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THE CANADIAN AGRI-FOOD POLICY INSTITUTE

Business Risk Management Programs and the Environment

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by

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Agriculture and the environment are inextricably linked through land and water. With and without government support, agricultural production impacts the environment through soil quality, water systems, air quality, biodiversity, and wildlife habitat. Input and output subsidies affect production decisions with respect to input mix and intensity, and output choice (both substituting one enterprise for another and overall scale of production). Over the past two decades Canada's approach to agricultural support/stabilization has involved a voluntary individual margin approach based on supporting net income. In one fell swoop this approach has elements of input and output subsidies that affect the bottom line; but the complexity of interactions of these elements across enterprises makes the analysis of the resulting economic and environmental impacts challenging. Given the complexity of these interactions it is less likely that producers are able to predict payouts and "farm" the programs. Consequently, the related environmental impacts are likely to be modest.

The objective of this paper is to begin to analyze the linkages between Canadian government support programs and agricultural environmental performance. The term Business Risk Management (BRM) is used to describe Canada's system of income support to agricultural producers. The current suite of BRM programs includes *AgriInvest* (a subsidized savings account), *AgriStability* (a deficiency payment triggered by a margin-based measure of overall farm income), *AgriInsure* (production or crop insurance) and *AgriRecovery* (a low-slung safety net for disaster assistance). All of these programs provide payouts when current income is lower than a predetermined threshold, thereby creating the potential incentive to change production decisions. The option of making payments of Canadian farm programs conditional upon environment performance has not to date not been employed. We find that current programs do not provide sufficient incentives for farmers to participate if this type of approach were to be implemented.

According to the OECD's (2018) set of agri-environmental indicators there are two broad areas of environmental concern for Canadian agriculture: (1) increasing risk of water contamination with nitrogen and phosphorus, and (2) deterioration of natural habitat and biodiversity (Lefebve et al. 2005). In addition to being one of the sectors that is most likely to be affected by climate change, agriculture also contributes to releasing greenhouse gases into the atmosphere. At the same time agricultural land can act as a carbon sink to help alleviate the problem.

This paper proceeds by asking what the production effects of current BRM programs are. Understanding how the programs incent more production and how land and input use are effected, helps to understand the unintended negative environmental consequences. Next the major environmental impacts and the presence of a linkage to the production effects created by each of the programs in the BRM suite are explored. Finally, the avenues for potential reform and practical implications are considered.

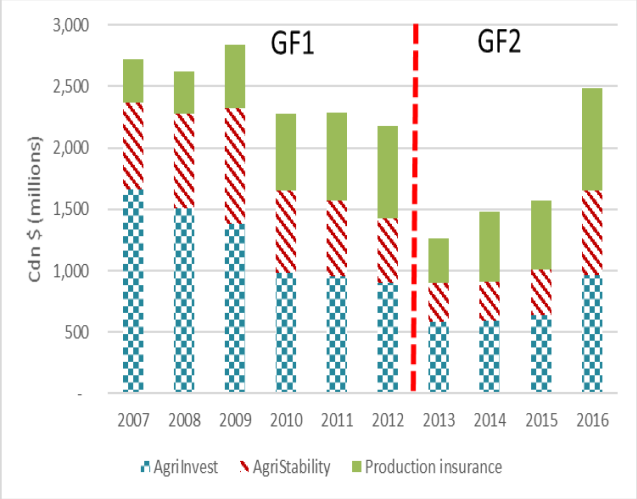
What are the production effects of BRM programs?

In general government programs that are specific to particular commodities create greater incentives to change production behaviour than programs that are generally available to all of agriculture. The more money that is provided through these programs the greater the incentive

for intensification and to bring marginal land into production. The evolution of Canadian safety net programs has been away from programs that are specific to a commodity toward those programs that stabilize a margin that represents an overall measure of whole farm profitability. These broadly based generally available programs do not favour one enterprise over another and as result do not distort the enterprise mix. The concern then centers on whether the subsidy leads to more intensive production systems or increase the over all scale of total production. These fears are partially alleviated because the existing BRM programs stabilize/support both revenues and costs. The program affects both costs and revenues to the extent the impacts begin to off-set each other so interactions between variables should be more production neutral than price supports.

Figure 1 describes historical government expenditure on *AgriInvest*, *AgriStability*, and *AgriInsure*. Between 2011 and 2016 annual payments from federal and provincial governments averaged $6 billion per year. Of this $2 billion were directed to BRM programs. Figure 2 describes the proportion of farm market revenues covered by AgriStability and producer participation rates in the program.

Figure 1: Expenditures on BRM



Source (OECD PSE Data base 2017)

Figure 2: Participation in AgriStability

Source (Office of Audit & Evaluation AAFC 2016)

Since 2011, depending in the year, *AgriInsure* comprises from a third to almost 40% of BRM expenditures. Conceptually an input subsidy *AgriInsure* is crop (or enterprise) specific. How much this specific subsidy actually induces production depends on whether: 1) the premium subsidies raises net revenues per hectare (and changes crop mixes); 2) the availability of insurance encourages producers to participate in more risky ventures; and 3) reduced yield losses encourage producers to undertake fewer other risk reducing practices (Sumner and Zulaf, 2012). So, the adverse effects for the environment include intensified production through increased use of fertilizers and pesticides.

The US experience with crop insurance (that is more extensive and offers much higher subsidies than Canada) shows that it only created a small inducement to convert non-cropland to cropland, while the impact was somewhat larger for crop choice and rotation (Claassen. Langpap, and Wu, 2016, and Weber, Key and O'Donoghue, 2016). Given this behaviour and the smaller level of Canadian support it is unlikely that *AgriInsure* will induce marginal land to be brought into production.

Since 2011, depending on the year, *AgriInvest* comprises from 39% to 42% of BRM spending. *AgriInvest* is a savings account where producers can each year deposit up to 100% of Allowable Net Sales. Producers receive a matching government contribution for deposits up to 1% of their allowable net sales. Although they are allowed to make additional contributions beyond this point, no additional government deposits are available (AAFC, 2015). Producers have the flexibility to withdraw funds at any time throughout the year. The money set aside can be used to manage risks for small income shortfalls, or to make investments to reduce on-farm risks. At first blush, this approach has potential to distort production decisions because producers could attempt to produce more, and take more risks, in order to increase their allowable net sales and thereby increase government contributions. But this situation only holds if the producer is already contributing 1% or more of their net eligible sales. If they are not contributing to this level, they can increase government payments simply by depositing more into their *AgriInvest* accounts. AAFC (2016) records indicate that for the period 2007-2014 producer deposits were 89.5% of their maximum allowable contributions for government matching. Although these contribution levels were high, participants still had room to increase matching government contributions without increasing production.

Even those producers that contribute up to this maximum will not necessary increase production. The decision rule for extra productive investments trades off the extra government induced profitability of the investment against an added opportunity cost of investment because potential dollars for these investments are tied up in *AgriInvest* savings accounts. Only if the added profitability equals or exceeds the added opportunity costs will farmers decide to produce more (Rude 2000). Therefore, it is expected that market considerations dominate and that the potential for *AgriInvest* to induce production, and associated negative environmental externalities, is minimal.

Since 2011 the share of *AgriStability* expenditures to total BRM expenditures has varied between 22% and 28%, while producer participation has declined from almost 50% to 33% (see Figure 2). *AgriStability* is a deficiency payment which is triggered by a margin-based measure of overall farm income. Rude and Ker (2013) examined the impact of Growing Forward I's version of AgriStability on farm inputs and crop allocation. They found that the program induced modest increases in crop production with approximately 2% additional wheat, coarse grain, and oilseed production. AgriStability distorts input use penalizing farmer owned inputs; e.g land, (non-eligibleinputs under the program) in favor of purchased inputs (eligible inputs under the program). Rude and Ker (2013) found that increased crop production was driven by 7.7% increased usage of herbicides, energy and fertilizer while land use barely increased. The trigger mechanism for *AgriStability* was reformed in Growing Forward II increasing the necessary

decline in production margins (roughly equal to net income) to trigger a government payment from 15% of a base reference margin to 30% of that margin. This reform should make *AgriStability* more production neutral, but the distortion encouraging purchased inputs relative to farmer owned inputs still remains and *AgriStability* most likely still encourages the (increased?) use of fertilizer and other chemicals. Therefore, depending on the crop, *AgriStability* likely contributes modestly to deteriorating nutrient balances. Problems with nutrient balances may be compounded by the fact that *AgriStability* participation rates are highest among hog producers (75%), which are primarily intensive livestock operations (AAFC 2016). Although intensive operations are typically associated with increased nutrient run-off there is no evidence that *AgriStability* creates an incentive for industry to consolidate into concentrated animal feeding operations (CAFOs).

What are Canada's biggest environmental problems?

Lefebve *et al.* (2005) probably provides the best historic overview of Canadian environmental indicators and describes which agri-environmental concerns deserve the most attention. Two broad areas of concern were identified: deterioration of nature conservation and biodiversity, and increasing risk of water contamination with nitrogen. Clearwater *et al.* (2016) identifies deterioration in the water quality agri-environmental performance index[1] between 1981 and 2011 with a declining score (out of a possible 100) from 92 to 74 and a rating that declined from desired to good. The largest declines in performance were for phosphorus (from 96 to 56) and nitrogen (from 85 to 56). Excess nitrogen appears to more of a problem in eastern Canada than for the prairie-provinces. Saskatchewan has particularly low levels of residual nitrogen. Although the Canadian nitrogen balance has increased over time, residual levels in Canada are considerably lower than in the EU and somewhat lower than the US.

Nutrient run-off from livestock, is a problem with intensified production that is associated with both ineffective fertilizer application/uptake and with livestock manure. The policies most closely related to input intensification are *AgriStability* and *AgriInsure*. In 2011 Canadian residual soil nitrogen levels were moderate and mainly the result of increased fertilizer use (Clearwater *et al.*, 2016). In 2011, twenty-one Canadian watersheds were classified as *very high risk* with contamination by phosphorus where the increased risk has been attributed to increased use of fertilizers and livestock numbers (Clearwater *et al.*, 2016). Very significant amounts of animal nutrient run-off are associated with concentrated animal feeding operations (Statistics Canada, 2004)[2]. The consolidation of smaller farms into large intensive units is driven by market forces and technological change and is not significantly affected by BRM programs.

[1] The Water Quality Agri-Environmental Performance Index combines indices for water contamination by nitrogen (N), phosphorus (P), coliforms and pesticides.

[2] In the US the US Environmental Protections Agency estimated that concentrated animal feeding operations were responsible for approximately 50% of all manure generated nitrogen and phosphorus (Sims et al., 2005).

Indices for habitat and biodiversity also deteriorated between the mid-1980's and 2011. Clearwater *et al.* (2016)) found that the Habitat Capacity index declined from 40 in 1986 to 36 in 2011. Although low in absolute terms, the index has remained relatively stable between 2001 (38) and 2011 (36). Again much of the change was specific to certain regions and land types. Most agriculture-affected wildlife species depend upon natural or semi-natural land-cover types, including unimproved pasture, woodland, wetland and riparian areas. Comparably small changes in these areas can have large changes for the Habitat Capacity index. Current BRM programs do not appear to encourage bringing marginal land into production. The Gross Revenue Insurance Plan (*GRIP*) operated from 1991 to 1996 and was associated with significant levels of product specific support. There have been some suggestions that *GRIP* did bring significant areas of marginal land into production. However, since that time safety net programs have tended not to encourage the conversion of marginal land.

Finally greenhouse gas (GHG) concentrations in the atmosphere are a global concern. In 2001 agriculture contributed 8% of Canada's green house gas emissions (Lefebve *et al.*, 2005). Agriculture both contributes to and reduces GHGs. On farm net-emissions consist of three gases: nitrous oxides, methane and carbon dioxide. Nitrous oxide emissions arise from agricultural fields and direct emissions from animal production. Methane emissions come mainly form animal production, while carbon dioxide emissions arise from fossil fuel combustion and the manufacturing of fertilizers (Lefebve *et al*., 2005). The role of BRM payments in these emissions should be relatively small. In terms of methane production only 34% of cattle producers employ *AgriStability* and only 27% of supply managed producers employ the program (AAFC 2016). Fertilizer utilization contributes to nitrous oxide production, but the overall effect relative to global climate change is infinitesimal. The same observation holds for incremental carbon dioxide emissions associated with BRM programs.

What are the policy implications and suggested remedies?

Cumulatively over time agriculture production has had a profound impact on the environment. However, the incremental negative impact of the current set of BRM programs is probably relatively minor. By design the programs are not commodity specific and are applied on a net basis to revenues and costs, so the programs do not provide significant direct incentives to produce more. None of the current suite of programs induces marginal and sensitive land into production. The only conduit to encourage production is through intensification. *AgriStability* creates modest incentives to use more fertilizer and pesticides; while *AgriInsure* may encourage production of more risky crops. In both cases the incentives are modest at best.

To the extent that there is an environmental problem there are three options for remedies. First, expenditures on the BRM suite could be reduced without taking any other action. While there may be efficiency reasons to reform the current suite of BRM programs, there are no compelling environmental reasons to reduce BRM expenditures in the absence of any other co-policy. Second, expenditures could be rebalanced between BRM programs and the environment by encouraging environmental stewardship with separate agri-environmental policies. Over the last decade federal and provincial spending on environmental stewardship is roughly only 8% of

BRM expenditures (Boxall, 2018). Specific agri-environmental programs could be used to correct long standing environmental problems.

Third, cross-compliance could be introduced to make eligibility for the receipt of a non-environmental program benefits (e.g. BRM) conditional on meeting a specific environmental requirement. However, designing a successful cross compliance scheme will be a significant challenge. First, the amount of leverage that the regulator has over the environmental impact depends on the level of the agricultural payment rather than the value of the environmental benefit. Second, the provisions of the relevant BRM program limit the degree to which targeting of the environmental problem is possible. The provisions of the BRM programs make it difficult to target specific individuals and fields, in order to target specific environmental problems. Third, Growing Forward II created the potential for provinces to introduce cross-compliance requirements for the delivery of *AgriInvest;* however, there currently is no other legislative route that would allow the implementation of cross-compliance. Rude and Weersink (2018) demonstrate that the approximate benefits of 1% of net sales under *AgriInvest* probably will not provide enough incentive for farmers to participate in cross-compliance given compliance costs of at least 2% of sales.

Although BRM programs have a relatively small incremental impact on the environment, over time agricultural production has had cumulative negative effect. In conclusion, it is appropriate to consider alternative remedies to address these problems. It is unfortunate that developed country governments typically do not employ the *polluter-pays principl*e with respect to agriculture, but rather promote environmental stewardship through subsidization and regulation. The subsidization approach typically involves cost-sharing of beneficial management practices. Whether the environmental program involves a regulation or an incentive, it is appropriate to target the problem directly at the source of the environmental concerns. Where possible, any regulatory standard should be performance (outcome) based rather than design (process) based. There is no one single issue with respect to negative agricultural environmental externalities, nor is there a single solution. Rather there is a spatial heterogeneity of impacts that depend not just on location, but also time, the operator and technology employed.

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