



Agriculture and
Agri-Food Canada

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Canada



Environmental Impacts of Canada's Business Risk Management Programs

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Purpose

- Present the methodology and results of the environmental assessment of BRM programs (i.e. AgriStability and AgrilInsurance)
 - While the impact on GHG emissions is the focus of this assessment, the analysis is broadened to cover some of the other environmental impacts such as soil erosion and biodiversity.

Outline

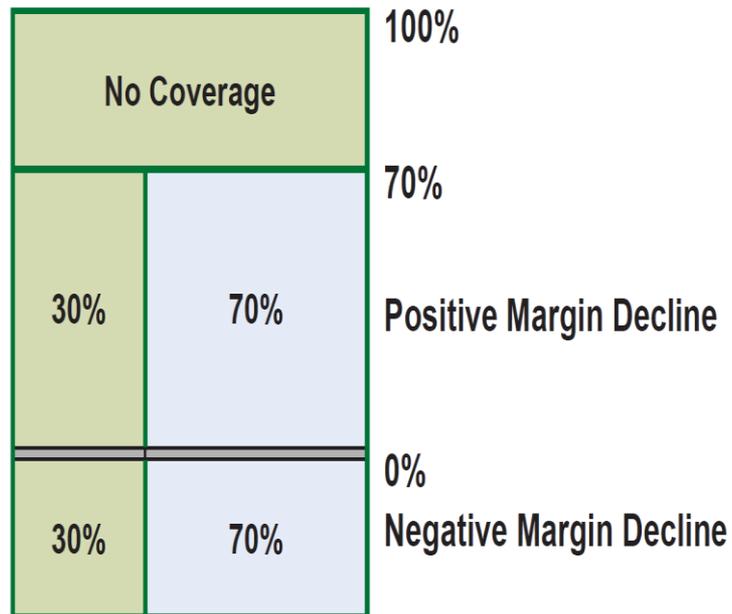
- Background
- Methodology
- Results

- In Canada, there are five-year policy frameworks for agriculture and agri-food sector. They are, in fact, investments by federal, provincial and territorial (FPT) governments and the foundation for government agricultural programs and services. *Growing Forward* (GF, 2008-2012) and *Growing Forward 2* (GF2, 2013-2018) are the two policy frameworks implemented over the last decade.
- GF2 (same as GF) provides an effective suite of Business Risk Management (BRM) programs including AgriStability and AgrilInsurance, to help farmers in managing risk due to severe market volatility and disaster situations.
- AgrilInsurance (crop insurance) is a federal-provincial-producer cost-shared program established to mitigate the financial impacts of production losses by providing insurance protection against uncontrollable hazards like drought, flood, excessive rain, heat and uncontrolled diseases.

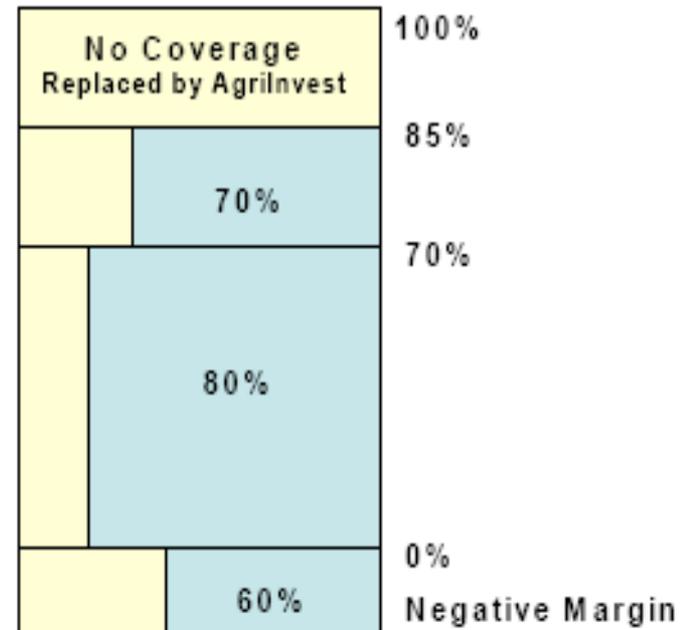
Background- Cont'd

- AgriStability is built on the philosophy that governments and producers share in the cost of replacing lost income (caused by circumstances such as low prices, rising input costs, and production losses). Under Growing Forward 2, AgriStability provides a 70% margin coverage with a 70% compensation rate for both Positive Margin and Negative Margin Declines.

**AgriStability under GF2
Applied Reference Margin**



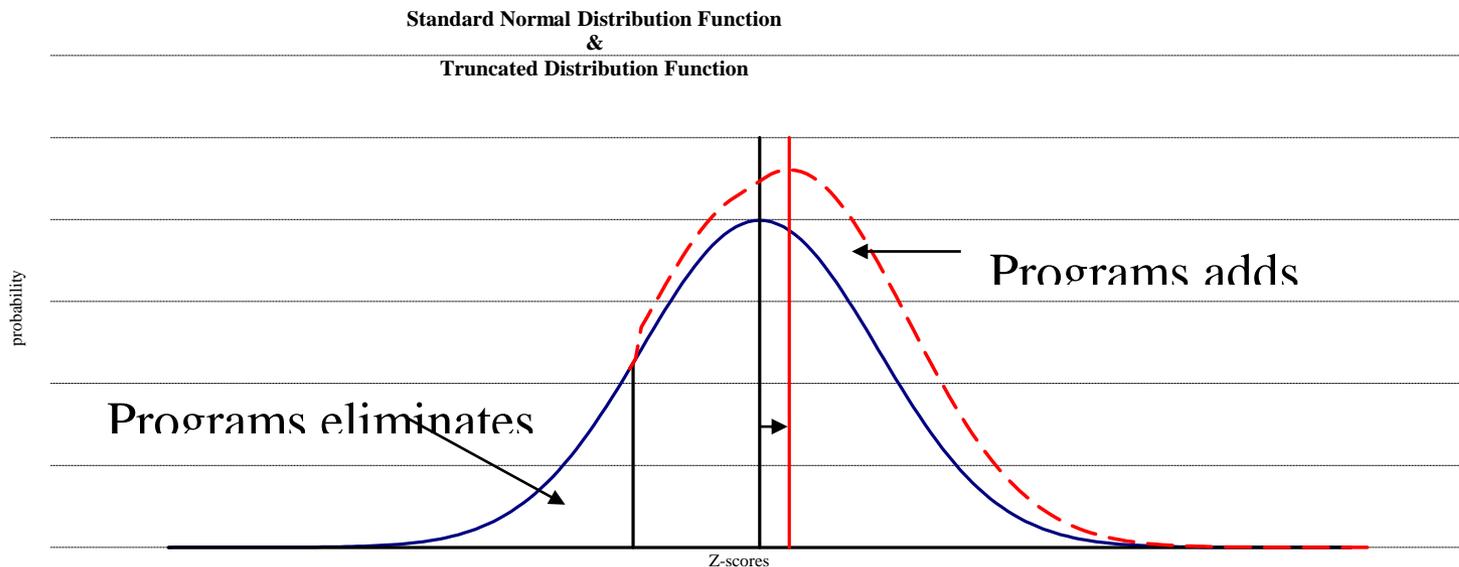
**AgriStability under GF
Reference Margin**



- As part of the GF2 (and also GF) multilateral framework agreement, Agriculture Canada must conduct, in consultation and cooperation with provinces and territories, an environmental assessment of BRM programs every five years and findings will be reported to the Parties to this Agreement and to each House of Parliament.
- Environmental assessment of AgriStability and AgriInsurance under GF and GF2 have been completed using an integrated modelling approach.

Methodology

- The environmental impacts of AgriStability and AgrilInsurance programs are estimated based on the changes in production levels and resource use resulting from AgriStability's income stabilization effect and indemnities provided by AgrilInsurance to cover income reductions and production losses.
- Approach leveraged AAFC's Canadian Regional Agricultural Model (CRAM) to determine the production impacts.
 - Drawing on the standard mean-variance utility function, Coyle (U of Manitoba, 2007) presented a theoretical framework and an empirical model that specifies how a farmer's objective function with risk is affected with and without the programs.



Total profit under Agri-stability: $\Psi = \pi + \theta \cdot (\pi^T - \pi)$

Government payment: $\theta \cdot (\pi^T - \pi)$

$$U = E_{\Psi} - \left(\frac{\alpha}{2}\right) \cdot (\sigma_{\Psi})^2$$

From Coyle (2007):

$$E_{\Psi} = Z_1 \cdot E_{\pi} + Z_2 \cdot E_{\pi}^2 + Z_3 \cdot (\sigma_{\pi}^2 - E_{\pi} \cdot \pi^T) + Z_4 \cdot \pi^T$$

$$\sigma_{\Psi}^2 = Z_5 \cdot \sigma_{\pi}^2 + Z_6 \cdot E_{\pi}^2 + Z_7 \cdot E_{\pi}$$

The coefficients (which are reflecting the coverage level of AgriStability under different policy frameworks) are estimated using a regression based on the farm level data for all producers who have participated in the program.

The variance-covariance matrices are calculated using farm level crop insurance data.

- CRAM was linked to key agri-environmental indicators developed by AAFC.
 - Changes in production, production practices and resource use impact the environmental indicators.
 - While the impact on GHG emissions is the focus of this assessment, other environmental indicators have also been included in this analysis.
 - Agri-environmental indicator models were developed through the National Agri-Environmental Health Analysis and Reporting Program (NAHARP) to measure the sector's impact on soil, water and air quality, and biodiversity.
- Solutions for three alternative scenarios were obtained for comparison to the baseline (with both programs):
 1. Removal of both AgriStability and AgriInsurance,
 2. Removal of AgriInsurance only, and
 3. Removal of AgriStability only.
- The way to interpret these results is that the scenarios are estimates of how baseline would have looked if the program(s) had not existed for a long time and producers had to “self-insure” against these risks.

Production impacts of AgriStability and AgrilInsurance under GF2

Changes in land use* and number of animals from baseline

	Crop area (1,000 ha)	Beef Cows (1,000 head)	Hogs (1,000 head)
Baseline with AgriStability & AgrilInsurance	-	-	-
Scenario 1: No AgriStability, No AgrilInsurance	-120.65 (-0.32%)	20.3 (0.20%)	4.3 (0.00%)
Scenario 2: No AgrilInsurance (with AgriStability)	-112.78 (-0.30%)	17.8 (0.17%)	5 (0.00%)
Scenario 3: No AgriStability (with AgrilInsurance)	0.00 (0.00%)	5.60 (0.05%)	-0.90 (-0.00%)

*It is assumed there is a shift from field crop production to more extensive land use (e.g. pasture).

Market conditions and program design impact results

- Resource use and production levels will be impacted by producer expectations related to the probability of a payout, especially for AgriStability.
- Comparing our results with previous assessment of programs under GF indicates that the impact of programs on production is reduced when the coverage level of AgriStability decreases.
 - For ex., as a result of a decrease in AgriStability coverage from 85% to 70% (as under GF2), the shift in land use toward extensive use decreases from 1,572,000 hectares (-3.3%) to almost zero under scenario 3.
- The estimated impacts of removing programs on livestock are small.
 - The major source of the risk for livestock, unlike crops, is related to the market price. In reality the risk arising through livestock prices is relatively small as compared to the risk associated with crop yields.

- The CRAM team worked directly with indicator science teams to integrate key indicator models with the CRAM model, to estimate the environmental impacts of different market scenarios. Integrated indicator models are:
 - Greenhouse gas emission (assessed using Canadian Economic and Emissions Model for Agriculture (CEEMA))
 - Risk of soil erosion (wind, water and tillage erosion)
 - Wildlife habitat capacity
 - Residual soil Nitrogen
- The latest indicator report (based on the 2011 Census of Agriculture) is available on AAFC web site.
- The focus of ongoing indicator work is expanding to help the sector address increasing demand for Sustainability Metrics.

Environmental impacts of AgriStability and AgrilInsurance

- Consistent with the small production impacts of AgriStability and AgrilInsurance, the results indicate that programs have almost no impact on the integrated Agri-Environmental Indicators.

% change in the Agri-Environmental Indicators from Baseline

	Greenhouse Gas	Wind Erosion	Water Erosion	Till Erosion	Habitat Availability	Residual Soil N
AgriStability and AgrilInsurance	-	-	-	-	-	-
No AgriStability, No AgrilInsurance	-0.04%	0.00%	0.15%	-0.008%	0.19%	-0.48%
No AgrilInsurance (with AgriStability)	-0.03%	0.00%	0.15%	-0.008%	0.16%	-0.66%
No AgriStability (with AgrilInsurance)	0.01%	0.00%	0.00%	-0.00%	0.03%	-0.00%

Conclusions

- All Environmental indicators are directly affected by output levels and resource use.
- This analysis concludes that the AgriStability and AgriInsurance have almost no impact on the environment, when compared to a scenario if insurance/risk management programs were not available.
 - This leads to a conclusion that these BRM programs are largely decoupled.
- AAFC's and provincial programs to encourage adoption of beneficial management practices also participate in improving environmental outcomes.