

INSIGHT

B.C.: A BIOENERGY LEADER

Developing British Columbia's Bioeconomy is a huge challenge requiring assertive companies, creative communities and visionary policy leadership and support.

A solid foundation for this has been provided through the BC Energy Plan, BC Bioenergy Strategy, the BC Climate Action Accord, and a Carbon Tax. The maturing of the Bioeconomy will require a focus on further technological, economic and social development while continuing to maintain environmental leadership.

This emerging Bioeconomy relies on development, integration and best utilization of low cost bioenergy feedstocks. Utilization of existing waste streams for bioenergy feedstocks holds the highest immediate potential for bioenergy development. Benefits include lowering the cost of waste disposal, reducing greenhouse gas emissions, fixing energy prices in a rising market, and generating green jobs and creating economic diversification in communities across the province.

Sustainable material sources

Woody biomass residuals are primarily sourced from sawmill, pulp and paper mills, or forest harvest residuals, including mountain pine beetle-damaged timber stands. These are then processed into wood chips, briquettes or pellets to replace fossil fuels used in heat and power facilities in Canada, the US, Europe, and Asia. Forest products companies are the original bioenergy pioneers—through the use of their own wood waste to generate energy for use in their plants to sell onto the electricity grid or to provide heat for community district energy systems. British Columbia has the largest concentration of pellet manufacturers in Canada, supplying over 1.1 million tonnes, mostly for export to Europe. The next generation of solid wood residual products, such as torrefied pellets and briquettes, represent one of the highest potential growth opportunities for BC. Torrefaction technology, (a process of roasting within a defined temperature range in the absence of oxygen) will increase energy density and reduce logistics costs. The University of British Columbia is the home of the first combined heat and power gasification plant based on the

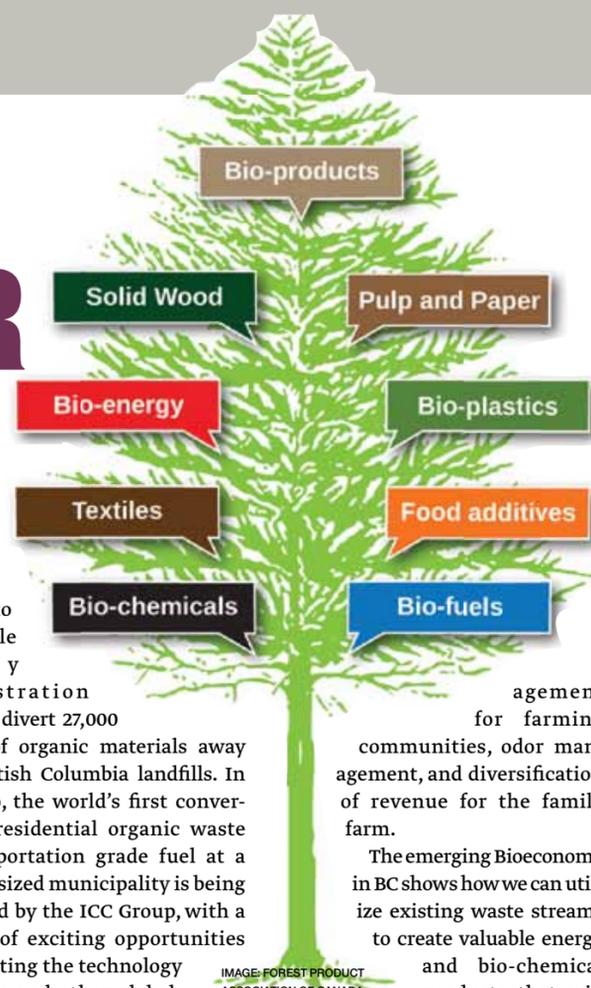
unique Nexterra thermochemical syngas conditioning technology that generates electricity efficiencies with low emissions, and utilizes heat generated in the process. In Burnaby, BC, Lignol Innovations Ltd., is leading the world in conversion of residual woody biomass to fuel ethanol, lignin-based products and other specialty bio-chemicals.

Cleaning up and cashing in

Utilization of municipal waste streams for bioenergy facilities reduces the amount of organic material sent to landfills where the organic matter converts to methane, a gas that is 20 times more harmful when released in the atmosphere than CO₂. Municipal waste streams include municipal woody debris, green yard waste, food waste from residences and restaurants, urban wood waste from clean construction and demolition sites, and biosolids from sewage plants. These wastes can be processed today with existing technologies for carbon neutral renewable electricity generation, heating applications, or transportation fuels. In Richmond, BC, Fraser Richmond Soil and Fibre is establishing an innova-

tive municipal green (food and yard) waste to renewable energy demonstration that will divert 27,000 tonnes of organic materials away from British Columbia landfills. In Nanaimo, the world's first conversion of residential organic waste to transportation grade fuel at a medium sized municipality is being developed by the ICC Group, with a number of exciting opportunities for exporting the technology to Europe and other global markets.

Animal and crop waste are two excellent feedstocks that can be used to produce heat and/or power through proven anaerobic digestion technology. The utilization of these wastes provides numerous benefits, including reduction of greenhouse gases, reduction of waste on agricultural lands, improved nutrient man-



agement for farming communities, odor management, and diversification of revenue for the family farm. The emerging Bioeconomy in BC shows how we can utilize existing waste streams to create valuable energy and bio-chemical products that will reduce our dependence on fossil fuels and lighten the pollution burden on the environment.

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Exploring a growing demand

Despite Canada's decision to withdraw from the Kyoto Protocol, prospects are still bright for the green industry.

However, Ian Moncrieff would like to see more government support to help grow the biofuels industry within Canada especially since this country is already a significant producer of biomass fuel in the form of wood pellets.

Unlike oil, the biofuel industry, receives no government subsidy, Moncrieff, who is the president of Canadian Biofuels Inc, says.

Fortunately for his business, Europe is very committed to greening their economies. "The Europeans are 10 to 15 years ahead of Canadians in terms of implementing biomass policy to meet their carbon footprint targets," he notes.

Even South Korea is exploring biofuels, he points out. In 2009, Reuters reported that the US, Europe, China and South Korea are leading global renewable energy spending plans after committing about US\$500 billion to push "green" technologies to stimulate their own economies.

Biofuel's importance

Biofuel fuel can create 91 percent less greenhouse gas emissions than fossil fuels. Last April, the International

Energy Agency calculated that bio-fuels can meet 27 percent of transportation fuels by 2050 and cut greenhouse gas emissions by 2.1 billion tons a year. However, those levels will remain pie-in-the-sky dreams unless conventional technologies become more efficient at converting crops, algae and other organic material into energy.

Moncrieff says the technology is available, but emphasizes that government buy-in is crucial to help the industry gain critical mass.

There are 58,000 farmers in Ontario, some of whom will be interested in growing crops like miscanthus grass for the biofuel industry. All Ontario needs is two million tonnes. "This internalizes the economy, so that Ontario can grow what it needs to generate its own power," Moncrieff says.

Such crops are grown on class 3 or less productive soils, which are too poor to sustain food crops, so "it is a hollow argument" that biofuel will displace food crops counters Moncrieff. They also do not require pesticides or fertilizers, keeping the farmers' costs outlay down. Miscanthus grass, "which are like a soft bamboo", are grown from rhizomes, and are sterile. The crops keep producing for 15 years.

Because there is a two and a half year period before they can be harvested, this deters farmers from growing them. A government subsidy will go a long way, he adds.

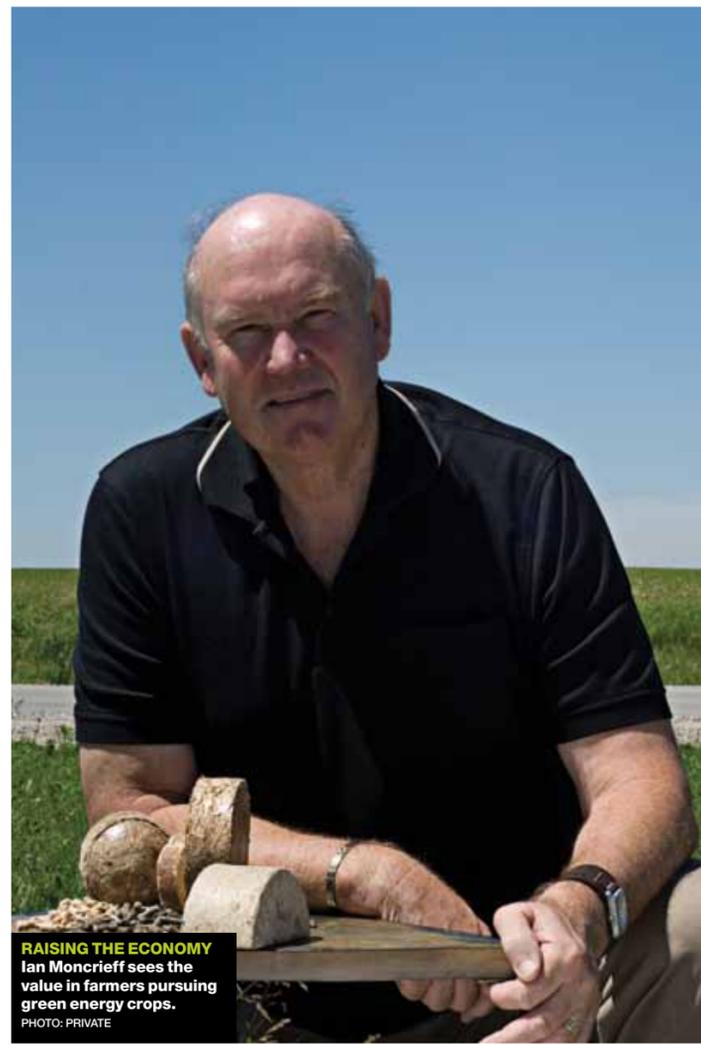
Business can boom, if conditions are right

Canadian Biofuel Inc, based in Southern Ontario, has developed a system to produce high quality biomass fuel pellets and briquettes using wood, found feedstocks diverted from the waste stream, agricultural residues, purpose grown crops and industrial by-products. It can produce 30,000 tonnes of pellets per year, but this can be increased to 100,000 tonnes. "We can also build five to six plants in small town Ontario if the business is there," Moncrieff says.

Despite a slow start in Canada, overseas demand is strong. On, December 5th, the Wood Pellet Association of Canada brokered a meeting between a major UK power authority and ten pellet manufacturers. "The power authority wants to purchase 1.5 million tonnes of pellets from 2013, increasing to seven million tonnes by 2017," revealed Moncrieff.

In January, two other European power authorities armed with similar shopping lists, are coming to Ontario.

"It's a good business we're in. We're not talking small change here—just think about it, 1.5 million tonnes at \$150 per tonne," Moncrieff says.



RAISING THE ECONOMY
Ian Moncrieff sees the value in farmers pursuing green energy crops.
PHOTO: PRIVATE

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NEW INNOVATIONS

Bio jet fuel use takes off

As the aviation industry pushes forward with development of bio jet fuel, the industry is abuzz with the commercial viability of an oilseed-based fuel.

For Patrick Crampton, vice president of business and product development for Ottawa-based Agrisoma, the bio jet fuel industry is teetering on that edge.

"It just at that tipping point where it's moving from the testing phase into the true start up of commercial operations using the fuel," he says, pointing out that both the U.S. and the Canadian Military have certified bio jet fuel for use in their aircrafts.

"The international aviation industry basically has stated an objective of carbon neutral growth forward," he adds.

In addition to carbon neutrality, the industry has also set a 50 percent reduction of greenhouse

gases (GHGs) by 2020 goal.

In early December, the Federal Aviation Administration in the United States shelled out US\$7.7 million to the aviation industry to fund the commercialization of bio jet fuel.

"The reality is the worldwide aviation industry consumes roughly 70 billion gallons of jet fuel a year excluding military use," says Crampton. "To be at a level of 10 percent of a global demand is seven billion gallons of bio jet fuel."

The challenge of taking to the skies

But the sector faces a few challenges that other transportation-related industries don't.

"In the automobile sector you have alternatives like hybrids and electrical vehicles as a path forward to reduce carbon emissions," says Crampton. "The aviation



A FRESH TAKE ON FUEL
Biofuels, which are derived from plant materials such as the Carinata flower, can be utilized for uses just as jet fuel.
PHOTO: CANOLA GROWERS OF CANADA

industry demands a drop-in solution that meets all of the stringent safety standards and all of the specifications around the fuel—a

liquid fuel-based solution is what's needed."

"Flight safety is the number one concern," says Wajid Chishty,

research officer at the National Research Council of Canada's Gas Turbine Laboratory, part of the Institute for Aerospace Research (IAR). "That is the reason we have stuck to the pre-existing specifications (for engines)."

Agrisoma has focused a lot of its research on Brassica Carinata—an oilseed commonly referred to as Ethiopian mustard (a cousin to the tabletop condiment).

"We call it a drop in crop because it leverages a lot of the existing infrastructure in Canada," Crampton adds. "It can leverage the existing crushing capacity and infrastructure in Canada as well as the agronomic knowledge and herbicides that are available for use with canola today."

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