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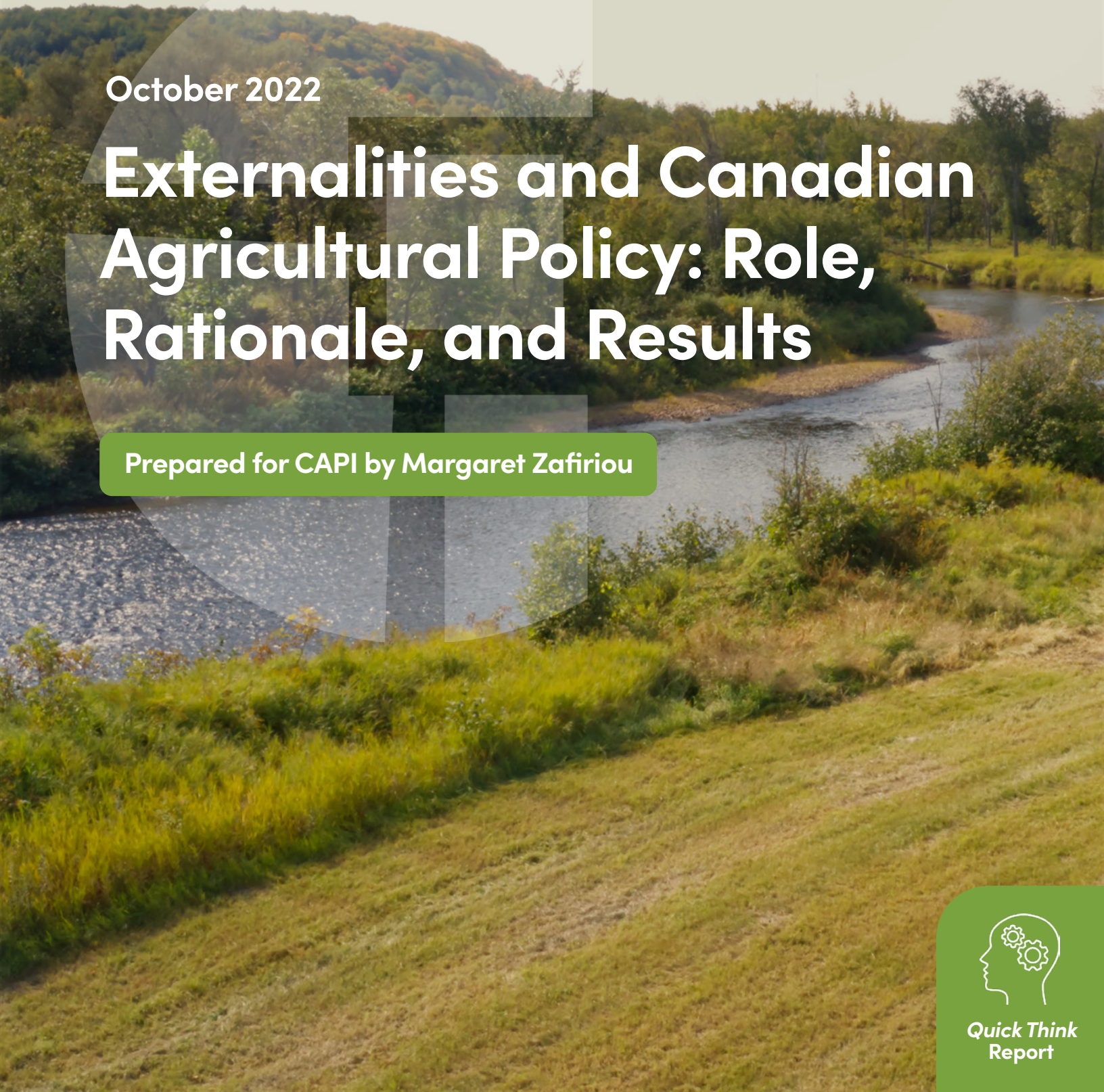

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Externalities and Canadian Agricultural Policy: Role, Rationale, and Results

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Quick Think Report

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Note from CAPI

The Canadian Agri-Food Policy Institute has an ongoing commitment to exploring the connection between sustainability and climate change and agriculture and food policy. Recently this has included a series of workshops, webinars and publications that have helped advance knowledge and policy solutions.

This *Quick Think* Report builds on past CAPI research and links externalities in agriculture to current issues in agriculture policy, including the agreement on the next Agricultural Policy Framework, announced by governments in July 2022.

Key Takeaways

- Understanding externalities, when the effect of production (or consumption) of goods or services impose costs (or generate benefits) for others which are not reflected in the prices charged for those goods or services, is important to effective policymaking.
- Estimates are that the net value of agriculture's environmental externalities are negative, but the sector is reducing its externalities, which can vary significantly by region.
- Understanding the cost or benefit of externalities, which exist outside conventional markets, can inform the need for policy intervention and whether the cost of the intervention is greater than the benefits on the externality.
- Investing in research to determine the value of externalities can also help farmers internalize externalities by adopting production practices which improve agriculture's environmental, economic and social impacts.
- Regulations, taxes, zoning, subsidies, property rights, knowledge transfer and moral suasion have been used to incentivize farmers to adopt BMPs that reduce externalities. Creating markets, such as carbon markets, are another mechanism to price externalities.
- The Sustainable Canadian Agricultural Partnership (SCAP) recognizes the importance of valuing externalities by rewarding ecological goods and services from farming and linking environmental practices to direct farm support.

Introduction

The recent meeting of federal provincial territorial (FPT) Agriculture Ministers in Saskatoon in July 2022 was important for setting the stage for the next five-year Agricultural Policy Framework that will govern and provide funding for FPT agricultural programs from 2023 to 2028.[1] Under the new Sustainable Canadian Agricultural Partnerships (SCAP) Agreement, FPT governments agreed to strengthen the resilience, sustainability and competitiveness of the sector as well as help Canada achieve its Paris climate change emission targets by 2030 on the path to net zero by 2050.

Under this framework, FPT Ministers agreed to a new $250 million program called the Resilient Agricultural Landscape Program (RALP) that will "support ecological goods and services provided by the agriculture sector". This program reinforces the importance of rewarding farmers for the environmental benefits they provide, rather than just penalizing them through regulations and taxes for the "negative externalities" from agriculture. With this additional funding on top of the existing On-farm Climate Action and Agriculture Climate Solutions funding and other core funding, Canada is making great strides to address the environmental impacts of agriculture and address climate change.[2]

In this *Quick Think* report, we attempt to synthesize CAPI research on externalities and place it in the current context in terms of the new FPT Sustainable Canadian Agricultural Partnership (SCAP) agreement and other policies and programs that are being put in place to address them in Canada and other countries.

1 AAFC News Release on FPT Ministers of Agriculture. Accessed here Aug 11, 2022 : Annual Meeting of Federal, Provincial and Territorial Ministers of Agriculture - Canada.ca

2 This includes spending on Living Labs, Climate Smart Agriculture and On-farm Climate Smart programming of $887 million by the federal government in Budget 2022.

What are Externalities?

"Externalities" are a basis for understanding agri-environmental policies and programs in Canada. They have been the focus of work by the Canadian Agri-Food Policy Institute (CAPI) over the past few years.[3] According to the Organization for Economic Cooperation and Development (OECD)[4]:

> *"Externalities" refer to situations where the effect of production or consumption of goods or services impose costs (or generate benefits) for others which are not reflected in the prices charged for the goods and services being provided."*

Greenhouse gas (GHG) emissions, water and air pollution, soil erosion and loss of biodiversity are all examples of negative externalities from agriculture. Farmers also produce "positive externalities" which include wildlife habitat, biodiversity, landscape aesthetics, strong rural communities and carbon sequestration.[5] These are also referred to as "ecological goods and services (EG&S)" with "public good" aspects to them because, once provided, it is not possible to exclude anyone from consuming them.[6] The elimination of negative externalities together with the creation of EG&S are a strong rationale for the increasing number of government programs that are being introduced to address environmental impacts of agriculture and climate change, in Canada and other countries.

3 See for example the papers and presentations from two workshops held in Calgary and Guelph in 2019 focused on "Optimizing Land Use for Sustainable Growth" available here: Optimizing Land Use for Sustainable Growth: CAPI Calgary Dialogue - February 21-22, 2019 - Canadian Agri-Food Policy Institute (capi-icpa.ca)

4 OECD, OECD Glossary of Statistical Terms - Externalities - OECD Definition

5 Skolrud T. et. al. (2020), "Measuring Externalities in Canadian Agriculture: Understanding the Impact of Agricultural Production on the Environment", Commissioned Report for CAPI. Pg. 19. Available here: 2020-01-15-CAPI-ag-externalities-Skolrud-paper_WEB-2.pdf (capi-icpa.ca)

6 Public goods are non-rival in consumption, meaning one person consuming it does not mean others cannot consume it; and one cannot exclude anyone from benefiting from them even if they did not contribute to their provision. (Fox, 2019, p. 7)

Why are Externalities a Concern and How Can they be Addressed?

Van Kooten (2019) argues that "externalities occur when the agricultural producer making a decision does not recognize the external or "spillover" effects" of that decision that impacts society.[7] This is particularly important in the case of negative externalities which impose "external costs" on the environment and society. These spillovers are a market failure, thereby justifying government intervention, but only if the costs of intervention do not exceed the benefits of intervention.[8] Over the longer term, they will impede a sustainable food system.

Whereas traditional output from agricultural production is priced by the markets (e.g. dollars per bushel of corn or head of cattle), externalities are not. Because they are produced outside the marketplace, their value is unknown and hence responsibility/liability is not factored into every day production decisions by farmers.[9] Assessing the monetary costs of the environmental and other impacts of agricultural production can help to fully identify their consequences for decision-making and a policy response.

Because the harm done by most of these externalities is not borne by producers but rather by broader society (e.g. water pollution), they will be over-produced unless their costs are "internalized". By using more sustainable production methods, farmers are to some extent "internalizing" the costs of these externalities.[10] However, the competitive marketplace and policy structure in which most farmers operate offers low returns and high risk, and this discourages them from adopting more sustainable production practices at a cost they incur while society benefits. This provides a rationale for government action to incentivize the adoption of these sustainable production practices.

Traditionally, policy instruments such as provision of information, awareness and moral suasion as well as regulatory standards, taxes, zoning, and subsidies have been used to mitigate offsite environmental impacts from agriculture.[11] While the "polluter pay principle" might warrant taxes or regulations on producers to reduce the negative externalities of agricultural production, it is not always easy to identify the source of the pollution. Conversely, taxing all producers regardless of how they farm is not the most efficient nor equitable solution. Rather policies and programs that highlight and incentivize sustainable methods in contrast to destructive, risky practices are a means of internalising the true costs of these impacts for the good of society.[12] This is the rationale for the range of programs that have recently been recommended and implemented across the country to address climate change, such as nutrient management, cover crops and rotational grazing.[13]

7 Van Kooten, G.C., "Policy Instruments for Addressing Externality in Agriculture", Paper prepared for CAPI, February 2019. p. 6. Available here: Economic Evaluation of Projects (capi-icpa.ca)
8 Ibid.
9 Skolrud, T., p. 13.
10 Van Kooten, G. C., p. 3
11 Skolrud, T. p. 13.
12 Tegtmeier, E.M. p. 16.
13 This includes recommendations made by Farmers for Climate Solutions in Budget 2021 consultations , "A Down Payment for a Resilient and Low-GHG Future " that had some influence in federal government programming. Available here: FCS_BudgetRecommendation2021.pdf (squarespace.com)

Other ways of internalizing externalities is to create markets for them (e.g. carbon credits) or by assigning property rights (e.g. conservation easements).[14] However, agricultural externalities are particularly challenging and require a different approach than externalities in other sectors. Finally, the issue of additionality is important when designing programs since efficient policies must lead to practices being adopted that wouldn't otherwise be adopted in their absence. The lack of additionality will be an important barrier to address going forward in this context.

Van Kooten (2019) argues that " the Canadian approach of incentivizing farmers to apply beneficial management practices (BMPs) is the most reasonable response to address externalities."[15] Recently introduced programs at the federal level, such as the On-Farm Climate Action Fund,[16] Living Labs,[17] and the Agricultural Climate Solutions[18] fund, as well as many provincial programs (see Annex A), have all been targeting BMPs that encourage sustainable production practices that address these negative externalities, especially GHG emissions and climate change. Some are even particularly focused on positive externalities such as wildlife habitat and biodiversity. There are also many conservation non-governmental organizations (NGOs) that focus on addressing externalities as well (see Annex A).

Addressing externalities is perhaps the most important rationale in the design of agri-environmental policies in Canada today. However, as Skolrud (2020) argues, the goal is not to eliminate (negative) externalities entirely, but to reduce them to a socially optimal level which incentivizes production to occur where marginal social benefit is equal to marginal social costs.[19] As an example, while the damage from over applying nitrogen (N) fertilizer is significant, this does not imply that the socially optimal response is to ban fertilizer application outright. Instead, crop yield increases resulting from fertilizer application must be appropriately balanced against the associated environmental damage or externalities from its use. Because of these nuances, policy development in this sphere is more challenging than in many other areas. This is especially true when also considering the difficulty of valuing externalities, the challenge of measuring the environmental impacts of specific BMPs, and the importance of accurately targeting BMPs to address their regional and even field level, soil and climate-specific environmental impacts.

In addition, the broad spatial and temporal effects of externalities add to the complexity of valuation efforts. This is especially difficult in agriculture because environmental outcomes cannot be guaranteed when participation in programs is optional. Hence the carrot approach can leave little to be desired.

14 Fox, G., "A Framework for Policy Innovation and Reform for Environmental Conflicts in Ontario Agriculture", Paper Prepared for CAPI's Optimizing Land Use for Sustainable Growth Guelph workshop, July 2019 p.. Available here: A Framework for Policy Innovation and Reform for Environmental Conflicts in Ontario Agriculture (capi-icpa.ca)
15 Van Kooten, p. 16.
16 OFCAF described here: Agricultural Climate Solutions – On-Farm Climate Action Fund - agriculture.canada.ca
17 Living Labs described here: Living Laboratories Initiative - agriculture.canada.ca
18 Agricultural Climate Solutions - Canada.ca
19 Skolrud, T. p. 20.

Valuing Externalities

Because externalities are not generally priced in the marketplace, they have to be valued through other methods. Without markets, economists and policymakers rely on the process of assigning an estimated economic value to them to have a better understanding of their magnitude for non-marketable impacts.[20] A monetary metric provides a basis for comparison to aid in prioritizing responses by policymakers and decision-makers, as well as for measuring results.

CAPI's recent study by Skolrud et. al. (2020) attempted to measure the monetary value of "externalities" in Canadian agriculture.[21] The authors argued that by placing a value on externalities, policy decision-makers will have a better sense of the magnitude of the impact agriculture has on the environment, human health and Canada's natural capital and resources. They can then prioritize measures to address these impacts, including at the regional level and even evaluate whether these measures have made a difference over time.

There are several methods for valuing externalities and they are highly complex and difficult to apply. Skolrud et al. followed three steps to measure them. First, they identified the set of externalities for which they had data of sufficient quality. Second, they used secondary data to measure the physical quantities of each externality at the annual provincial level (e.g. agri-environmental indicators). Third, they used the benefit-transfer method based on a literature review and international comparisons to estimate the monetary value of the externality measured in the second step. Each externality required subtle variations depending on data availability and the environmental issue.[22]

A key assumption underlying valuation is that the economic value of a product or service is its contribution to human well-being (its utility).[23] Measurement is often based on the concept of

willingness to pay (WTP) for the improvement of a product or service or the willingness to accept compensation (WTAC) for its deterioration. Valuation approaches fall into two categories, direct and indirect. Direct survey or stated preference methods are when individual preferences for improvement or loss of wellbeing associated with a condition are sought. This is the most common approach. Indirect valuation, on the other hand, observes behaviour in related markets and use such data as proxies.[24] But data and metrics needed to estimate these values are often missing and therefore, often limit the ability to value externalities.

To value positive externalities, economists make use of use and non-use values; which refer to the values associated with knowing a thing merely exists regardless of intent of use; and option value, the value of preserving a resource for possible future use.[25] Preserving wetlands and water resources for future recreational use are examples of option values. Finally, environmental externalities frequently have broad spatial and temporal effects, adding to the complexity of valuation efforts.

20 Tegtmeier, E.M. and M. D. Duffy, "External Costs of Agricultural Production in the United States", International Journal of Agricultural Sustainability, Vol. 2, No. 1, 2004, p. 2
21 Skolrud et. al. (2020). Available here: 2020-01-15-CAPI-ag-externalities-Skolrud-paper_WEB-2.pdf (capi-icpa.ca)
22 Skolrud. p. 20.
23 Tegtmeier, p. 2.
24 Ibid.
25 Ibid.

Table 1 summarizes the estimates developed by Skolrud et. al (2020) for both positive and negative externalities from Canadian agriculture. Data for the estimates were based on AAFC's agri-environmental indicators, which though dated (i.e. 2011), demonstrate a valuable time series to show where improvement or deterioration has occurred. And while the estimates are relatively dated and incomplete, they do show the value of the most important externalities linked to agricultural production. Estimates were developed for both the Prairies and Central Canada reflecting the differences in provincial climate, soil conditions and policies. Their value came from existing literature, where the authors used a "value transfer" method to estimate values for Canada.[26] In some cases, the value was estimated based on replacement cost such as for nitrogen (N), reflecting the cost of removing excess N from the environment. According to the authors, negative externalities associated with soil erosion were valued at $2 billion constant dollars in 2011, down 9% from $2.2 billion in 2006 and 23% from $2.6 B in 2001. The value of externalities associated with air pollution from Particulate Matter (PM) was similarly down 24% from 2006 to 2011 and 36% from 2001 to 2011. Externalities associated with GHG emissions from agricultural production, valued at $1.5 billion in 2011 were down 6% and 12% from 2006 and 2001 respectively. On the other hand, the negative impacts of pesticide and nitrogen use for water pollution increased over the period, growing by 15% and 5% over the 2001 to 2011 period.

Their results also showed differences between Western and Central Canada. So for example, improvements in the externalities associated with GHG emissions were significantly better on the Prairies (18%) relative to the slight deterioration in Central Canada (-1%). Externalities associated with Nitrogen water pollution showed substantial deterioration in the Prairies, up 42% between 2001 and 2011, while Central Canada saw a slight improvement of 2%. [27]

26 Skolrud et. al. p. 7.
27 Skolrud, p. 83.

Table 1: Negative, positive, and net environmental externalities over time for the Western and Central Provinces (millions of 2012 dollars)

	Negative externalities							
Externality	**1981**	**1986**	**1991**	**1996**	**2001**	**2006**	**2011**	**Percentage change (1981-2011)**
GHG	1,679	1,628	1,609	1,768	1,659	1,628	1,503	-10%
Ammonia	1,319					1,696	1,499	14%
PM	3,989	3,651	3,278	2,986	2,544	2,061	1,601	-60%
N-water	706	857	806	810	942	981	985	39%
P-water	48	52	52	54	57	56	55	14%
Pest-water	539	592	655	701	754	813	869	61%
Coliform-water	43	41	42	42	42	44	42	-3%
Soil erosion	2,843	2,950	2,828	2,733	2,637	2,226	2,049	-28%
Wildlife/biodiversity	286	274	266	271	266	264	253	-12%
Total negative	**11,452**	**10,043**	**9,535**	**9,365**	**8,901**	**9,768**	**8,856**	**-23%**

	Positive externalities							
Externality	**1981**	**1986**	**1991**	**1996**	**2001**	**2006**	**2011**	**Percentage change (1981-2011)**
Wildlife habitat	38	36	35	35	35	34	32	-6%
Landscape aesthetics	4,607	4,739	4,739	4,748	4,705	4,693	4,506	-4%
Total positive	**4,644**	**4,774**	**4,773**	**4,783**	**4,739**	**4,728**	**4,539**	**-2%**

Source: Skolrud, T., K. Belcher, P. Lloyd-Smith, P. Slade, A. Weersink, F. Abayateye, and S. Prescott, Report prepared for CAPI, January 2020. Available here: 2020-01-15-CAPI-ag-externalities-Skolrud-paper_WEB-2.pdf (capi-icpa.ca)

Valuing Externalities through Markets and Offset Systems

One metric missing from the Skolrud analysis is the value of the positive externalities associated with storing carbon in soils. Given the importance of carbon sequestration for offsetting GHG emissions from agriculture, and the dramatic improvements Canadian producers have made in boosting their soil carbon through BMPs, it is worth ascribing a value to it.

There have been efforts made to develop carbon credit markets to reward carbon sequestered in agricultural soils. Alberta was one of the early developers of a carbon offset program that included farmers in Canada. Alberta's Agricultural Carbon Offsets Program was originally introduced in 2007 with the goal of reducing Alberta's GHG emissions by 200 MT by 2050.[28] In 2007, large industrial emitters (oil and gas) were required to reduce their GHG emission intensities over time and could achieve this through voluntary emission reductions or by buying carbon offset credits from others, which created the opportunity for the farming community to change their practices to be able to earn carbon credits. The program was revamped in 2016 and is still in play.

Producers and ranchers can sell credits in this carbon market as long as they follow approved protocols by adopting agricultural practices that create carbon credits. They can then trade in Alberta's carbon market and earn extra income while realizing long-term environmental benefits for their operations. Some of the protocols developed covered conservation cropping[29] (i.e. no-till, cover crops etc.), reductions in emissions from fed cattle, nitrous oxide emission reductions, biofuel production and usage, waste biomass, solar and wind micro-generation, beef low-residual feed intake, biogas generation and energy efficiency. Since 2002, nearly 13 Mt of CO2eq were voluntarily removed from the atmosphere in Alberta by improving agricultural practices, and offsets generated about $170 million for farmers and aggregators.[30] As for a voluntary carbon market across Canada, there is still work to be done as they are still in their formative stages. But we have a few ideas as to how they will evolve. We need to study the feasibility and the protocols, agents and mechanisms for ensuring an efficient carbon market can fully operate at the national level. However, the measurement, monitoring and verification of terrestrial carbon offsets will continue to be a challenge for these markets.

The U.S. *Ecosystem Services Market Consortium (ESMSC)* is an example of an organization that creates a market to pay farmers and ranchers for EG&S. This includes quantified, verified, certified, and outcomes-based soil carbon, net greenhouse gases, water quality and water conservation credits generated from regenerative agricultural practices in most major cropping and livestock systems.[31] These credits can be "stacked" so that not only are they rewarding farmers and ranchers for improved soil carbon and reduced greenhouse gases but also for the biodiversity benefits from habitat for pollinators, insects, and birds. At the same time, the demand side of these markets need to be developed to ensure there are institutional, regulatory and governance systems in place (e.g. certification and verification) to develop trust and credibility for facilitating markets. By developing markets for these ecosystem services, these services are priced more efficiently than without these markets.

28 Yildirim, T. et. al. "Clean Growth in Agriculture", White Paper prepared by CAPI for the Clean Energy Fund, May 2019, p. 66. Available here: Clean Growth in Agriculture (capi-icpa.ca)
29 The conservation cropping protocol has been terminated given additionality criteria See: clarification on withdrawal of the quantification protocol for conservation cropping (alberta.ca)
30 Alberta's Offset Market Program. Available here: Alberta Emission Offset System | Alberta.ca
31 About Us – ESMC (ecosystemservicesmarket.org)

What policies and programs are available to address externalities?

As is evident in Canada, where increased funding is being targeted to address the negative externalities of agricultural production, other countries are also allocating more to agri-environmental programs. Nevertheless, the OECD, in its recent Agricultural Monitoring and Evaluation Report, 2022, stated that insufficient amounts of direct farm support were being spent on addressing climate change and reducing GHG emissions. They argue that more of the $817 billion currently spent on direct farm support needs to be redirected to R&D, infrastructure and programs that promote low-emission-intensity agriculture and sustainable productivity growth. Searchinger (2020) also argues that farm income support funding should be increasingly redirected towards boosting efficiency and conservation efforts.[32] The only difficulty is it is not as easy to determine the benefits since environmental outcomes are are a challenge to measure and other sectors may be able to reduce GHG emissions at lower costs.

Among the various initiatives announced under the new Canadian FPT policy framework (SCAP), several initiatives appear to be leaning towards cross-compliance. One such initiative will include a review of how to integrate climate risk and readiness into business risk management (BRM) programs.[33] The provinces will identify potential incentives and then launch a pilot for producers who adopt environmental practices that also reduce production risks. Also, a new initiative which links AgriInvest to an environmental risk assessment through an Environmental Farm Plan (EFP) was included in the agreement.

While Canada has been reluctant to use cross-compliance up till now, it appears as though opinions are changing. Cross-compliance is "any measure that makes eligibility for the receipt of a non-environmental program benefit conditional on meeting a specific environmental requirement," according to Rude and Weersink (2018) who evaluated its feasibility in a 2018 paper.[34] The authors concluded that Canadian agricultural support programs do not provide sufficient incentives for farmers to participate in cross-compliance. In a more recent CAPI Quick Think Report, Mussell and McCann (2022) argued that there are significant challenges with cross-compliance, including ineffectiveness, moral hazard, administrative burden and actuarial soundness concerns. However, by targeting and possibly leveraging the EFP, more efficient and effective environmental outcomes may be possible.[35]

32 Searchinger, T. et. al "Revising Agricultural Support to Mitigate Climate Change", World Bank Group, 2020. Available at: Revising Public Agricultural Support to Mitigate Climate Change (worldbank.org)
33 AAFC News Release on FPT Ministers of Agriculture. Accessed here Aug 11, 2022 : Annual Meeting of Federal, Provincial and Territorial Ministers of Agriculture - Canada.ca
34 Rude, J. and A. Weersink, " The Potential for Cross-Compliance in Canadian Agricultural Policy: Linking Environmental Goals with Business Risk Management Programs", Canadian Journal of Agricultural Economics, Vol. 66 (2018) p.360.
35 Mussel, A. and T. McCann, " Challenges with Cross Compliance and Agricultural Business Risk Management Programming in Canada", Quick Think Report Prepared for CAPI, July 2022.

Cross-compliance is being used in both the EU and the U.S. to reduce some of the externalities associated with agricultural production. Both Van Kooten (2019) and Baylis et. al. (2008) argue that cross-compliance linkages play an important role in ensuring the efficient delivery of environmental services, by requiring producers to meet minimum environmental standards before becoming eligible for certain farm payments.[36] In the U.S. the "sodbuster" and swampbuster" programs introduced elements of compliance when direct payments would be denied for crops produced on acreage converted from highly sensitive land or wetlands.[37] More recently, discounted crop insurance premiums are being offered when cover crops are planted.[38] In the EU, greening payments were introduced to reward farmers for the environmental benefits or positive externalities from certain farming practices, specifically, 1) crop diversification- in an effort to promote soil quality, 2) maintenance of permanent grassland to promote biodiversity and sequester carbon, and 3) maintaining land with specific characteristics or "ecological focus areas" to improve biodiversity. In a December 2017, EU Court Audit, however, Auditors concluded that greening payments did not benefit the environment and climate due to lack of data, ineffective targeting, overly generous payments and high complexity.[39] There is a risk that other countries' agri-environmental programming will suffer the same fate, as targeting for environmental outcomes at a local level may not be as easy to do as it seems.

36 Baylis, K., S. Peplow, G. Rausser and L. Simon, "Agri-environmental policies in the EU and the United States: A Comparison", Ecological Economics, Vol 65 (2008) p. 753.
37 Ibid. p. 755.
38 Producers with Crop Insurance to Receive Premium Benefit for Cover Crops | RMA (usda.gov)
39 EU Court of Auditors, "Greening: A More Complex Income Support Scheme, Not Yet Environmentally Effective," Dec. 2017. Accessed at: http://publications.europa.eu/webpub/eca/special-reports/greening-21-2017/en/.

Conclusions

With the growing number of agri-environmental programs that are being introduced in Canada that target reducing the negative externalities associated with agricultural production, it is important to understand the rationale behind these programs and the potential benefits they produce. The new FPT SCAP agreement signed by Ministers covering the next five-year period (2023-2028) is particularly focused on addressing these externalities with more funding going to reward farmers for the environmental benefits or ecological goods and services (EG&S) they provide. The new program called RALP which focuses on resilient landscapes is a case in point. Finally, the potential for cross-compliance and conditionality in some of the new agri-environmental initiatives point to a new direction for FPT governments, given that this is something previous governments in Canada have been reluctant to adopt.

While other countries such as the U.S. and the EU have a longer history of implementing cross compliance in agri-environmental programs, there are lessons that can be learned from their experience. However, in Canada, there is still significant work to be done to ensure that these programs are designed in such a way that they are effective, efficient, well targeted, and accommodate regional differences, such as soil types, crop types, climate and farm structure, which all vary across the provinces. And when it comes time to evaluate whether they provide value for money, it will be important to have the proper data, metrics, monitoring and evaluation tools for measuring the environmental outcomes they produce. It will also be important to be able to value the externalities that they have addressed. Further research in this area is therefore important to be able to design better agri-environmental programs in Canada.

Annex A

Provincial programs that Address Ecological Goods and Services in the Regions

The new RALP program that received $250 million from the FPT Ministers of Agriculture launched in July 2022 is modelled after existing programs that are currently operating in three provinces. It is evident, based on the differences between the provincial programs, how the provinces have been able to address their own unique regional differences by targeting different environmental issues that depend on regionally specific soil, climate, topography and farm type and structure.

Prince Edward Island: Alternate Land Use Services Program

This program provides financial incentives to agricultural landowners to establish or maintain BMPs on agricultural land or for the removal of targeted environmentally sensitive land from agricultural production with a focus to prevent soil erosion and siltation of watercourses and wetlands to improve water quality and enhance wildlife habitat. Funding offsets costs of expanding buffer zones, retiring highly sloped land, maintaining livestock fencing and delaying hay cutting etc.

Source: Alternative Land Use Services (ALUS) Program | Government of Prince Edward Island

Manitoba: Growing Outcomes in Watersheds

This program promotes the conservation of natural areas and land use changes that provide EG&S on agricultural land to work with farmers on maintaining or improving watershed health. Projects help reduce flooding and drought vulnerability and improve water quality and nutrient management in Manitoba. Funding is delivered through conservation contracts and incentives covering implementation costs and annual payments for acres enrolled. "Farming the best and conserving the rest".

Source: Natural Resources and Northern Development | Province of Manitoba (gov.mb.ca)

Quebec: Ministerial initiative to reward agri-environmental practices

This program aims to recognize and encourage the adoption of agri-environmental practices that go beyond regulatory requirements and generate significant environmental gains. The following agri-environmental practices are eligible for financial assistance:

1. **Crop Diversification:**
   - A. Other annual crops;
   - B. Perennial fodder crops

2. **Off-season soil protection:**
   - A. No fall tillage;
   - B. Winter cover crops;
   - C. Combination of practices A and B;
   - D. Combination of practices A and B and no spring tillage;

3. **Reduction in the use of herbicides:**
   - A. Spot spray;
   - B. Intercropping cover crops;
   - C. Band spraying;
   - D. Physical or mechanical weeding.

4. **Use of seeds not treated with insecticides:**
   - A. Grain, field and sweet corn.

5. **Implementation of facilities favorable to biodiversity:**
   - A. Widened shrub or tree riparian strip;
   - B. Hedge or wooded island;

6. **Crops of grain corn, fodder corn and soybeans** replaced by other annual crops or by perennial forage crops.

Upon registration, the applicant will receive an advance of 40% of the potential financial assistance. In total, for the duration of the Initiative, financial assistance may reach $50,000.

Source: MAPAQ - Initiative ministérielle de rétribution des pratiques agroenvironnementales (gouv.qc.ca)

Voluntary Programs promoted by Non-Governmental Organizations:

Alternative Land Use Systems

ALUS (alternative land use systems) is a charitable organization with an innovative community-developed and farmer-delivered program that produces, enhances and maintains ecosystem services on agricultural lands. Projects such as wetland restoration and enhancement, riparian buffers, shelterbelts, afforestation and native prairie grass restoration provide cleaner water and air, habitat, carbon sequestration and climate resiliency. ALUS began in 2006 in Blanshard, Manitoba and has expanded to 35 communities in six provinces across Canada who have voluntarily adopted the program, enrolling more than 1,400 farmers and ranchers. ALUS provides direct financial and technical support to these farmers and ranchers who deliver ecosystem services in their communities, such as cleaner air, cleaner water, carbon sequestration, erosion control, flood mitigation, pollinator support and wildlife habitat.

Source: ALUS available at: Who We Are - ALUS

Ducks Unlimited

Ducks Unlimited Canada (DUC) is a non-profit charitable organization that was established in 1938, with the goal of conserving, restoring and managing wetlands and grasslands across Canada to benefit waterfowl, wildlife and people for generations to come. Through a combination of government funding, donations and volunteers, who give of their time and efforts, DUC has been able to complete more than 11,890 projects and conserve, restore and influence more than 163.5 million acres of habitat.

Source: Conserving Canada's Wetlands | Ducks Unlimited Canada

Nature Conservancy of Canada

Nature Conservancy of Canada (NCC) is Canada's leading national, private land conservation organization with the aim of protecting and caring for our most ecologically significant lands and waters and the species they sustain. Founded in 1962 the Nature Conservancy of Canada (NCC) has grown to become the largest land trust in Canada. To date NCC has helped conserve over 4 million acres of land and worked with over 1300 landowners. A science-based conservation planning process drives their work, partnering with individuals, governments, indigenous communities, corporations and others to achieve durable conservation solutions. NCC secures properties through donation, purchase, conservation agreement and the relinquishment of other legal interests, and manages them for the long term. Since 1962, NCC and its partners, including Environment and Climate Change Canada, through the Natural Areas Conservation Program, have helped conserve more than 1.1 million hectares (2.8 million acres) of ecologically significant land from coast to coast.

Source: NCC: Nature Conservancy of Canada

List of Acronyms

FPT	Federal, provincial, and territorial
RALP	Resilient Agricultural Landscape Program
CAPI	Canadian Agri-Food Policy Institute
GHG	greenhouse gas(es)
EG&S	ecological goods and services
BMP	beneficial management practice
N	nitrogen
WTP	willingness to pay
WTAC	willingness to accept compensation
AAFC	Agriculture and Agri-Food Canada
SCAP	Sustainable Canadian Agricultural Partnerships Agreement
OECD	Organization for Economic Cooperation and Development
MT	metric tonnes
CO2eq	carbon dioxide equivalent
BRM	business risk management
EU	European Union

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