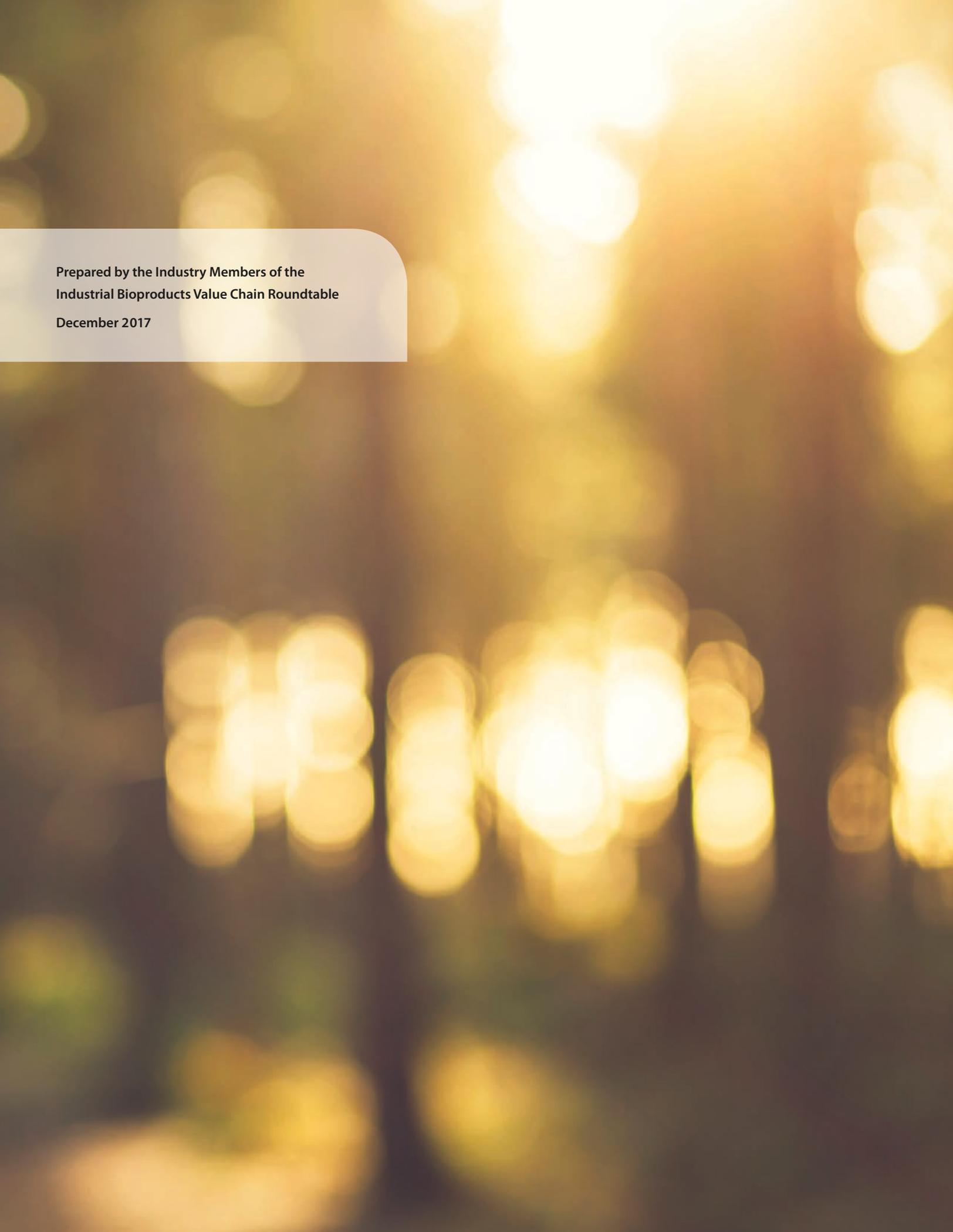


A close-up photograph of a hand holding a stalk of wheat in a golden field at sunset. The background is a blurred landscape with hills under a warm, orange sky. The text is overlaid on the upper left portion of the image.

Innovation in Agriculture: Canadian Industrial Bioproducts Industry Priorities & Recommendations



Prepared by the Industry Members of the
Industrial Bioproducts Value Chain Roundtable
December 2017

Canada's strength in natural resources management and applied innovation make it well positioned to transition to a clean growth economy and become a global leader in the rapidly growing bioproducts industry.

A focused, integrated policy framework for Canada's bioproducts sector will create valuable knowledge-economy jobs, leverage Canada's innovation and commercialization capacity, contribute to mitigation of greenhouse gas (GHG) emissions, focus public and private investments and open up new markets and diversification opportunities for our agriculture and agri-food industry. When Canadians and policy-makers think Agriculture, it is imperative they consider more than "food". Canadian agriculture is about food, feed, fibre and bioproducts derived from agricultural sources, farm family and rural household livelihoods, and also provides Canadians and global consumers with environmental goods and services (including clean technologies). Agriculture is also well-positioned to cooperate with and provide solutions to the natural resource sectors of energy, mining, forestry, and fisheries.

Canada's strong agriculture sector, scientific and commercial research capacity, highly educated population, and robust entrepreneurial communities together present myriad opportunities for Canada to be a global leader in the innovation, manufacture, consumption and export of value-added bioproducts. The industrial bioproducts industry will help to drive clean job creation and economic growth in Canada.

This paper was produced by the industry members of the Industrial Bioproducts Value Chain Roundtable and outlines priorities and recommendations as input to a national policy agenda in support of the industrial bioproducts industry. The priorities include:

1. Establishing Canada as a global leader in **feedstock development**¹.
2. Establishing Canada as a leading developer and adopter of **data-driven management practices** focused on improving environmental performance.
3. Building market awareness for bio-preferred products through the development of a **BioContent Canada Program**.
4. Providing **incentives and rewards** for both domestic and international commercial innovation and market adoption.
5. Establishing a **system of regulations and policy** to ensure safe, sustainable commercial demand and that supports Canada's bioproducts industry to grow both domestically and internationally.
6. Providing **enterprise support** to accelerate commercial success and economic development.

¹ Feedstock development by agri-food producers would include such areas as: genomics, crop variety selection and development, agronomic practices, application of precision agriculture, and waste management.





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Introduction

This paper was developed by the industry members of Canada's Industrial Bioproducts Value Chain Roundtable (IBVCRT) as input into the Roundtable's strategic plan (2017 – 2019) and the 2016/17 policy consultations occurring across Canada, including:

- Agriculture and Agri-Food Canada's (AAFC) Canadian Agricultural Partnership (2018 – 2023)
- Clean Growth and Climate Change
- Clean Technology in the Natural Resource Sectors

For the purpose of this report, industrial bioproducts cover four main market segments: biochemicals; bioenergy; biofuels; and biomaterials.

Biochemicals

Biochemicals are chemicals produced from bio-based inputs to supplement or replace petroleum based inputs. Canada's agricultural sector has already been producing feedstocks for the industrial biochemical markets. Corn grain products, flax oil, canola oil and soy oil are used for both food ingredient and chemical markets. Biomass such as corn stover and straw and purpose-grown crops are now being used for bio-based chemicals. The key purpose grown crops used for biochemicals in Canada today are miscanthus, switchgrass, camelina, and carinata.

Biomaterials

Biomaterials are processed or engineered materials that are fully or partly derived from biomass. Examples of biomaterials include soy-based foam, composites incorporating agricultural or wood fibres, and bioplastics. Biomaterials are already being used by major auto manufacturers in various ways, including: bioplastics used in the production of vehicle interiors and biofoams used in car seats.

Biofuels

Biofuels are fuels obtained by converting grains, such as corn, soybeans or canola and crop residues such as corn stover and straw, into liquid or gaseous fuels such as ethanol, biodiesel, biogas and hydrogen. The term commonly refers to fuels such as ethanol that are used largely for transportation but also includes heating fuels, "drop-in" fuels² and bio-based jet fuels that are under development.

Bioenergy

Bioenergy refers to the conversion of biomass into heat and power, replacing traditional methods such as petroleum, coal and nuclear fuels. Bioenergy can be produced in several ways. In the case of agriculture, the most common form is heat and power resulting from the combustion of biogas produced through anaerobic digestion, and to a smaller extent, the direct combustion of biomass pellets. Agri-food processing waste and livestock manure are the main inputs for biogas production. The heat and power are generally used to meet internal energy needs and, where provincial policies exist, are often sold to electric utilities and natural gas companies.

Industrial bioproduct value chain

The supply chains for industrial bioproducts will vary depending on the market segment (e.g., biochemicals, biomaterials, biofuels, bioenergy). However, there are some main components to the value chain that can be depicted.

In general, the industrial bioproduct value chain would begin with the feedstock (biomass) suppliers, would advance to companies providing logistic services (e.g. aggregation, transportation, storage), then would move on to the bioproduct manufacturers, and then to the final consumer.

Supporting this value chain would be market price discovery, the regulatory framework, research, development and demonstration projects, and communication systems.

² "Drop-in" fuels are those renewable fuels which can be blended with petroleum products, such as gasoline, and utilized in the current infrastructure of pumps, pipelines and other existing equipment.

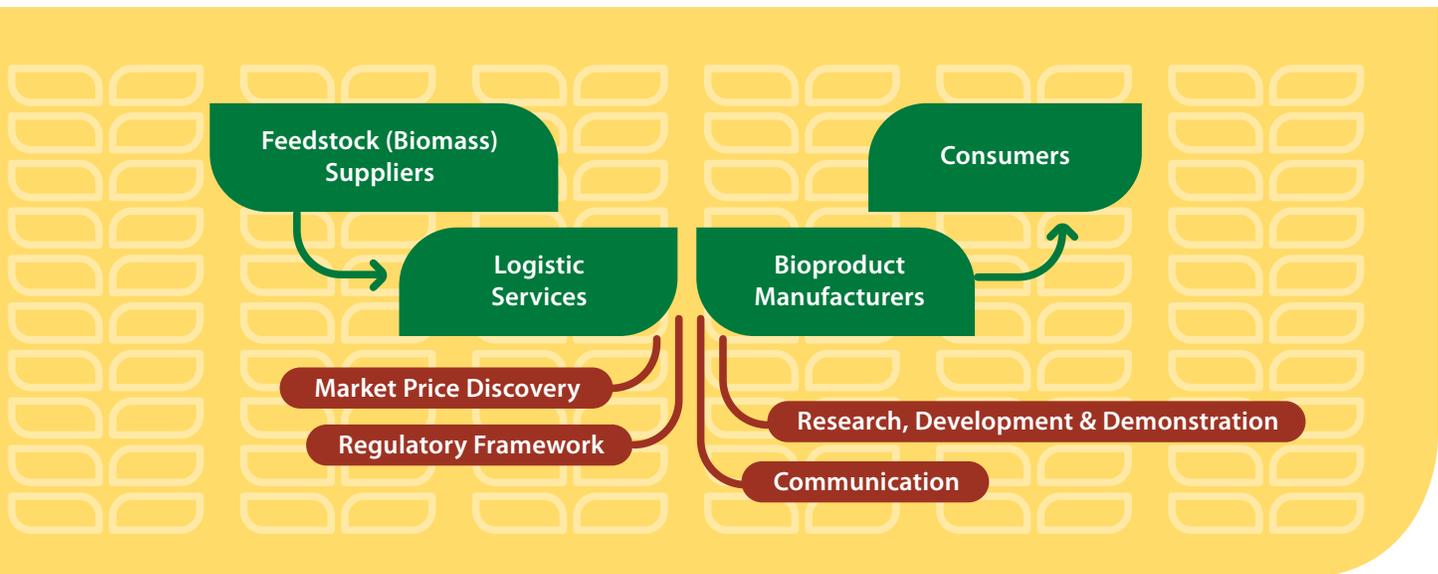
Key principles for policy consideration include:

- **Position bioproducts as a pillar to help grow the Canadian economy and to become an integral part in the future of agriculture.** This sector will be an important commercial vehicle for the delivery of the federal and provincial governments’ commitments to climate change, a low carbon economy, and clean growth.
- **Develop strong supply chains** to meet the growing global demands for bioproducts and clean technologies. Agricultural biomass is a major input into these renewable industries and the demand for such biomass is expected to grow significantly in the years ahead. It will be important for agri-food producers to be integral participants in supply chains from the outset in the development of markets for non-food agricultural products and environmental goods and services (e.g., waste, purpose-grown crops, land as carbon sinks).
- **Utilize the full spectrum of policy levers available to governments:** laws and regulations; loan guarantees; tax credits; research, development, and demonstration (RD&D) incentives; commercialization and marketing support; building on the strengths of farm, rural and Aboriginal communities.

- **Support bioproduct innovations across all parts of the value chain.** The areas of precision agriculture, life sciences, new technologies, and innovative products with key consumer attributes will contribute to the Canadian economy, clean growth, and the prosperity of Canadians in exciting new ways.

New innovative technologies, products and processes are major drivers in the bioproducts industry. For Canada’s competitiveness, it is imperative that a supportive, effective and efficient regulatory system exists. Technological advancements and regulatory evaluations need to move together concurrently and expediently in order for Canada to remain competitive. The Canadian industry is willing to assist government regulatory agencies to ensure a transparent, timely, and efficient regulatory system exists to enable a competitive and growing bioproducts sector.

Since 2011, the Industrial Bioproducts Value Chain Roundtable has brought together key industry leaders with federal and provincial government officials to hold discussions and create a shared vision to support an innovative, profitable, and internationally competitive Canadian bioproducts sector. Although AAFC plays a key role as Co-chair with industry and the Secretariat for the Roundtable, this document reflects the views of the Roundtable’s industry members specifically.



Global Market Size

Regardless of which market segment one is considering in the industrial bioproducts industry, the growth trajectory is upward with major drivers being a low carbon economy, climate change, protection of the environment, economic growth and job creation.

According to McKinsey and Company, the global market for energy from biomass and biofuels is expected to grow from \$203 billion in 2008 to \$544 billion in 2020, and accounts for a rapidly increasing share of the total market for energy³. Similarly, the portfolio of commercially available bio-based materials is experiencing rapid growth. For example, the bioplastics industry is forecast to grow at a compound annual growth rate (CAGR) of 14.8% to 2020 with packaging representing the most significant growth potential at 31.8% CAGR during the same forecast period.

The bioenergy sector is second only to the biofuels sector in terms of production and market size. The wood pellet industry in Canada is the second largest in the world, with production of about 4 million tonnes in 2015, increasing at 15% to 20% per year. ISO Technical Committee 238 Solid Biofuels (ISO/TC238) is responsible for development of ISO Standards for the solid biofuels sector, which incorporates fuels such as pellets, briquettes, chips, fire wood and advanced thermally treated materials. The purpose of ISO/TC238 is to foster the use of universal quality and testing standards for sourcing biomass materials and production of graded biofuels for trade in domestic as well as international markets. The standards set minimum requirements and specification limit values that help to protect the Canadian market from other jurisdictions that may use non-sustainable or low grade materials which could result in damage to combustion equipment or result in poor combustion during energy conversion. A total of 18 of the 42 Standards currently developed or under development by ISO/TC238 are managed by Canada through the Canadian Standards Association (CSA).

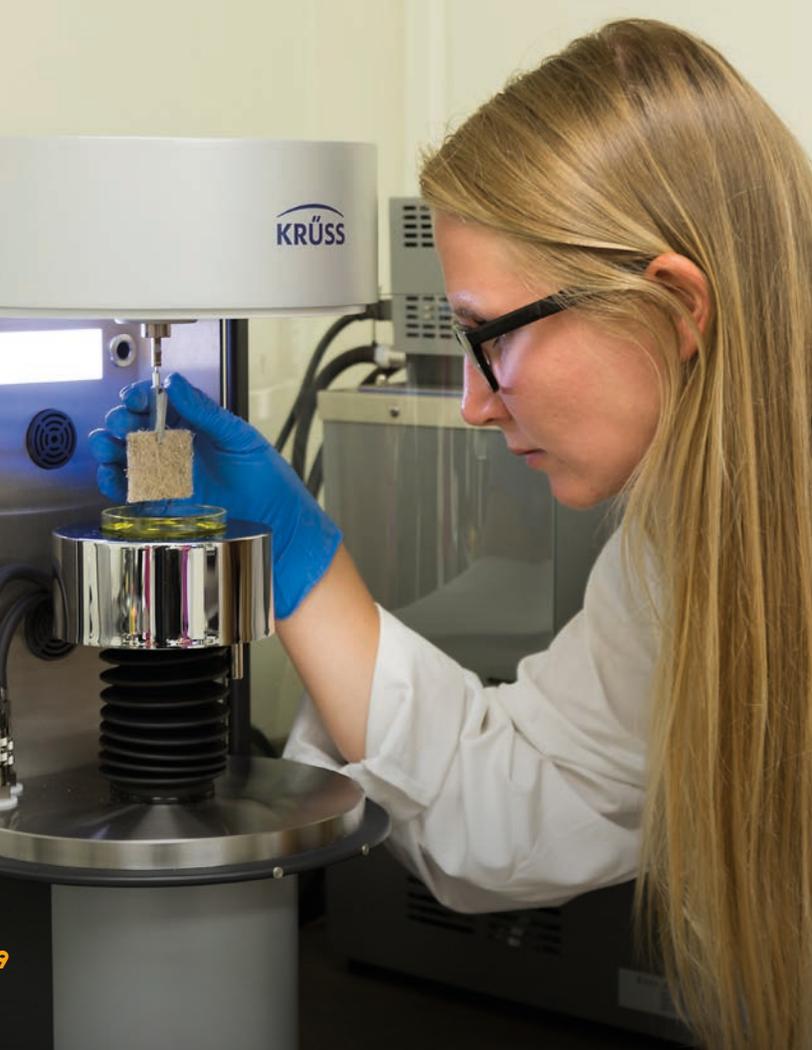
According to researchers at the Nova-Institute (Germany) and the Biobased Industries Consortium (Belgium), most of the European Union short-term investments are taking place in the lignocellulosic and forestry-based value chains, such as transitioning from first-generation to second-generation ethanol production and expanding second-generation technologies to the development of biochemical building blocks. In the agricultural crop value chain, a focus is on the utilization of vegetable oils for conversion into biobased products (e.g., bio-lubricants, bio-plastics).⁴

As new bioproducts are developed and come to market, employment opportunities are emerging across the value chain, from the farm to research & development, transportation/logistics, processing, manufacturing, sales and marketing.

Canada will become a global leader in bioproducts innovation, commercialization and export, while Canadians become the world's 'cleanest' consumers.

³ McKinsey & Company (2013). Biosystems. Retrieved from <http://www.mckinsey.com/business-functions/sustainability-and-resource-productivity/how-we-help-clients/biosystems>

⁴ Stephan Piotrowski, Michael Carus, and Dirk Carrez. Industry Report: European Bioeconomy in Figures. Industrial Biotechnology, April 2016, pgs. 78 - 82.



Priorities & Action Plans

We believe Canada can build leadership in bioproducts innovation on a robust foundation of six integrated and mutually supportive priority areas. Each priority area comprises a series of initiatives designed to respond to industry drivers, support economic development and transition, and mitigate the challenges that might hamper progress.

Feedstock Classification

1st Generation: Feedstocks are from food crops (e.g., corn, wheat, canola, soybeans, sugar beets) which are widely available in Canada.

2nd Generation: Feedstocks that are not suitable for human consumption – for example - crop straw/stover, grasses, agri-food waste (e.g., food waste; animal manure, fats and tallow; used cooking oils). By 2020, sugars (or any sustainable carbon blocks) from carbon dioxide, wood chips, agricultural residue, cellulose and more is expected to become commercially viable for conversion into base materials for bioproducts.

3rd Generation: Base materials will be developed from methane, mitigating the potential environmental damage of this highly potent greenhouse gas. Research will focus on economically viable processing.

Priority Area 1



Feedstock Development

Establish Canada as the leading global developer of agricultural biomass feedstocks for the industrial bioproducts industry. This will be achieved through strong cooperation and coordination within the agricultural industry and across the other natural resource sectors of the economy (energy, forestry, mining, and fisheries). Canada will be a reliable source of biomass of sustainable quality and quantity to meet long term industry requirements.

Canada's vast agricultural land base and existing crops are well-suited to establishing Canada as a leading supplier of bioproduct feedstocks today and into the future. These feedstocks are locally available and of the quality and economics to meet the market needs.

To establish and maintain a leading position for the long term, Canada has an opportunity to invest in the development of value chains for both existing and new purpose-grown feedstock resources. This action can contribute to creating higher value and sustainable feedstocks that put no additional strain on Canada's arable land.

Recommended Action Plan

- Encourage cooperation and support of the Biomass Quality Network Canada, the Industrial Bioproducts Value Chain Roundtable's Biomass Quality & Supply Working Group, and Canada's farm organizations to make recommendations about feedstock development planning, to coordinate development and adoption of internationally recognized standards to support industrial adoption of agricultural biomass, to foster supply chain integration and to monitor innovation and adoption of feedstocks across industries.
- Continue to support fundamental research in academia, while creating opportunities for government, research organizations and industry to collaborate toward commercialization of Canada's innovations.
- Support industrial innovation and commercialization of bioproducts through research, development and deployment opportunities for bio-based technologies, tax incentives, strategic funding mechanisms and knowledge transfer.
- Develop a chemical inventory so all bioplastics and additives can be registered and tracked. Define a chemical risk assessment tool that presents a score on numerous impact categories using California's respected Proposition 65 as reference.
- Extend recycling standards to include bioproduct waste streams, and to include waste plastics in production of new bioplastics and/or safe conversion to biofuels. (The French Reverplast Project is one benchmark for this work).

Priority Area 2

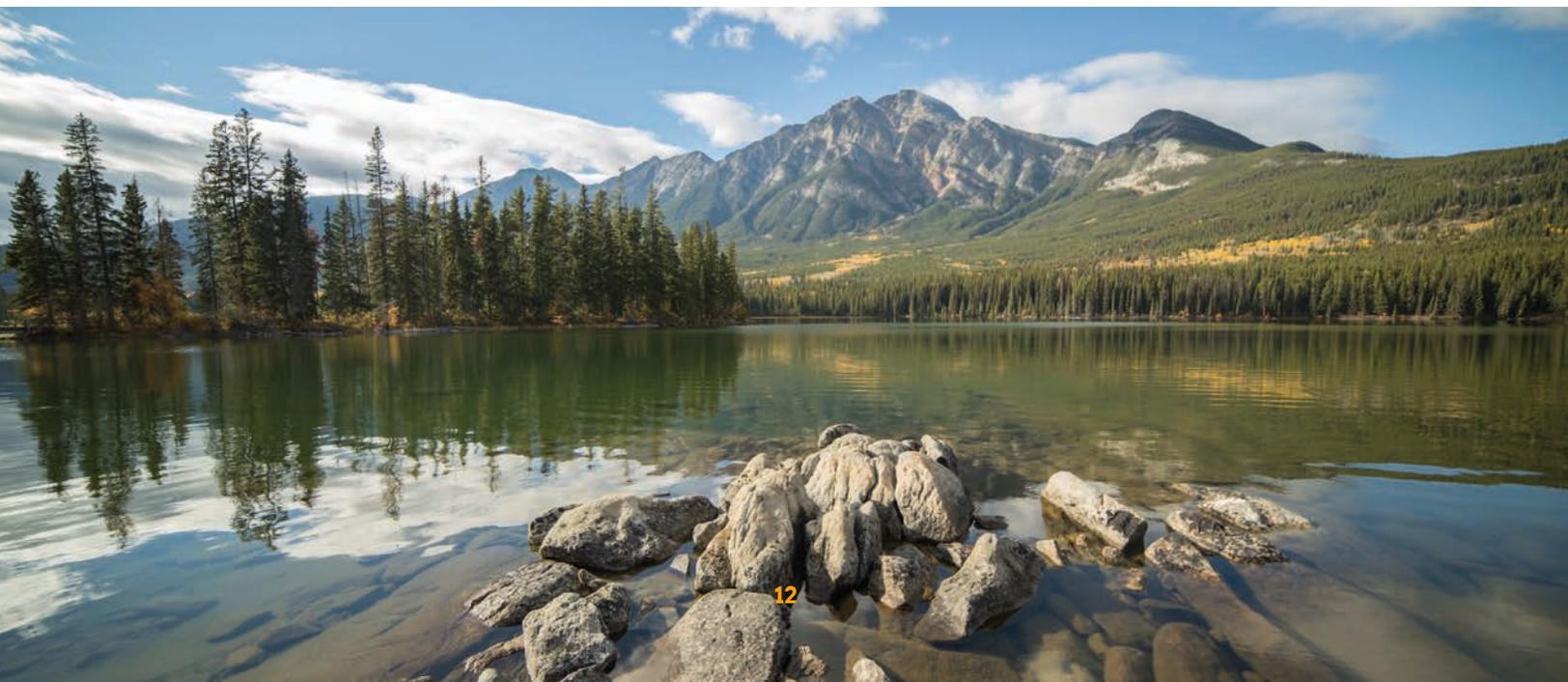


Clean Technology & Data

Establish Canada as a leading developer and adopter of data-driven management practices using precision agriculture technologies and farm best management practices that focus on improving environmental performance (e.g., mitigating/reducing greenhouse gases, soil management, water and wetlands management, food and animal waste management). Industry recognizes that measuring and reporting on the production systems, standards and performance will be an important input to validate the contribution of bioproducts to Canada's goals on sustainability, environment and climate change.

Recommended Action Plan

- In the Canadian Agricultural Partnership, increase support to the industry-led Environmental Farm Plans for the introduction of best management practices (BMPs) that can contribute to mitigation and adaptation to climate change and the sustainable provision of feedstocks to a growing bioproducts sector.
- Support initiatives to enhance data collection and analysis pertaining to Canada's industrial bioproducts industry (e.g., supply/disposition of biomass/feedstocks, quality indicators, prices, socio-economic contribution, performance/benchmarking measurements) to aid in measuring and validating its contributions to the specific and overall socio-economic goals and objectives.
- Increase government support to the agriculture and agri-food sector for RD&D projects, and accelerating commercialization in clean technologies, particularly small-and-medium sized enterprises (SMEs). This could include adding an area of focus that would address understanding the environmental goods and services that are provided by feedstocks. Encourage cross-sectoral cooperation in the area of clean technology and natural resources (e.g., agriculture, energy, forestry, mining, and fisheries).



Priority Area 3



BioContent Canada Program

Establish and promote a national certification and labelling program to provide assurance to consumers about the quality and trustworthiness of Canada's bio-based products and packaging.

By creating national certification and labelling for bio-based products, the Government of Canada will simultaneously convey the importance of the sector, establish health and environmental safeguards, and create a market for 'preferred' purchasing patterns by consumers, business and the public sector.

Complementary to and harmonized with the US Department of Agriculture's (USDA's) BioPreferred Program, Canada's program will ensure alignment with our most important trading partner while also establishing a strong, and federally approved, certification and labelling program for Canadian bioproducts. This is similar to the Canadian Food Inspection Agency's 'Canada Organic' regime, which is well aligned with the USDA's Organic standards.

Recommended Action Plan

- Establish a national certification and labelling program to provide assurances to consumers, in Canada and internationally, about the quality and trustworthiness of Canada's bio-based products.
 - Involves developing standards and associated tests to allow industry to use label.
 - Establish network of industry leaders to conduct testing.
 - Involves a restricted substances list to support the food safety ambitions and secure trust in the sector.
 - Requires engaging with a standard setting body (e.g., Canadian Standards Association or the Canadian General Standards Board).
- Include BioContent in governmental purchasing criteria.
- Develop a national awareness campaign to increase businesses' and consumers' awareness of the BioContent standard.
- Define and disseminate a categorization system for bioproducts and their utilization by markets (e.g., packaging, food contact, building construction, toys) and product technology (e.g., rigid packaging, films, pouches, food-service wares, durable goods).

Priority Area 4



Incentives & Rewards

Create incentives and rewards for farmers, manufacturers and retailers of bioproducts to achieve zero waste and reduce GHG emissions, overall environmental management, and product safety.

By using fiscal instruments to make bioproducts and bio-packaging as or more preferable than recycling petroleum-based products and packaging, the Government of Canada will help to provide market incentives in support of the bioproducts sector. With regard to bio-based food packaging, there is also a goal of simultaneously maintaining and improving product safety. Incentives and rewards will also be catalysts for driving market demand, which will lead to more private investment for consumer bio-packaging and bioproducts.

Recommended Action Plan

- Establish fiscal instruments (e.g., balance of tax incentives and subsidies) that encourage: zero waste to landfills; retailers to sell bioproducts; RD&D and farm-level support to reduce GHG (methane) emissions; farm-level and rural biogas production; and bio-packaging.
- Establish a sub-committee to set a policy objective and timeline for the food production and retail sectors to reach zero waste to landfill.
- Establish an Awards Scheme to recognize and reward best practices in the increased use of bioplastics, to help promote and spread the use of bioplastics both in and beyond consumer packaging.



“ The Government of Canada is committed to increasing the use of clean and sustainable technology. Making investments in the use of renewable biomass fuels through research and innovative practices will help the agricultural sector to be more competitive in a global economy, while reducing greenhouse gas emissions.”

The Honourable Lawrence MacAulay,
Minister of Agriculture and Agri-food
(August 2, 2016)⁵

⁵ www.agannex.com/biomass/biomass-program-continues-to-support-transition-to-renewable-energy-in-manitoba

Priority Area 5

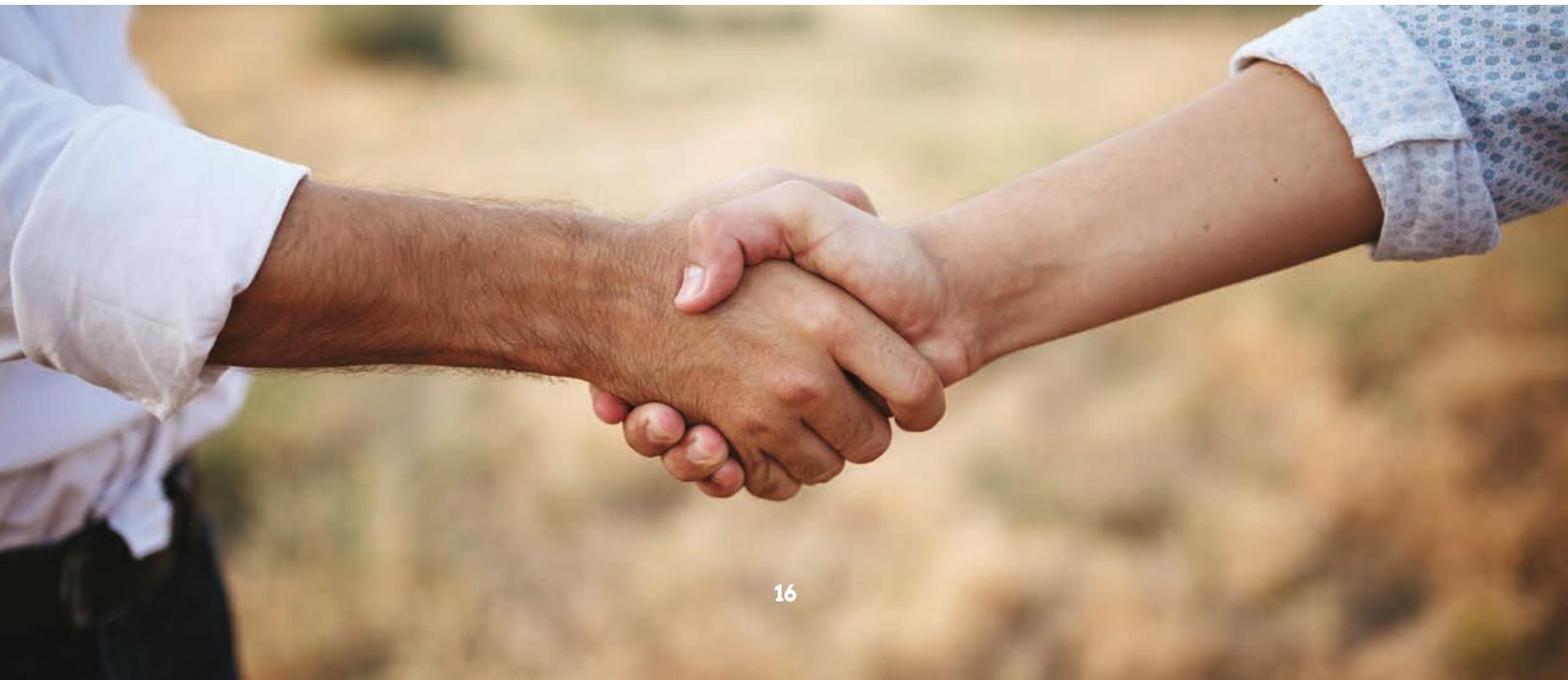


Regulations & Government Policy

Establish a system of regulations in the industrial bioproducts sector that enable commercialization in a process which is transparent and efficient to ensure the Canadian bioproducts value chain from the farm to the end consumer is competitive and responsive to changing market demands. The regulatory framework for bioproducts should also complement the emerging national climate change plans to reduce carbon emissions. This will assist the Canadian bioproducts sector to grow both within Canada and with the exports of goods and services internationally.

Setting carbon emissions reduction targets and helping Canadian consumers to transition to industrial bioproducts that can support these goals is important. For example, renewable fuels (advanced fuels, ethanol, biodiesel) all reduce GHG emissions on a life-cycle basis and increased use of these fuels will contribute to GHG reduction goals. Increasing the adoption of lightweight biomaterials in ground vehicles to replace petroleum based products and reduce fuel usage is also synergistic. A regulatory framework that would support consumers to select biomaterials would be supportive of the goals. For example, mandating the switch to bioplastics in fresh food packaging will deliver on the Minister of Agriculture and Agri-food's mandate to help the sector adjust to climate change. Standards setting minimum carbon emission reductions for bioproducts will support this goal.

Industry stakeholders in Canada have concerns that the approval process for new products in Canada is generally much longer and more difficult than in the United States. Regulatory harmonization with the United States and/or other leading international jurisdictions would assist Canadian companies to have an equal competitive advantage. This will also help attract bioproduct development and commercialization in Canada.



Recommended Action Plan

- Establish a Regulatory Concierge Service for Bioproducts in Canada to address the novelty aspects of many bioproducts, the complexity of the regulatory approval process, and to support the many innovative SMEs to focus on what they do best, starting and growing Canadian companies. Gaining regulatory approvals in a timely manner and navigating government programs are critical to enabling companies to commercialize their new innovative products and technologies. Guidance and clarity provided by a cross-sectoral regulatory concierge function will enable the bioproducts industries to better navigate the regulatory systems and increase the productivity and scope of the industrial bioproducts sector.
- Harmonize regulatory systems and approvals, where appropriate, in the area of life sciences and applied technologies between Canada and other leading international jurisdictions to maintain Canada's competitiveness in the bioproducts sector. The bioproducts sector stakeholders will work with Canada's regulatory agencies as well as organizations such as the Canada-United States Regulatory Cooperation Council (RCC) and other international organizations to address issues of a regulatory nature.
 - Establish a national industry/government working group, and/or participate within existing national working groups, to identify regulatory measures in Canada where the bioproduct industry and Canada's economy would benefit from regulatory harmonization with the United States and/or other leading international jurisdictions.
- Establish a coordinated and efficient system of federal and/or provincial regulations that enables the sector to advance. This also includes regulations that dovetail with the emerging Pan-Canadian Clean Growth and Climate Change Framework to both reduce GHG emissions in the agriculture and agri-food sector and support the contributions of the agriculture and agri-food sector as a solution provider for GHG emission reduction/mitigation for other sectors of the Canadian economy.
- Establish carbon emissions reduction targets for the food manufacturing and retail sector, including incentives or sanctions for companies.
- Introduce a policy that requires all packaging tied to fresh vegetables and produce to meet GHG emission objectives and contain no chemicals of concern.
- Identify other consumer goods categories in which a switch to biomaterials can help reduce greenhouse gases and hazardous waste.
- Increase the mandate of renewable content in diesel and gasoline from 2% to 5% nationally and increase the ethanol blend in Canadian gasoline from 5% to up to 10%.
- Change Canada's renewable fuel content requirement to enable renewable natural gas (RNG) as an allowable fuel. Introduce a renewable content requirement of 10% by 2030 in the natural gas supply system, leveraging existing infrastructure, and improving resilience of Canada's energy system.
- Introduce policy to incent the manufacturing and production industry to use biomass to convert to bioenergy such as combined heat and power (CHP).
- Provide tax exemptions for advanced fuels (e.g., cellulosic) to encourage use and market uptake similar to what has been done for other alternative fuels (e.g., propane, natural gas).
- Establish offset protocols that recognize the methane abatement value of biogas.

Priority Area 6



Enterprise Support & Industry Capacity

Support new and expanding businesses in the bioproducts innovation ecosystem as they transverse the difficult early commercialization stages between the lab and the marketplace. Continued support to RD&D and accelerating commercialization investments in this sector will be critical to competitiveness and economic growth.

Canada has well-established support programs for scientific and commercial research and pre-commercial product development. In addition, established Canadian companies access regional, national and international private sector debt and equity financing, and are able to distribute products and services to global markets. However, improvements to the bioproducts innovation ecosystem are required to support new and expanding businesses as they traverse the difficult early commercialization stages between the lab and the marketplace. Continued support to RD&D projects in this sector will be important for future growth, including support for SMEs.

Widely referred to as the 'Valley of Death' among technology entrepreneurs, the early commercialization phase for Canadian companies is strikingly absent of dedicated investors, or appropriately structured debt vehicles. This is challenging enough for entrepreneurs in established market segments; it is profoundly more difficult in emerging spaces like bioproducts, in large part because private investors may not have had investment experience or successes in this rapidly developing and multiple-market sector.

Mandates across the Government of Canada reflect a commitment to development of 'clean jobs'. In the Canadian context, this is widely interpreted as a reference to clean energy jobs. However, significant and diverse opportunities exist for early stage companies, including those developing and commercializing bioproducts such as biomaterials, natural product chemistry replacements for petroleum-based chemicals, and bio-based energy sources that have a wide range of applications in the economy. The announcement in March 2016 by Innovation, Science and Economic Development Minister Navdeep Bains of a significant investment in Sustainable Development Technology Canada (SDTC) indicates this is a recognized priority for the Government of Canada. However, while this is an important signal, additional support, coordination and reinvention of public policy tools across governments is necessary to create the conditions for commercialization success. Federal programs including NRC-IRAP, WD's Western Innovation Initiative, ACOA's Atlantic Innovation Fund, AAFC's AgriInnovation Program, provincial equity tax credit programs, among others, have been valuable tools to de-risk commercialization of new bio-based products. With the appropriate supports for early stage commercialization in place, the Canadian bioproducts industry can accelerate growth and become a global leader.

Recommended Action Plan

- Encourage governments and industry to better utilize and support the existing national structure of organizations in Canada that have a mandate to assist early stage companies and to connect bioproduct-based technologies emerging from academic research centres, scientific research organizations and SME's to accelerate the commercialization of natural product-based technologies, including bioproducts.
 - The structure comprises industry-led regional, provincial, and national incubator, accelerator, and cluster development organizations with a mandate and expertise to help early stage bioproduct-based companies become investor-ready.
 - These organizations include, for example, AgWest Bio (Saskatchewan), Alberta Innovates BioSolutions, BioIndustrial Innovation Canada (Sarnia), BioEnterprise, LSAM (Manitoba), OAFT (Ontario), CRIBIQ (Quebec), BioNB, PEI BioAlliance, and Natural Products Canada (NPC).
 - Ensure this existing national structure works with stakeholder public and private sector organizations in addressing companies' gaps in business model, regulatory strategy, IP strategy, market assessments, marketing strategy, and capital formation. This allows for a coordinated, collaborative effort among agencies like NRC-IRAP, Federal Regional Development Agencies (RDA), AAFC, and provincial economic development agencies in increasing commercialization success.
- Ensure that AAFC's Canadian Agricultural Partnership, federal RDA, provincial economic development agencies, and SDTC programs include patient, non-dilutive loan and grant funding to invest in early stage, viable bioproduct-based businesses.
- Explore financial mechanisms to fund pre-commercialization of bioproduct projects, products and services that reduce carbon.
- Characterize and evaluate effectiveness of existing incentives that enhance private sector investment in the Canadian industrial bioproducts sector and identify new strategies. This includes support to Canadian angel investors/networks with tax incentives to invest in early stage bio-based ventures. Acceleration of commercialization of Canadian bioproduct innovations is extremely important for Canada to capitalize on our RD&D programs and projects.
- Endow university-based research chairs for bioproducts science to preserve current research capacity as key national researchers anticipate retirement.



Taking Action: Next Steps

In Budget 2017, the Government of Canada made important commitments to innovation and clean technology as policy priority areas. Bioproducts are singled out as well in Prime Minister Trudeau's Mandate Letter to the Minister of Agriculture and Agri-Food. In addition, AAFC's bioproducts sector development strategy has been considered closely during development of this paper.

The bioproducts sector has huge potential to contribute to a number of different policy objectives in the agriculture sector and beyond; developing clean technology jobs, sparking innovation and economic development, addressing climate change and enhancing food safety and security.

Canada is positioned to seize significant opportunities in bioproducts. We look forward to advancing policy discussions on this important emerging sector of the bio-economy, and to playing our role in generating opportunities across innovation, commercialization and manufacturing to support Canada's objectives.

“ Now is the time for Canadian companies to capture their share of the global market for clean technology.”

The Honourable Navdeep Bains, Minister of Innovation, Science, and Economic Development (March 4, 2016)⁶

National Industry Organizations Supporting the Bioproducts Industry

In addition to the leadership roles being taken on the bioeconomy at the Provincial level across Canada, a number of national industry organizations have formed to support the advancement of Canada's bioproducts industry, both at home and in seeking partnerships and export markets globally. The following provides a brief insight into this vibrant and growing part of our nation's economy:

BioFuelNet Canada

www.biofuelnet.ca

BioFuelNet Canada (BFN) is an integrated community of academic researchers, industry partners and government representatives who engage in collaborative initiatives to accelerate the development of sustainable advanced biofuels. BFN's research is funded through a mix of government and private contributions, and is structured around the themes of feedstock, conversion, utilization, and social, economic and environmental sustainability.

Bioindustrial Innovation Canada (BIC)

www.bincanada.ca

Bioindustrial Innovation Canada was established in 2008 with start-up funding from the Centres of Excellence for Commercialization and Research (CECR) program. The mission of BIC is to help Ontario and Canada become a globally recognized leader in taking sustainable feedstock, such as agricultural and forestry by-products and wastes, and turning these renewable resources into energy and value-added chemicals for use in applications ranging from construction to automotive parts. New jobs will be created in Canada by building a world-class bioindustrial industry.

In 2016, BIC launched the creation of the Centre for Commercialization of Sustainable Chemistry Innovation (COMM SCI). Based within Canada's first Hybrid Chemistry Cluster in Sarnia, Ontario, at the doorstep of Ontario's chemistry, energy and agriculture heartland, COMM SCI will be an anchor and hub for the commercialization and collaboration of new clean technologies and technology companies in sustainable chemistry based and bio-based innovation.

Biomass Quality Network Canada (BQNC)

www.bqnc.ca

The Industrial Bioproducts Value Chain Roundtable has recommended that quality standards and measurement techniques are required as a key enabler in the commercialization of biomass into industrial bioproducts. As a result of this direction, the Biomass Quality Network Canada was established by industry stakeholders in 2015 to oversee the selection/creation of applicable quality control and quality assurance standards necessary to build a strong bioproducts industry in Canada.

Canadian Biogas Association

www.biogasassociation.ca

The Canadian Biogas Association (formerly known as the Agri-energy Producers' Association of Ontario) was incorporated as a nonprofit organization in 2008 by a group of farmers interested in supporting and promoting the development of agriculture-based renewable energy sector, specifically farm-based biogas systems. Biogas, resulting from the process of anaerobic digestion, is a renewable energy source that can be used to create heat and power, used as a natural gas equivalent in the pipeline, or transportation grade fuel in vehicles.

Composites Innovation Centre (CIC)

www.compositesinnovation.ca

In partnership with industry, government and academia, the Composites Innovation Centre (CIC) develops and commercializes innovative composite technologies for aerospace, ground transportation, biomaterials, and industrial applications that are more cost effective, environmentally friendly and offer enhanced performance. Over the past 12 years, CIC has evolved into Canada's largest composites technology centre due to industry demand.

Natural Products Canada (NPC)

www.naturalproductscanada.com

Natural Products Canada (NPC) is a Centre of Excellence for Research and Commercialization of natural products. The not-for-profit was established in 2016, and has a broad focus on: functional foods and food ingredients; nutraceuticals and cosmeceuticals; agricultural products, animal feed ingredients, and veterinary care products; and green replacements for chemically derived products. NPC's national network includes large and small companies, investors, research institutes, and innovation and commercialization experts. Drawing on a rich pipeline of natural products and natural product technologies, NPC fulfills its mandate via services from four pillars: Connect, Evaluate, Accelerate, and Invest to bring products to market faster, cheaper, and more efficiently.

Renewable Industries Canada (RICanada)

www.ricanada.org

Renewable Industries Canada represents the leaders of Canada's bioeconomy – producers of renewable fuels and value added products that reduce GHG emissions and provide economic opportunity to the benefit of all Canadians. In 2016, the 32-year old nonprofit Canadian Renewable Fuels Association (CRFA) relaunched under the RICanada name to better represent and reflects the diversification within its member companies.

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