



IEA Bioenergy  
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## Summary Series

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# Sustainability Governance of Canada's Agriculture-based Bioeconomy

**Author:** Charles Lalonde and Maria Wellisch

**Edited by:** C. Tattersall Smith and Inge Stupak

## SUMMARY

The industrial bioeconomy represents a more sustainable and cleaner way of producing energy, fuels, chemicals, and bio-based materials. The agricultural bioeconomy is the subset in which agricultural biomass is used as the feedstock. These feedstocks can take the form of existing grain and oilseed crops, crop residues, livestock manure, processing residues and dedicated energy crops, with each feedstock group having its own set of sustainability issues.

In Canada, the agricultural bioeconomy is still emerging with liquid biofuels and biogas production being at commercial scale while many other types of bioproducts are still in the R&D and pilot stages of innovation. To date, the dominant feedstocks supplying the bioeconomy are grain corn, canola oil, wheat, soy oil, used cooking oil, animal fat, dairy manure, and food processing waste.

Grains and oilseeds are commodities that are produced as part of the core business of Canadian agriculture that supplies growing global food and feed markets. Yet, a small portion of these crops is used for industrial purposes (i.e. biofuels production) and only wastes are currently used to generate biogas. The report presents crop yields and acreages from 2006 to 2016, the period when domestic biofuel production was established in Canada. It shows that the rate of growth in the consumption of grains and oilseeds for biofuels has been less than the yield increases per hectare of these crops over this time.

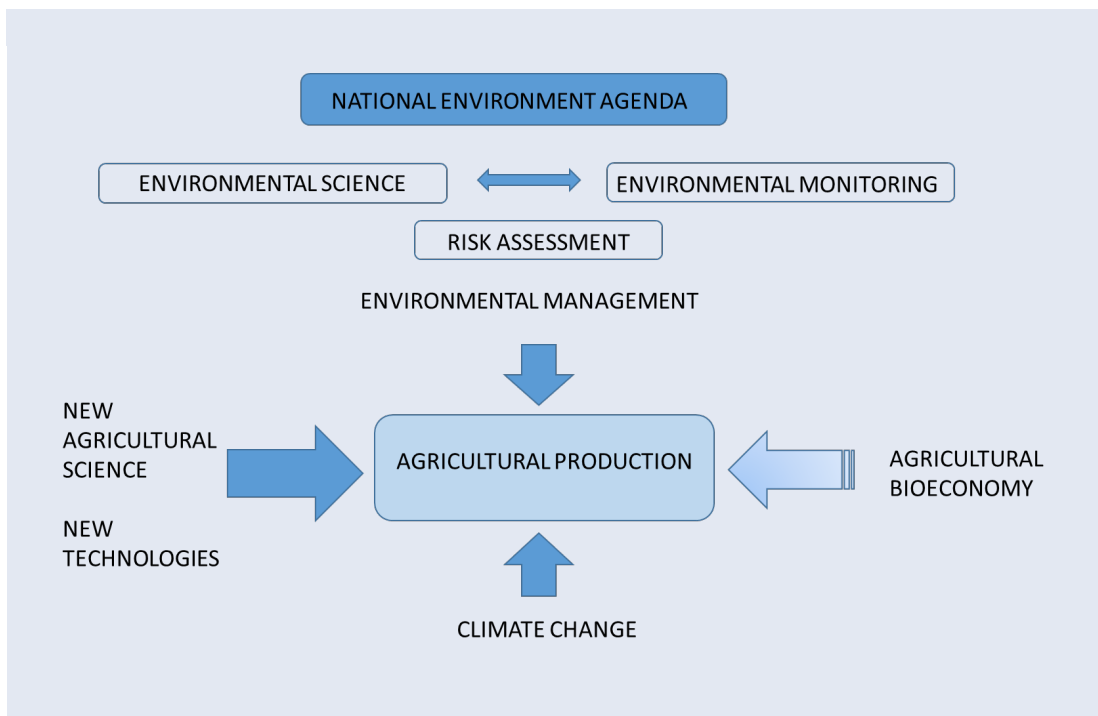
There is significant potential for using crop residues, agricultural wastes as well as dedicated energy crops for bioproducts, however these supply chains are not developed in Canada as the demand signal is not yet there. Before agricultural producers can commit to growing and harvesting these other feedstocks, the industrial markets need to exist and the requirements for feedstock quality and sustainability need to be well defined.

Sustainable agriculture integrates aspects from the three dimensions that are constantly interacting in the production of food, feed and fibre: economic, environmental, and societal. Today, numerous sustainability schemes exist to assess and compare the sustainability of agricultural production as well as the bioproducts that are made from agricultural biomass.

The different subsectors of Canadian agriculture, such as beef, dairy, horticulture, and grains, each have identified the primary sustainability issues of their respective markets and have developed sustainability initiatives to address these issues. However, these issues are not necessarily the same priorities that are of interest to biofuel or other bioproduct markets.

Regarding the bioeconomy, the sustainability of biofuels has received the most attention, with a greenhouse gas (GHG) lifecycle assessment being the predominant tool to demonstrate GHG emission reduction. It is generally agreed that both direct and indirect effects should be accounted for, however it is not evident how indirect effects can be accurately estimated and therefore different approaches are used to reduce the risk of land use change. As the bioeconomy expands its product suite beyond biofuels, feedstock production is expected to continue to play an important role in the product sustainability together with sustainability issues related to the product's fate at its end-of-life.

In Canada, sustainability governance is shared between governments at federal and provincial levels, that set environmental and social priorities, monitor environmental indicators and set thresholds for areas with conservation values at high risk of loss or damage, while private firms and NGOs set expectations vis-à-vis environmental and social performance and demand evidence of minimal negative impact and progress towards more sustainable production over time. The sustainability of agricultural production is driven by the demands of consumers in the food and feed markets and, only to a small extent, by bioproducts' markets.



Key Factors Influencing Sustainable Agricultural Production in Canada

At the farm level, there is no single approach to sustainability. Agricultural producers access a variety of assessment tools, including environmental farm planning, and a suite of best management practices that enable them to address environmental objectives while also meeting new demands for biomass feedstock for the bioeconomy. By nature, the management of biological systems must be adaptive. Producers adjust their agricultural practices and adopt new technologies on an ongoing basis as part of a continual improvement process associated with profitable agriculture. Precision agriculture technologies are being increasingly adopted and are expected to facilitate more data collection and further improve environmental management on farms.

## CONCLUSIONS

Canada's agricultural bioeconomy is small and emerging slowly. The approach to and design of a sustainability governance system depends on a number of key factors, including the definition of sustainability, the drivers and motivation for the governance requirement, the shape and size of the country's bioeconomy and its relationship to the agriculture sector.

The drivers for sustainable biomass production have changed since 2016, from GHG emission reduction for use in biofuels production to meeting the triple bottom line. Today, sustainability work in agriculture is driven by the demands of consumers in the food and feed markets and, only to a small extent, by bioproducts' markets. With respect to environmental sustainability, agricultural producers must respond to regional environmental priorities that are defined by regulatory standards or government objectives. At times, this requires making trade-offs to meet multiple environmental objectives weighing regional priorities against national goals.

Communication on agricultural practices and how the system operates is essential to maintaining social licence to operate and increasing public trust in sustainability of economic activities. Industry associations, such as the Canadian Roundtable for Sustainable Crops, are providing greater public access to science-based sustainability information on the sector and thereby are enabling agricultural producers to more easily demonstrate compliance with the sustainability requirements of different markets for agricultural products.

The full report can be downloaded from:  
<http://task43.ieabioenergy.com/publications/sustainability-governance-of-canadas-agriculture-based-bioeconomy-tr2020-04/>