

AGRICULTURE AND AGRI-FOOD CANADA BIOENERGY - THE CANADIAN CHALLENGE

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Context and Challenges

Canada currently derives 6% of its energy from biological sources, but aims to increase that proportion. A current "stretch goal" envisions bioenergy being the source of 20% of Canadian energy requirements by 2030 (2 EJ/yr). The drivers of bioenergy in Canada include diversification of energy sources, environmental concerns, the rural economy and farm income.

With 10% of the world's forests and 68 million hectares of farmland, Canada has access to a massive amount of biomass, but also faces significant challenges:

- cool climate;
- diverse ecozones;
- large distances between biomass sources and markets;
- lack of significant sources of private sector investment (compared with USA and EU);
- small intensely urbanized population; and,
- economic viability

Canada looks at bioenergy as being more viable in the context of a more integrated biobased economy. Energy on its own may not be competitive, but could be a crucial output of biorefineries, in many cases being derived from the co-products stream resulting from the production of more valuable products. As a small player on the global scale of research, Canada will be more likely to succeed if it integrates research efforts in the government, universities and the private sector, while making strategic decisions on what needs to be invented in Canada and what should be adapted from elsewhere. The federal government led for energy lies with Natural Resources Canada (NRCan) but as a cross-cutting issue, there is a history of collaboration with other federal departments including Agriculture and Agri-Food, Environment, Industry, and the National Research Council.

Strategy

The Canadian government has developed a number of new programs to address renewable and bioenergy which focus on collaboration. Among them is the Agricultural Bioproducts Innovation Program (ABIP) which aims to fund research within networks that can include federal researchers from relevant departments, universities and the private sector. Its focus is on improving feedstocks, improving processing, and developing more non-traditional products.

Research in Canada

The areas of research needed for the development of the bioeconomy include:

- inventory analyses;
- life cycle analyses of various bioenergy systems in the Canadian context;
- feedstock identification and optimization;
- conversion technologies, including flexible feedstock systems;
- development of novel bio-based products and biorefineries including:
 - biologically active molecules for human and animal health and wellness (functional foods, nutraceuticals, pharmaceuticals),
 - industrial chemicals,
 - composites and materials;
- process engineering and scale-up;
- new crops and cropping systems; and,
- harvest management for energy crops, including ligno-cellulosics.

Canada has traditionally had strong research in:

- plant breeding and biotechnologies, notably cereals and oilseeds;
- genetic resources;
- integrated production systems; and,
- environmentally sustainable production practices.

Some recent examples of pertinent investigations include:

- development of biorefineries based on cereals (wheat, oats, triticale) and oilseeds (brassicacae, flax, soy);
- integration with health researchers in teaching hospitals, universities and vet colleges;
- production of pharmaceuticals in plants, and conversion of co-product stream to energy; and,
- management of animal wastes in the biorefinery context.

Potential collaboration

Areas most suitable for international collaboration include:

- adaptation of feedstocks where environmental conditions are similar;
- extraction, refining and conversion technologies;
- process engineering;
- new product development.