and the return on the asset portfolio are variable, which are determined by the volatility parameter assigned to certain assumptions. The volatility parameter can be viewed as a measure of the uncertainty in the forecasted assumption (i.e. the extent which actual experience differs from the value used in the model is proportional to the volatility parameter).

4.2 Model Assumption – Program Cashflows

The following chart summarizes the assumptions used within the model for projecting cashflows.

Assumption	Notes	Value	Calculated Standard Deviation	Volatility Parameter
Exposure to risk in year 1	This is calculated as the maximum amount of volume of exposure in the last 5 years, as inferred from the data provided by CGC.		n/a	n/a
Allocation of Exposure by month	All projected claims are assumed to be allocated in one month (September) for ease of modelling. Future analysis can easily incorporate claim occurrence throughout the year.	100%: September	n/a	n/a
Annual Increase in Exposure	This is calculated as the average of the annual increase in exposure over the past five years, using data provided by CGC. The volatility parameter is determined by dividing the standard deviation by mean.	2.94%	8.45%	2.87
Rate of Default (per $ of exposure)	The rate of default is measured as loss per dollar of exposure. It is calculated as the average of annual recorded losses divided by exposure. The volatility parameter is determined by dividing the standard deviation by the mean.	0.21%	0.31%	1.48
Expenses - Fixed	Fixed expenses are costs that do not vary with the volume of transaction (i.e. accounting fees, investment management expenses). It is set equal to the maximum incurred fixed expenses by the Ontario program in the previous 5 years. A conservative estimate was considered appropriate given the Ontario program has been in practice for many years and would likely have an advantage over a newly implemented program in terms of administration efficiency.	$38,220 for peak months (per month from April-Aug) $4,200 for off peak months (per month)	n/a	0.50
Expenses - Per $ of exposure	Variable expenses are costs that vary in relation to the volume of transactions placed (i.e. costs related to processing claims). Its value is derived from past experience of the Ontario Program.	0.00002$ for dollar of exposure of risk	n/a	0.50
Initial Start-up costs	Expenses expected only in the first year of operation that relate to the initial start-up of the program.	25% of fixed expense of the initial year of operation	n/a	0.50

Note: Exposure data provided by the CGC is confidential. It was assumed that the total posted security amount did not represent total exposure in a given year. This was concluded from the observation in publicly available data (https://www.grainscanada.gc.ca/en/about-us/org/initiatives/2021/canada-grain-act/producer-payment/history-payments.html)

that program payouts did not always provide 100% compensation to grain sellers when buyers defaulted on owed money. Therefore, it was necessary to apply a factor to adjust for the estimated shortfall in posted security.

Past experience for expenses incurred in the Ontario Government's Grain Financial Protection Program, referenced above, can be found here: http://www.omafra.gov.on.ca/english/open/gfpb-bus1720.htm

A more detailed and comprehensive breakdown on how the model assumptions were derived is provided in the Appendix.

4.3 Model Assumptions – Market Assumption

The overall rate of return of the investment portfolio is calculated as a weighted average of the projected return of the individual asset classes that comprise of the fund portfolio.

Assets are modelled using a method called Capital Asset Pricing Model (CAPM), which considers the relationship between market risk and expected return (i.e. assets with a higher expected return have a higher risk of default). The parameters of each asset class are based off historical data, illustrated in the chart below:

Asset Type	Expected Return/ Volatility	Fitted Distribution	Data Source for modelling
Long-term Government Bonds	Low/Low	Modified Normal (minimum value is 0, since government bonds never have negative returns) (Mean = 0.16%, STD = 0.0272)	Government of Canada Bond Yields/Marketable Bond Average Yields
Provincial & Municipal Bonds	Low/Low	Modified Normal (minimum value is 0, since government bonds never have negative returns) (Mean = 0.18%, STD = 0.0225)	S&P Canada Provincial & Municipal Bond Index
High-Yield Corporate Bonds	High/High	Normal (Mean = 0.53%, STD = 0.0661)	S&P Canada High Yield Corporate Bond Index
Investment Grade Bonds	Medium High/Medium-High	Normal (Mean = 0.22%, STD = 0.0222)	S&P Canada Investment Grade Corporate Bond Index
Commercial Mortgages	Medium/Medium	Normal (Mean = 0.32%, STD = 0.0035)	Canada Mortgage and Housing Corporation, conventional mortgage lending rate, 5-year term
Equities	High/High	Lognormal (Mean = 0.38%, STD = 0.0597)	Scotia Canadian Equity Index Series A (0P000070D3.TO) (https://ca.finance.yahoo.com/quote/0P000070D3.TO)
Stocks	High/High	Lognormal (Mean = 0.57%, STD = 0.0459)	S&P TSX Composite Index
Cash equivalent	Low/Low	Gamma (Shape parameter = 13.2784, Rate parameter = 80320.0279, Mean = 0.017%, STD = 0.0000454)	U.S. Daily Treasury Long Term Rate Data

Inflation: The model uses inflation to determine annual changes in expenses. Expected future inflation rates were provided by the website Statista and are illustrated in the table below:

Year	Inflation Rate (Annually)	Inflation Rate (Monthly)
2021	1.27%	0.105%
2022	1.62%	0.134%
2023	1.86%	0.154%
2024	1.96%	0.162%
2025	1.99%	0.164%

In testing the model (summarized below), different asset portfolios were used. They differ in the proportion of each asset class used in the total portfolio. The following table illustrates the difference between the three portfolios tested:

Asset Type	Conservative	Moderate	Aggressive
Long-term Government Bonds	**20.00%**	12.50%	5.00%
Provincial & Municipal Bonds	**20.00%**	12.50%	5.00%
High-Yield Corporate Bonds	5.00%	12.50%	**20.00%**
Investment Grade Bonds	5.00%	12.50%	5.00%
Commercial Mortgages	5.00%	12.50%	5.00%
Equities	5.00%	12.50%	**20.00%**
Stocks	5.00%	12.50%	**35.00%**
Cash equivalent	**35.00%**	12.50%	5.00%

4.4 Model Shortfalls

The intent of this analysis was to provide a preliminary analysis of model results. Therefore, future work will need to devote additional resources and actuarial software should be used to further develop the model and test assumptions. The following provides a description of the main model shortfalls. This could be used as a guide for the requirements needed to implement an actuarial sound model that could be used in practice.

4.1.1 Data and Assumptions

The assumptions used for rate of default should be based on larger sets of data; if possible, extending to out of jurisdiction experience, which could further validate the derived rates. More comprehensive data should be sought, which could be used to analyze the relationship of default rates with other relevant variables, such as transaction size, type of commodity, financial rating of buyer. This in turn could be used to refine the assumptions used in the model to better reflect the characteristics of the expected covered volume of transactions.

Note with minimal available data, the modelling of the rate of default was limited to 'rate per dollar of exposure'. In practice, most credit default models comprise of two components 'frequency of default' and 'severity of loss given default.'

Further, in practice the assets comprising the portfolio should be modelled in greater detail (i.e. each asset should be modelled individually, reflecting individual characteristics like grade, duration, expected return/volatility). Modeling assets with broad classes was used because it is not known the precise assets that would comprise of the fund's portfolio if the program were implemented. Therefore, this was not the result of limitations in available data.

4.1.2 Model complexity issues

- Liquidity: The model does not consider available cash requirements. In the event insufficient cash is available to meet payment obligations, assets will need to be brought to market, which can depreciate in values depending on market conditions. This cost is not reflected in the model.
- Reinvestment: When fixed-income assets mature, they need to be re-invested. The model does not consider any reinvestment strategy or the impact of changes in market rates when assets are reinvested.
- Taxes: This would likely be easy to implement to the current model design, but it is not clear what taxation rules would be applicable to the proposed fund-based model.
- Asset correlations: Asset returns are modelled independently but should take into account correlations (i.e. usually stocks and equities risk and fall together).

Note, addressing these issues would require implementation of actuarial software, such as GGY-AXIS.

4.5 Summary of results

A main focus of the analysis was to understand the initial capital requirements to establish a fund-based model, as well as sample premiums. The following table shows the calculated target fund balance for a given premium rate based on three portfolio investment assumptions, followed by the sensitivity analysis of the assumption. The initial target balance is important for understanding the feasibility of a fund-based approach for a producer payment security program, providing an estimate of the amount of capital required initially to set up the fund. The table below shows different initial target balances depending on assumptions surrounding a conservative, moderate or aggressive portfolio in terms of an investment strategy. As well, three different assumptions for the premium are considered, which corresponds to the amount that would need to be collected from farmers (via a check-off fee) and/or licensees to maintain the Fund to ensure claims could be paid out when they occur. In general, there is a trade-off between collecting a lower premium and requiring greater initial capital for the fund, compared to collecting a larger premium and requiring less initial capital for the fund establishment. Based on the set of assumptions considered, the calculated premium rate (based on 100% coverage and VaR 95, which is further explained below) ranges from a low of 0.0005 per dollar of risk exposure to a high of 0.004 per dollar of risk exposure. This means that for each dollar of grain value insured, the cost to the farmer and/or licensee is between 0.0005 and 0.004 cents. Consider the following example below for further illustration, which considers a premium cost per acre (which could also be converted to a per tonne or per dollar value).

- Assume 55 bu/acre canola is produced at $13/bu/ac
- This is roughly equivalent to 1.25 tonnes at $573 per tonnes
- The grain value is then approximately $715/acre
- In this example, the premium rate in our model would be equivalent to:
    - A low of $0.3575 per acre
    - A high of $2.86 per acre

The table below provides an overview of the model assumption and the corresponding initial capital (i.e. initial target balance) required to establish the fund, based on three premium rate scenarios (0.0005, 0.002, and 0.004 per dollar of risk exposure)[4] and three portfolio investment strategies (conservative, moderate and aggressive). In addition to each of these scenarios, the model also assumes 100% coverage (i.e. if there is a claim then 100% of the loss is paid to the farmer) and VaR 95, which is an actuarial measure that sets the safety of the fund. This is a common threshold used to calculate the capital required, which is set based on VaR 95 in this example, which is defined as the maximum dollar amount expected to be lost over a given time horizon, at a 95% confidence level. The remainder of the table provides a sensitivity analysis, which provides insight regarding our set of assumptions used in the model and if the actual rate of default, exposure and expenses increased by more than 5% relative to the assumptions used in the analysis. In this way, we can understand to what degree the initial target fund balance would be underestimated.

Note these results are for illustrative purposes only. The numbers are derived using the limited data available and within the confines of the model assumptions and limits. To put a Fund model into practice, further analysis is required by using a larger set of data (as discussed above). The purpose here was to build a framework/model that can be further populated and used in the future to develop a fund-based program.

							10% increase in assumption:
Premium Rate	Portfolio	Initial Target Balance 100% coverage (VaR 95)		Default Rate	Sensitivity Analysis - 5% increase in assumption: Initial Exposure	Annual Increase	Expenses
0.0005	Conservative	$53,249,770		$55,305,622	$54,328,407	$52,977,790	$53,050,084
0.0005	Moderate	$49,986,158		$53,493,426	$52,714,677	$50,451,028	$52,135,388
0.0005	Aggressive	$47,848,549		$50,567,568	$49,545,760	$48,433,881	$49,127,042
0.002	Conservative	$40,851,652		$43,115,920	$42,718,837	$40,286,575	$42,361,101
0.002	Moderate	$39,628,123		$40,899,084	$40,268,021	$39,600,244	$40,976,871
0.002	Aggressive	$37,338,362		$39,548,331	$38,875,312	$35,944,750	$38,042,829
0.004	Conservative	$24,650,570		$27,476,816	$25,640,091	$26,104,132	$26,642,694
0.004	Moderate	$24,159,401		$26,337,713	$24,659,163	$23,391,609	$25,735,891

[4] Referring to a rate per dollar of risk exposure forv100% coverage, where Coverage from Program = Total Exposure of grain Producer. In the last chart of this section the calculations involve coverage less 100%. Where it is indicated that coverage is less than 100%, the 'dollar exposure' > 'program coverage,' and premium rates are still dollar of exposure. For clarity, at 90% coverage, for $1 transaction, the program would pay $ 0.9 in benefits, but, Premium rate = Premium rate X $1.

0.004	Aggressive	$22,131,750	[redacted]	$24,859,482	$24,304,365	$22,272,308	$23,796,001

Some key observations of the results shown in the table above include:

- Premiums, which are collected from farmers via check-off fees and/or grain licensees (individually or in some combination), range from 0.0005 to 0.004 cents per dollar of insured risk. For an average canola crop, this would equate to a premium of approximately $0.3575 per acre to $2.86 per acre, respectively.
- Based on the assumptions considered, the initial capital required to implement a fund-based model (target balance) ranges from a high of $53M to a low of $22M, where it is assumed that 100% coverage is offered and VaR 95 is implemented. For example, if a larger premium is charged to farmers and/or licensees, the required initial capital based on an aggressive portfolio investment strategy is $22M, while if a smaller premium is charged to farmers and/or licensees, the required initial capital based on an aggressive investment strategy is $47M. These initial capital requirements are based on a pure fund-based model without any reinsurance.
- The initial capital is the amount of funds required upfront to establish the fund. This value is greater than what would be expected to be paid out in losses in any year as it also contains a significant safety net in case much more catastrophic losses occur (to ensure fund stability and so that claim obligations can be met in the future, even under rare and very extreme events). In other words, this refers to using a risk threshold of 95% rather than 50% in the VaR calculation or straight expected loss E[X] value. In addition to the initial capital required upfront to establish the fund, premiums also need to be collected each year to maintain a healthy fund balance. The ongoing premium collected from farmers and/or licensees is in addition to the initial capital required.
- From a portfolio investment strategy perspective, there is a trade-off between risk and return in designing the fund. Adopting a more aggressive investment strategy where fund assets (initial capital and premiums) are invested in more aggressive assets decreases the initial target fund balance, however, this approach also increases risk exposure to markets.
- The sensitivity analysis reveals that the model results are least sensitive to annual increases in exposure. In some instances, the initial target fund balance decreases with an increase in the annual change of exposure. This follows from increases in program payments being offset from increase in premiums and investment income. This could be used as an indication that premiums are correctly priced for the given level of risk tolerance.

4.6 Further Analysis

Additional analysis was conducted to illustrate how decisions related to product design can impact the initial target fund balance. Some examples of design features are discussed next.

- Changing the risk tolerance threshold: Decreasing the level of risk tolerance used in the VaR calculation, such as reducing the required VaR from VaR 95 to VaR 90, increases the likelihood that the fund balance will be adequate to fulfill payment obligations. As VaR requirements decrease the initial target fund balance typically decreases as well. The table below provides a number of examples that demonstrate this. For example, at a premium rate of $0.0005 under a conservative portfolio investment strategy and 100% coverage, the initial capital required for the fund (initial target balance) is $53M under VaR 95 (a program with 95% confidence that over the next year the portfolio will not lose more than the $53 surplus) and is reduced to $45M under VaR 90 (a program with 90% confidence that over the next year the portfolio will not lose more than the $45 surplus). The following table illustrates how the initial target fund balance changes

with decreasing assumptions of VaR (and different assumptions regarding the premium rate and portfolio construction).

Premium Rate	Portfolio	Initial Target Balance (VaR95)	VaR99	VaR90	VaR75	VaR60	VaR50
0.0005	Conservative	53,249,770	66,200,782	45,971,187	36,153,662	29,889,892	26,249,875
0.0005	Moderate	49,986,158	62,383,741	43,605,952	34,518,853	28,608,498	25,187,525
0.0005	Aggressive	47,848,549	59,012,956	41,860,685	33,022,259	27,229,762	23,994,158
0.002	Conservative	40,851,652	53,200,653	34,279,473	24,106,046	18,032,664	14,525,936
0.002	Moderate	39,628,123	52,148,735	33,154,047	23,505,825	17,329,448	14,174,396
0.002	Aggressive	37,338,362	49,575,657	31,359,054	22,322,765	16,687,093	13,493,937
0.004	Conservative	24,650,570	34,951,874	18,781,026	9,433,993	3,349,220	(270,071)
0.004	Moderate	24,159,401	35,246,066	17,810,212	8,882,901	2,774,204	(536,429)
0.004	Aggressive	22,131,750	33,883,135	16,555,130	7,983,270	2,781,095	(421,242)

- Inclusion of a Reinsurance policy: Another significant design feature is layering a reinsurance policy on top of the fund to transfer larger losses to a 3rd party and reduce the risk exposure of the portfolio. In return for paying a premium to the reinsurer(s), claims that exceed a certain threshold are paid through a reinsurance policy, rather than the fund having to pay the claim. There are many different types of reinsurance treaties, and they can be structured to provide unlimited coverage beyond a certain threshold (referred to as a stop-loss reinsurance treaty; i.e. reinsurance coverage includes losses above $10M in a year), or alternatively the reinsurance treaty can be limited to cover just a band width (also referred to as a stop-loss reinsurance treaty but with a cap, where any loss over the cap is incurred by the fund; i.e. reinsurance coverage includes losses above $10M but not exceeding $20M in a year). Another common type of reinsurance treaty is called quota-share where all losses are shared in some proportion (i.e. the fund is responsible for 70% of all losses, while the reinsurance treaty covers 30% of all losses). A stop-loss reinsurance structure would be the most common type of structure for this type of aggregate risk, and this is consistent with the reinsurance treaties in place for crop insurance across the provinces in Canada. Reinsurance polices usually contain a co-insurance factor, which is the percent of loss within the coverage that is paid out to the policyholder within the specified coverage band or limit (i.e. typically 90% of losses within the reinsured portion of the coverage would be paid by the reinsurer, with the policy holder being responsible for the remaining 10%). The addition of reinsurance to a fund-based producer security program is of interest as a way to reduce the initial capital requirements for the fund and ongoing surplus requirements.

- Inclusion of government support (back-stopping): As a further way to add stability to the fund and reduce initial capital requirements, a layer of government back-stopping can also be considered. Typically, government backstopping can be used as a way to keep private reinsurance

costs lower as the financial strength of government can be leveraged to provide a guarantee that in the case of a very rare, but, extreme loss, the government (one, or more, levels of government) can step in and pay claims exceeding a specified threshold. This is similar to a reinsurance policy and is typically structured with no limit to cover catastrophic risk. Typically, there is not a required premium and no co-insurance factor is applied. There are examples of this type of arrangement in Canada, including under AgriInsurance. Another example is the Ontario Grain Financial Protection program, where OMAFRA back-stops the fund. The table below demonstrates how the initial target fund balance changes with different risk structures[5], where VaR 95 is assumed. This includes:

- A purely fund-based approach (with no reinsurance)
- A fund-based approach considering three different reinsurance treaties (with a 90% co-insurance assumption, which means that the reinsurer(s) only pay 90% of the losses within the coverage band, and the fund is responsible for 10%). The three reinsurance designs considered include:
  - A stop-loss reinsurance structure that attaches at an annual aggregate lower band of $10M with no upper limit
  - A stop-loss reinsurance structure attaching at an annual aggregate lower band of $10M and an upper band of $20M ($10M band) with the fund assuming losses beyond the $20M reinsurance layer
  - A stop-loss reinsurance structure attaching at an annual aggregate lower band of $10M and an upper band of $20M ($10M band) AND the government providing a back-stop beyond the $20M layer of reinsurance (with no limit)
- A fund-based approach with no private reinsurance, and instead the government providing a back-stop starting at $10M (with no limit)

In exchange for transferring risk to a 3rd party private reinsurer, reinsurance premiums must be paid. Therefore, to model the different reinsurance structures, a reinsurance premium model was also developed. Future work would require further development of the reinsurance premium calculations and assumptions.

Reinsurance Policy	Premium
Reinsurance at 10M No Policy Limit 90% coinsurance factor	$100,000
Reinsurance at 10M $10M Band Width 90% coinsurance factor	$80,000

[5] Note that the reinsurance bands and limits were chosen as examples only. In general, there is always a trade-off with transferring more risk to a reinsurer in the form of the reinsurance premium that is required. Given that the largest loss incurred under the current producer payment security program was $11M, $10M attachment points were chosen for the model. The more risk that is transferred to a 3rd party, such as a reinsurer or the government, the lower the initial capital required for the fund.

A detailed breakdown on how these premiums were estimated is provided in the Appendix.

Based on these five different risk structures (designs) contemplated in the table below, the range of the required initial target fund balance is a high of $53M and a low of $6.1M. The highest initial capital requirement to establish the fund (initial target balance) is based on Design 1, with a purely fund-based model (with a lower premium rate of $0.0005 and conservative portfolio investment strategy). The lowest initial capital required to establish the fund is based on Design 5, with no 3rd party private reinsurance and government backstopping starting at an annual aggregate loss of $10M with no limit. These results are as expected, with the lowest initial capital required in the scenario where the government takes responsibility for paying large and unexpected losses without a required premium. The most practical option for program implementation is either a $10M band of reinsurance or a $10M band of reinsurance with government providing a back-stop beyond the reinsurance, which corresponds to Design 3, or 4, respectively. In these two designs the lowest capital requirement (assuming a higher premium rate) is between $8-11M and the highest capital requirement (assuming a lower premium rate) is between $35-38M.

Premium Rate	Portfolio	(Design 1) Initial Target Balance – Purely Fund-Based Model (VaR95)	(Design 2) Private Reinsurance attaching at $10M with no policy limit (90% coinsurance factor)	(Design 3) Private Reinsurance with a $10M band width attaching at $10M to a maximum of $20M (90% coinsurance factor)	(Design 4) Private Reinsurance with a $10M band width attaching at $10M to a maximum of $20M (90% coinsurance factor) and then Government Backstop beyond $20M with no limit	(Design 5) No Private Reinsurance, and Government Backstop starting at $10M with no limit
0.0005	Conservative	53,249,770	35,670,852	38,662,577	35,076,452	33,669,093
0.0005	Moderate	49,986,158	34,768,897	36,864,691	34,493,047	32,889,287
0.0005	Aggressive	47,848,549	32,391,615	34,909,955	32,156,153	31,033,467
0.002	Conservative	40,851,652	24,050,487	27,039,437	23,803,562	22,530,152
0.002	Moderate	39,628,123	23,099,266	25,478,276	22,716,218	21,522,480
0.002	Aggressive	37,338,362	22,197,433	24,455,512	21,903,878	20,143,241
0.004	Conservative	24,650,570	8,808,112	10,619,319	8,762,766	6,390,419
0.004	Moderate	24,159,401	8,944,472	11,263,678	8,513,902	6,510,727
0.004	Aggressive	22,131,750	7,787,678	10,237,075	8,261,175	6,164,830

The last table demonstrates how the initial capital requirements change as the coverage level is reduced. The current producer payment security program does not provide a guaranteed coverage. In the event that there is insufficient security to pay claims, the security is divided amongst all of the claims. In some cases, this amounts to farmers receiving a claim covering 100% of their losses (100% coverage), and in other cases they may only receive a relatively small amount, such as 35% (35% coverage). In discussions with farmers, there was a strong desire to have 100% coverage. In most cases with an insurance policy, however, there is typically some deductible, and the coverage is usually no greater than 95% (to help concerns over moral hazard, where a farmer may change their behaviour and become riskier if they are fully covered by insurance). Explanations of each of the table columns and corresponding examples are provided under the table below.

Premium Rate (per dollar of risk exposure)	Example Premium per Acre of Canola ($/acre in tonnes)	Portfolio	Initial Target Balance 100% Coverage (VaR 95)	95% Coverage	90% Coverage	85% Coverage	80% Coverage
$0.0005	$0.3581	Conservative	$53,249,770	$49,704,169	$47,215,373	$44,331,111	$42,176,127
$0.0005	$0.3581	Moderate	$49,986,158	$46,873,714	$45,075,619	$41,663,408	$40,424,463
$0.0005	$0.3581	Aggressive	$47,848,549	$46,893,308	$42,374,220	$40,416,586	$37,929,783
$0.0020	$1.4325	Conservative	$40,851,652	$37,816,721	$34,994,524	$31,507,720	$30,284,488
$0.0020	$1.4325	Moderate	$39,628,123	$35,959,138	$33,925,720	$30,941,892	$27,671,212
$0.0020	$1.4325	Aggressive	$37,338,362	$34,386,265	$31,624,373	$28,462,219	$27,182,521
$0.0040	$2.8650	Conservative	$24,650,570	$21,403,764	$19,018,152	$17,298,710	$14,350,587
$0.0040	$2.8650	Moderate	$24,159,401	$20,701,820	$18,749,013	$15,852,967	$13,233,977
$0.0040	$2.8650	Aggressive	$22,131,750	$20,748,382	$17,677,269	$15,566,439	$12,382,468

- Premium Rate (per dollar of risk exposure): This is the premium rate for each dollar that is covered by the program where the crop value is multiplied by the premium rate to get the total premium.
- Example Premium per Acre of Canola: For example, assume 55 bu/acre of canola are produced at $13/bu/ac, which is roughly equivalent to 1.25 tonnes at $573 per tonnes. The value is then approximately $715/acre. In this example, the premium rate in our model would have a low of $0.3575 per acre and a high of $2.86 per acre, to be shared between producers (via a check-off fee) and the grain licensee.
- Portfolio: We consider three different portfolio investment scenarios, including conservative, moderate and aggressive. The conservative scenario refers to taking the lowest amount of risk in the fund investment strategy, and thus the fund is expected to earn a lower return. Conversely, the assumption of an aggressive fund investment strategy means that the fund assets are in higher risk investments, and thus the fund is expected to earn a higher return. A conservative investment strategy (and lower return) means more initial capital is required for the fund, while an aggressive strategy (and higher return) means relatively less capital is required for the fund.
- Initial Target Balance 100 Coverage (VaR 95): This is the initial capital required to establish the fund. This value is based on key assumptions, including 100% coverage (i.e. if there is a claim then 100% of the loss is paid to the farmer) and VaR 95, which is an actuarial measure that sets the safety of the fund. VaR 95 is a common threshold used to calculate the capital required, which is set based on VaR 95, which is defined as the maximum dollar amount expected to be lost over a given time horizon, at a 95%confidence level.
- 95% Coverage: This is similar to the previous column, but, shows the initial capital required to establish the fund assuming 95% coverage (i.e. if there is a claim then 95% of the loss is paid to the farmer). VaR 95 is also assumed.
- 90% Coverage: This is similar to the previous column, but, shows the initial capital required to establish the fund assuming 90% coverage (i.e. if there is a claim then 90% of the loss is paid to the farmer). VaR 95 is also assumed.

- **85% Coverage:** This is similar to the previous column, but, shows the initial capital required to establish the fund assuming 85% coverage (i.e. if there is a claim then 85% of the loss is paid to the farmer). VaR 95 is also assumed.
- **80% Coverage:** This is similar to the previous column, but, shows the initial capital required to establish the fund assuming 90% coverage (i.e. if there is a claim then 80% of the loss is paid to the farmer). VaR 95 is also assumed.

In addition to the various design features considered above, another feature that may be considered in the future is related to declining coverage as the grain payment period gets longer. For example, the farmer may receive 100% for the first 30 days, but, as the payment window is extended the coverage may be reduced, so that by day 180 the coverage is 50%, as an example. This feature could not be modelled in this work given the lack of available data. It should be noted that this feature is consistent with the Ontario-based fund model.

5. Risk Response

The Risk Response step involves identifying the range of controls available for mitigating or handling risk (in terms of probability and/or consequence) and assessing the appropriateness of each alternative. In general, there are four categories of risk response strategies that are considered:

- Avoidance: Taking action to exit the activities that give rise to the risks.
- Reduction: Reducing the risk probability, consequence, or both.
- Transfer: Reducing the risk probability or consequence by transferring all, or a portion of the risk to a third party.
- Acceptance: Taking no action to affect probability or consequence.

Given the objective of this study regarding assessing the feasibility of a fund-based (with back-stopping) producer payment security program, the focus of this section is on Risk Transfer. Therefore, the remainder of this section provides a recommendation regarding program design and assessment in terms of feasibility.

The results shown in section 4.6 illustrate that the initial fund requirements decrease with the inclusion of reinsurance and/or a government back-stop policy. While both options are beneficial for protecting the fund from catastrophic losses, the use of a government back-stop (if feasible, and for illustration purposes to guide further conversation around various alternatives) provides an opportunity to further reduce the required initial capital requirements to facilitate the launch of such a producer payment security program with lower initial capital requirements.

The value of these 'risk transfer' mechanisms in a catastrophic event is best quantified using the metric Conditional Tail Expectation at 95% (CTE 95). This value equals the average fund balance required to fulfil program payments *in the worst 5% of all possible future scenarios*. In other words, CTE provides a more conservative estimate compared to VaR.

For further clarity, VaR 95 provides information of losses *only* at the 95th percentile of projected scenarios, from which it follows that the probability that actual losses will exceed observed losses in this scenario is 5%. CTE 95 provides information of all observed losses beyond the 95th percentile, from which actual losses in the 1% of the worst possible cases are expected to be equal to the losses in the scenarios

used to calculate CTE 95. The table below summarizes various initial target fund balance alternatives based on a more conservative measure of CTE 95 (compared to the table above that used VaR 95).

Premium Rate	Portfolio	Initial Target Balance (CTE95)	(Design 1) Initial Target Balance – Purely Fund-Based Model (VaR95)	(Design 2) Private Reinsurance attaching at $10M with no policy limit (90% coinsurance factor)	(Design 3) Private Reinsurance with a $10M band width attaching at $10M to a maximum of $20M (90% coinsurance factor)	(Design 4) Private Reinsurance with a $10M band width attaching at $10M to a maximum of $20M (90% coinsurance factor) and then Government Backstop beyond $20M with no limit
0.0005	Conservative	$61,058,562	$38,840,633	$44,079,903	$38,514,472	$36,545,838
0.0005	Moderate	$57,562,049	$37,868,567	$41,469,027	$37,644,021	$35,681,054
0.0005	Aggressive	$54,569,294	$35,820,082	$39,712,159	$35,329,776	$ 33,550,040
0.002	Conservative	$48,453,052	$27,204,523	$31,864,998	$26,626,320	$25,280,201
0.002	Moderate	$47,265,826	$26,266,069	$30,069,077	$25,722,817	$ 24,288,432
0.002	Aggressive	$44,905,384	$25,190,733	$29,063,707	$24,806,715	$ 22,858,334
0.004	Conservative	$31,839,094	$11,927,089	$15,315,798	$12,168,176	$9,563,654
0.004	Moderate	$31,294,315	$11,890,915	$15,474,117	$11,581,713	$ 9,419,136
0.004	Aggressive	$29,498,475	$11,104,050	$14,590,039	$11,387,975	$9,256,931

The required initial target fund balance under CTE 95 is slightly higher compared to forecasts under VaR 95. Similar to the VaR 95 results, a significantly lower initial fund balance is required to withstand losses in the worse possible case of outcomes under structures that include reinsurance and/or government back-stop. Considerations regarding an appropriate premium rate (from the perspective of licensees and/or producer check-off) should be further discussed. Higher premium rates reduce the initial target fund balance requirements. One strategy may be to have a more aggressive premium rate initially and then reduce the premium rate once the fund reaches the desired level (or in some cases stop collecting premium if/when the fund surplus is beyond a minimum threshold).

6. Risk Monitoring

Risk Monitoring encompasses the regular monitoring and reviewing of risks to understand the changing dynamic of risk. This is recommended in the future to ensure the success of a new producer payment security program.

7. Risk Reporting and Communication

Throughout the process, information on risks are reported and communicated to stakeholders, with a focus on evaluating the adequacy of the risk response and making changes as required.

Appendix I: Fund Model Assumptions and Calculations

The following provides detailed breakdown for the calculations used to determine model assumptions.

Historical Exposure Scaling Factor

There were identified shortfalls in the posted security amounts listed in the published data on historical payouts from the current security program (listed here: https://www.grainscanada.gc.ca/en/about-us/org/initiatives/2021/canada-grain-act/producer-payment/history-payments.html). The following ratio was calculated to estimate these shortfalls: “Actual Loss/Posted Security”. If this ratio was < 1, it was assumed that the posted security equaled 100% of the outstanding liabilities for the corresponding grain buyer. The mean of these values (100% used when the ratio <1) were calculated, which is illustrated in the table below.

Note that ‘Actual Loss’ was not provided in the published data but was calculated as ‘Payout’/ ‘Payout %’

Company	Crop Year	Posted Security	Payout	Payout %	Actual Loss	Actual Loss/Posted Security	Min (100%, Previous Column)
Cancom Grain Company Inc.	2001-2002	$3,600,000	$1,724,524	100%	$1,724,524	48%	100%
Naber Seed & FrGrain Co. Ltd.	2001-2002	$1,000,000	$1,000,000	51%	$1,946,283	195%	195%
Alberta Oats Ltd.	2002-2003	$600,000	$134,145	100%	$134,145	22%	100%
Farmgro Organic Foods Inc.	2002-2003	$200,000	$160,643	100%	$160,643	80%	100%
API Grain Processors Limited Partnership	2003-2004	$750,000	$750,000	100%	$751,503	100%	100%
Venture Seeds Ltd.	2004-2005	$150,000	$150,000	28%	$535,714	357%	357%
Diversifoods Inc.	2004-2005	$500,000	$98,949	100%	$98,949	20%	100%
Cloutier Agra Seeds Inc.	2005-2006	$375,000	$355,330	100%	$355,330	95%	100%
Alexander Grain Inc.	2007-2008	$150,000	$129,215	100%	$129,215	86%	100%
West-Can Agra Inc.	2008-2009	$300,000	$300,000	68%	$439,239	146%	146%
Mustard Capital Inc.	2011-2012	$300,000	$264,461	100%	$264,461	88%	100%
Newco Grain Ltd.	2011-2012	$3,000,000	$3,000,000	95%	$3,154,574	105%	105%
Bissma Pacific Inc.	2012-2013	$1,000,000	$859,912	100%	$859,912	86%	100%
Naber Specialty Grains Ltd.	2014-2015	$150,000	$150,000	14%	$1,055,595	704%	704%
Canadian Exotic Grains Ltd.	2017-2018	$450,000	$362,604	100%	$362,604	81%	100%
Ilta Grain Inc.	2018-2019	$12,000,000	$11,146,350	100%	$11,146,350	93%	100%
Global Grain Canada Ltd.	2020-2021	$1,250,000	$699,403	100%	$699,403	56%	100%
Canpulse Foods Ltd.	2020-2021	$6,500,000	$3,066,394	100%	$3,066,394	47%	100%
					Average		**156%**

The purpose of this factor was to apply it to the data on the total annual historical posted security amounts, which would provide an estimate of the total exposure to credit default risk in prior years.

Rate of Default

Due to the confidential nature regarding the data provided by the CGC on the total annual historical value of securities provided by licensees to CGC, a detailed calculation for the rate of default is not provided in this report. The chart below provides data used for the calculation, which is publicly available at: https://www.grainscanada.gc.ca/en/about-us/org/initiatives/2021/canada-grain-act/producer-payment/history-payments.html)

Crop Year	Reported Losses
2016	$0
2017	$362,604
2018	$11,146,350
2019	$0
2020	$3,765,797
Average - Reported Losses	**$3,054,950**
Estimated rate of default (per dollar of exposure)	**0.21%**
Standard Deviation of 'Reported Loss/Total Security'	**0.31%**

Expenses

Fixed expenses are modelled off the experience of the Ontario Grain Financial Protection program (see table below for actual values). The model uses the maximum observed expenses incurred by the Ontario Program within the past 5 years. This value is equal to $210,000 and increases annually with projected inflation. A conservative estimate is justified as the program would likely incur higher costs in its initial years, as compared to a program that has been in operation for many years, which would have had the opportunity to improve administration efficiency. Further, fixed expenses are incurred throughout the year but are more heavily weighted in the peak-season months (April to August).

In addition, there will be expected costs that relate to initial program set-up. There is no supporting data for this assumption, therefore a conservative estimate was considered, which is 25% of fixed expense of the initial year of operation.

Lastly, the model considers variable costs, which are directly proportional to the total volume of transactions. Budgeting for variable expenses provides a layer of protection for when the number of transactions is larger than expected. A variable cost of 0.00002 per dollar of exposure (approximately 10% of the fixed expense) was considered appropriate.

The following table shows the budgeted/actual expenses incurred by the Ontario Grain Financial Protection program over the past 5 years (source: http://www.omafra.gov.on.ca/english/open/gfpb-bus1619.htm). Note, actual expenses are only given up to 2016, likely since actuarial valuation occurs every 5 years.

Year	Budget 2014/15	Actual 2014/15	Budget 2015/16	Actuals 2015/16	Budget 2016/17	Budget 2017/18	Budget 2018/19
Total Expense	256,440	205,556	243,940	159,464	273,940	248,940	248,940

Reinsurance Premium

Reinsurance premiums were estimated using published loss ratios from Swiss Re's (https://www.swissre.com/investors/events/20170316-annual-report-2016-evm-results-investors.html) and the provided data of historical losses for the current security-based model program.

The following table illustrates the calculation for estimating reinsurance premiums:

Number of Losses Recorded Above $10M	1	Based on prior 20 years' experience from payment security program
Value of Losses Recorded Above $10M	$11,146,350	
Loss Incurred By Reinsurer	$1,031,715	10M deductible, 90% co-insurance factor, no policy limit
Loss Incurred By Reinsurer/year	$51,586	annual losses, divide previous number by 20
Expected Loss ratio from reinsurer	70%	inferred from Swiss Re data
Estimates policy Premium	$73,694	$51,586 / 70%
Premium - No Policy Limit	**$100,000**	Rounded up
Premium - $10M band Width	**$80,000**	20% discount from no-policy limit policy

Appendix III: Notes on Ontario Model

In Ontario, grain producers seek compensation from payment default through a government sponsored fund-based program. The following provides a brief description of the Ontario program, which might be helpful when considering the development of a similar program in Western Canada.

Name: The Grain Financial Protection Board (Board or GFPB)

Objective of Fund: ensure financial compensation is available to grain corn, soybean, wheat, and canola producers/owners when required.

Beneficiaries of fund: grain corn, soybean, wheat, and canola producers/owners that sell or store grain with elevator operator.

Mandate of board:

- administer funds/assets for beneficiaries
- investigating, granting and refusing claim

Composition of Board: The Board comprises of 7 members which are appointed by Ministry responsible for the fund (Minister of Agriculture Food and Rural Affairs). There is a minimum requirement of 5 board members at any given time. The Board is classified as a Board-Governed Provincial Agency under the Agencies and Appointments Directive (AAD).

Administration: The Board is ultimately responsible for the Fund but hires 'Agricorp' for day-to-day administration.

Fund Structure: 4 separate funds, including one for each insured commodity (grain corn, soybean, wheat, and canola). Memorandum of Understanding (MOU) between the Minister and The Chair of the Board sets out the investment policy of the fund.

Source of Fund revenue:

- Check-off fee when grain is sold ($/tonne). Current annual target $375,000.
- Investment interest

Current Premiums:

- Corn: 1/10 of 1 cent/tonne
- Wheat: 5 cents/tonne
- Soybeans: 10 cents/tonne
- Canola: 20 cents/tonne

Actuarial Valuations:

- Actuarial Valuations are conducted periodically by KPMG, which for each fund, provided a calculated 'Required Minimum Fund Balance'. This value is calculated using VaR99.5% with a 10- year time period.

Current Financial Projections:

- $263,000 for annual claims. The likelihood of paying claims is low based on past experience (Actuarial study used to forecast current claims completed in 2016 and 2011).
- Current annual target of $375,000 of fees.
- Additional cashflows considered: Expenses and interest revenue

Identified External Risk Factors:

- Interest rates
- Commodity price volatility
- Producers selling out of jurisdiction or to non-licenced dealers
- Financial strength of licensed dealers

Other Risks to Consider:

Data constraints in forecasting actuarial liability of fund: history of low frequency and little experience data.