

Bio-Industrial Opportunities Branch:

Seeding the Bioeconomy:

Growing Alberta's BioClusters

David Fielder

Phytochemist & Senior Scientist

January 22, 2015

BioClusters

Bio-economy: the economic activities related to the development and commercialization of products and processes – in whole or in part – using renewable biological sources from agriculture, forestry and marine.

Biomass: is agriculture and forestry fibre, by products and other feedstocks such as livestock manure.

Bio-Industrial Products: are products that use biomass to make chemicals materials and fuels.

BioClusters: are bio-industrial companies that co-locate to share resources such as a side or waste stream to realize economic opportunities.



Alberta is unique:

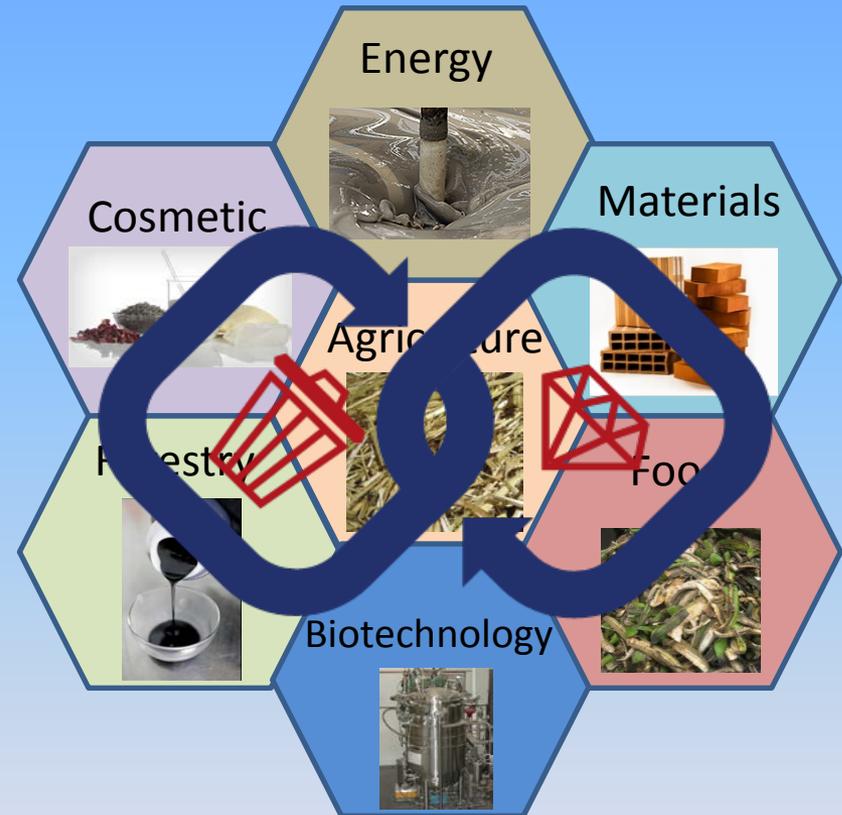
- Agriculture, Energy and Forestry in one jurisdiction
- Abundant Biomass
- Forested lands: 38 M ha or 60% of the province
- Agriculture: 21M ha in agriculture, 9.3M ha in crops and 0.7M ha under irrigation (2009 Statistics)
- Alberta food manufacturing sales reached a record \$11.8 B in 2012. (Alberta Agri-Food Industries Data and Trends, Dec 2013)



Cross-sector utilization of Bio-mass

- Food processing waste streams
- Agricultural waste streams
- Forestry waste
- Industrial crops
- Specialty botanicals

- Functional Foods
- Nutraceuticals
- Cosmetic ingredients
- Active pharmaceutical ingredients (API)
- Energy applications
- Biomaterials
- Animal and Aquaculture feeds



Bio-Industrial Opportunities Branch



- Food and Bio Processing Division, Alberta Agriculture and Rural Development
- Highly dedicated team of business, scientific and engineering professionals
- Primary objective is to enable industry
 - through the application of science, engineering and business development.



Bio-Industrial Opportunities Branch



- Provide industry with business development expertise and specialized knowledge to identify and create new opportunities
- Provide facility and knowledge for process/ product development and scale-up
- Support Industry and rural economic development



Our Focus: Maximizing Value and Sustainability

1. **New Opportunities** for Ag Processing and Production Wastes / By-Products

- Reduce / reuse / repurpose agricultural production and processing wastes
- Reuse into bioenergy (biogas, bioethanol)
- Zero waste (goal is to an integrated, collaborative and sustainable waste to resource)

2. **Maximizing Value** through Fractionation for Ingredients and Intermediaries

- Increase utilization and product identification from grains, oilseeds, pulses and biomass
- Understand feedstock
- Facilitate value chain development

3. **Facilitate Commercialization** and market access

- Create an environment for companies to demonstrate, test market, and prepare for commercialization
- Help for business connections, market information



Alberta Bioenergy Opportunities

❖ Renewable Gasoline

- Ethanol
- Methanol
- Butanol
- Green gasoline

❖ Renewable Diesel

- FAME
- HDRD

❖ Biocrude

❖ Bio-coal

❖ Biogas

❖ Renewable Natural Gas

❖ Syngas

❖ Energy Pellets

- Straw
- Waste
- etc.

❖ Renewable Chemicals for the Oil Patch

- Drilling fluids
- Surfactants
- Solvents



Alberta Biomaterials Opportunities

- Fibre processing
- Biocomposites
- Building products
- Textiles
- Automotive parts
- Reclamation / erosion control
- www.albertabiomaterials.com



Specialty Chemical Ingredient Initiative

- Unique government-industry collaboration advancing an emerging bio-based chemistry cluster in Alberta.
- Focused on development and commercialization of innovative, high-value ingredients/products from renewable biomass and biorefining sidestreams.



- www.agriculture.alberta.ca/biobasedchemicals



Alberta Biochemicals Opportunities

Specialty Chemical / High Value Ingredients

- Cosmetic and Personal Care Functions
 - Anti-microbial/Anti-inflammatory/Anti-irritant/Anti-oxidant
 - Preservative
 - Solvents
 - Emulsions/surfactants
 - SPF Boosters
 - Thickeners
 - Silicone replacements/styling resins
- Biorefining sidestreams
 - As intermediates for other ingredients
- Industrial and Household Cleaning
 - Surfactants/detergents
- Perfume/Fragrance
- Pharmaceutical/Nutraceutical
- Food and Feed

Industrial Bio-Based Chemicals

- Renewable Chemicals for the Oil Patch
 - Drilling muds
 - Surfactants
 - Solvents
 - De-icers
 - Rust inhibitors
- Industrial Chemicals
 - Solvents
 - Coatings



Our Services



Technical

**Business
Development**

Scientific

Engineering

BIO - INDUSTRIAL
OPPORTUNITIES



Business Development Services

❖ Business Planning

- ❖ Market research
- ❖ Feasibility studies
- ❖ Assist with site locations
- ❖ Access to funding



❖ Strategic Counsel

- ❖ Supply chain logistics
- ❖ Market access
- ❖ Regulatory issues



❖ Collaboration & Networking

- ❖ Academia
- ❖ Industry
- ❖ Municipalities
- ❖ Regulators



❖ Industry Advocacy

- ❖ We are a champion for Alberta's bioeconomy!



Technical Services

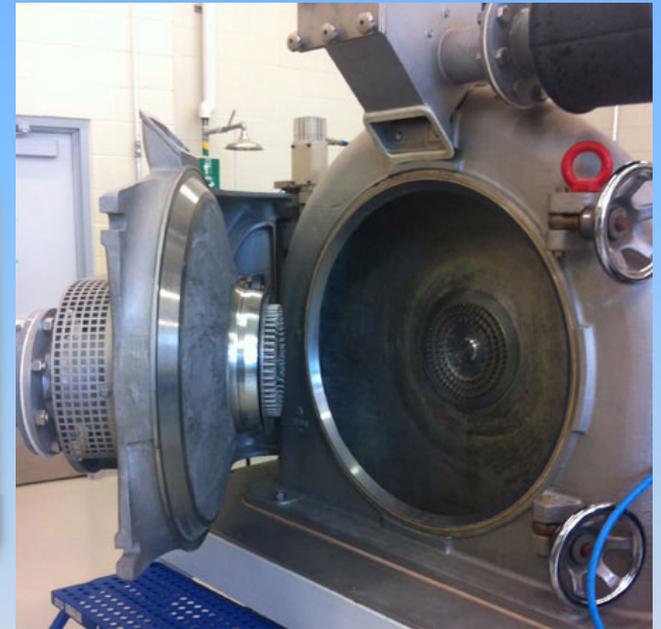


BIO - INDUSTRIAL
OPPORTUNITIES



Primary Processing - Dry

- Seed cleaning
- Decortication
- Sorting
- Sieving
- Milling
- Grinding
- Tempering



Dry Fractionation

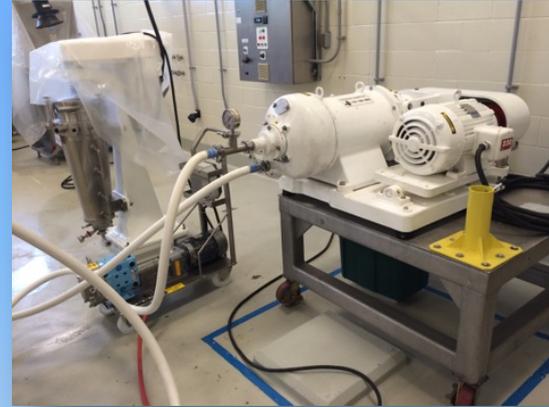


- ❖ Size reduction
- ❖ Fine and coarse fractions
- ❖ Uniform particle size
- ❖ Dry fraction enrichment
- ❖ Pelletizing



Secondary Processing - Wet

- Extraction
- Maceration
- Oilseed processing
- Distillation
- Centrifugation
- Filtration
- Dewatering and concentrating



Extrusion & Pelleting



Non-traditional uses

- Bio-plastics & natural fibers
- Bio-composites
- Extrusion-assisted solvent extraction of bio-actives

- Fuel Pellets
- Volume reduction of biomass
- Processing feedstock

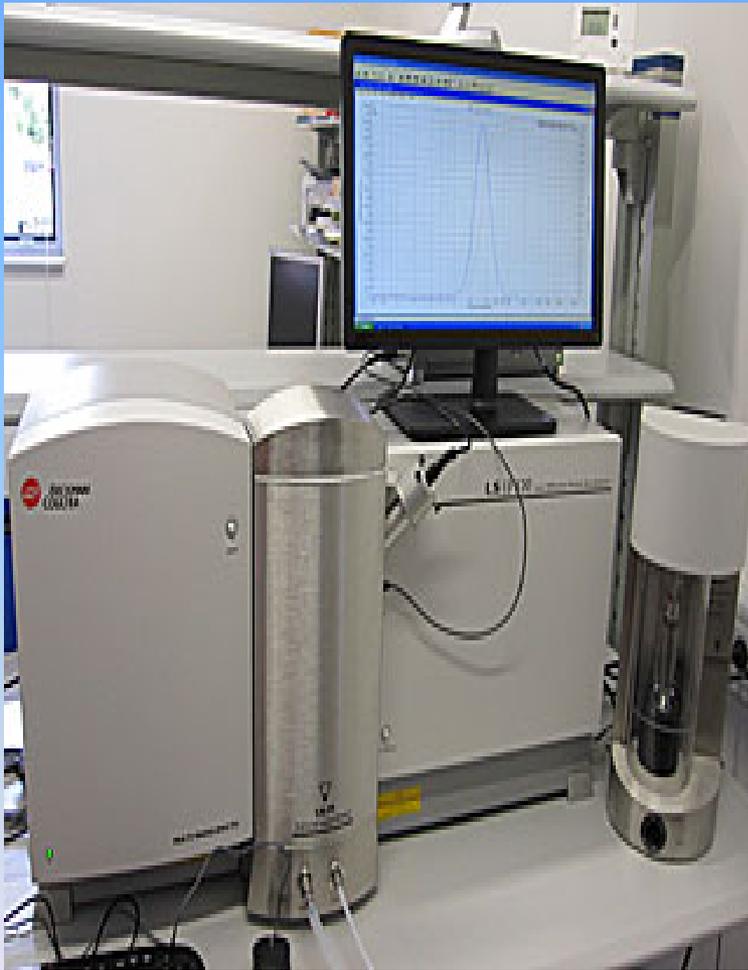


Tertiary Processing -Fractionation

- Precipitation/Flocculation
- Ultrafiltration/Nanofiltration
- Chromatography



Analytical



- Laser particle size profiling
- Surface area and pore size analysis (BET)
- Chemical & enzymatic assays
- Pressurized extraction
- UHPLC, NIR, FTIR & GC
- Chromatography
- Tangential filtration
- Formulation



Processed Hemp

Stalk



Hurd



Fibre



Dust/Particulates



Seeds



Hulls



Oil



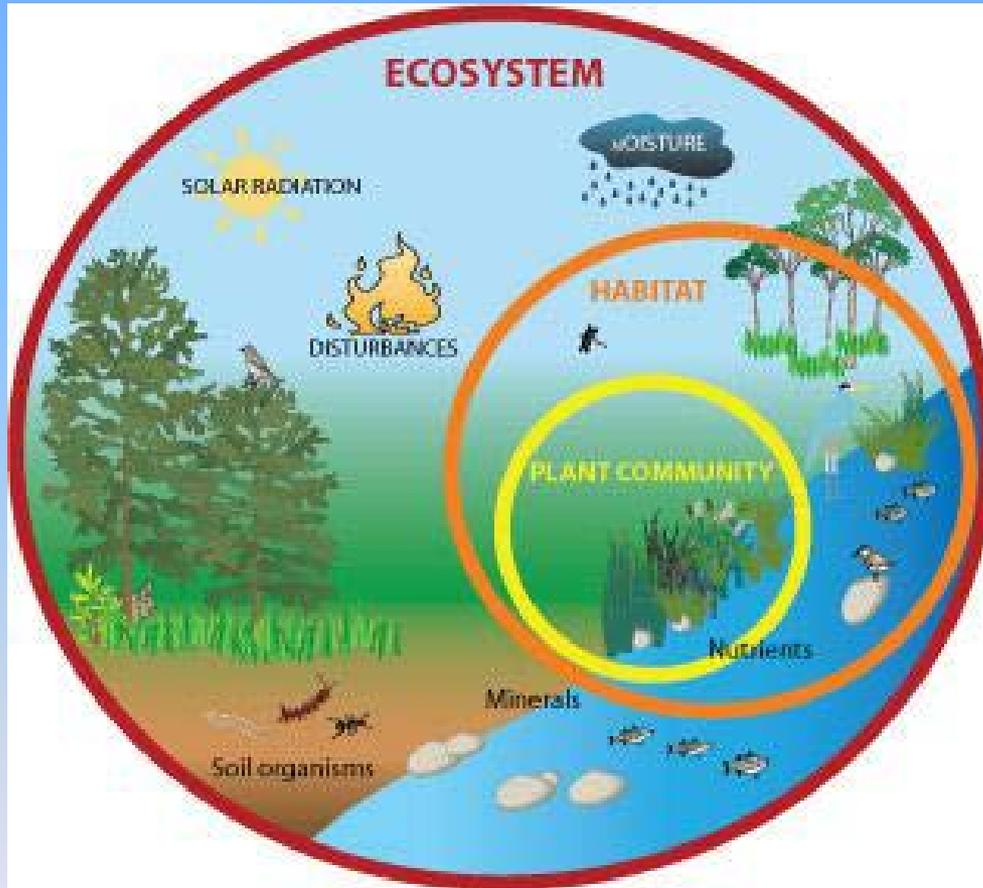
Protein



BIO - INDUSTRIAL OPPORTUNITIES



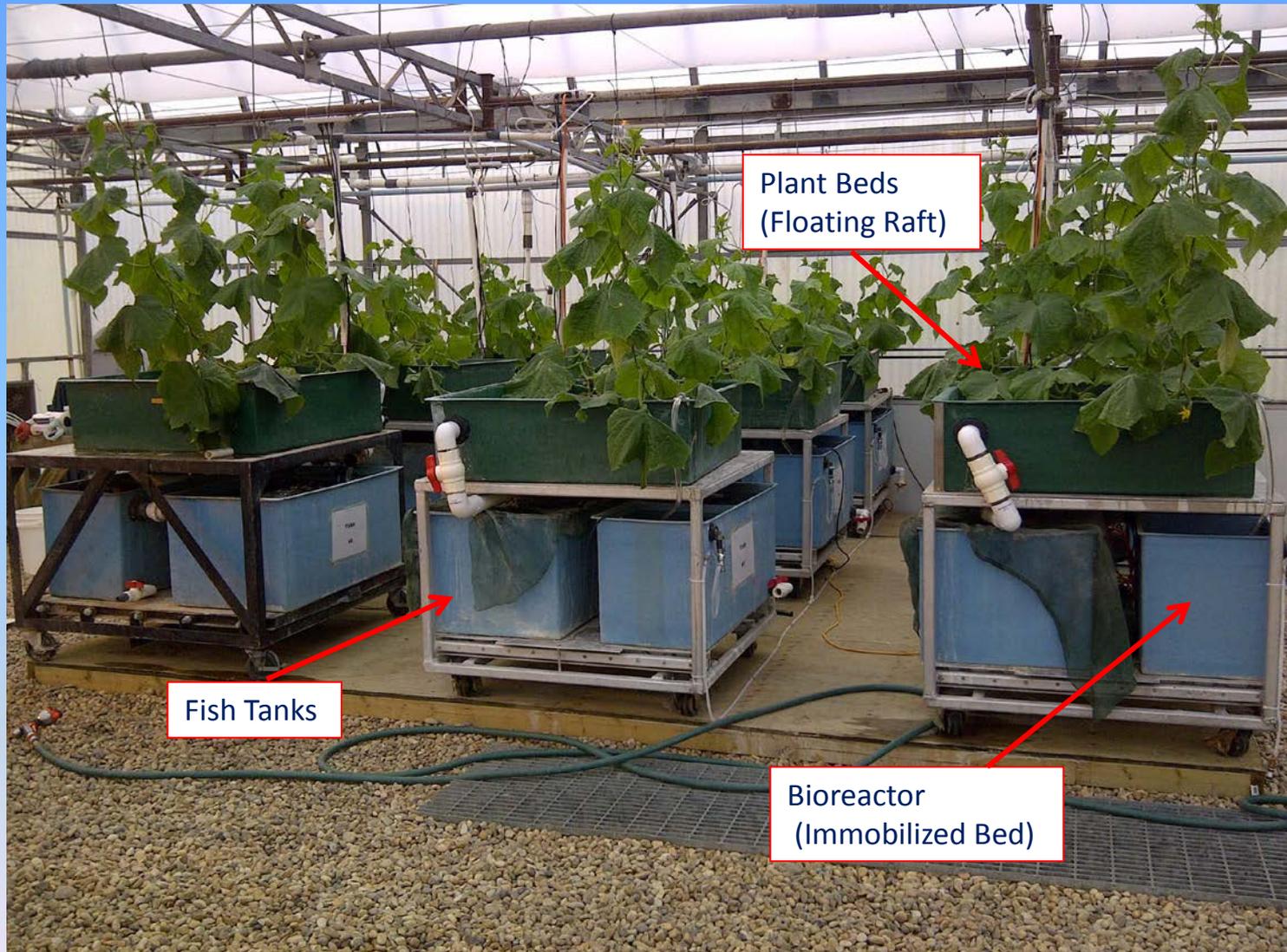
Aquaponics



Biologically, aquaponics is an example of an artificial ecosystem or agro-ecosystem designed for food production



Mini Aquaponics Systems



Rosemary Roots

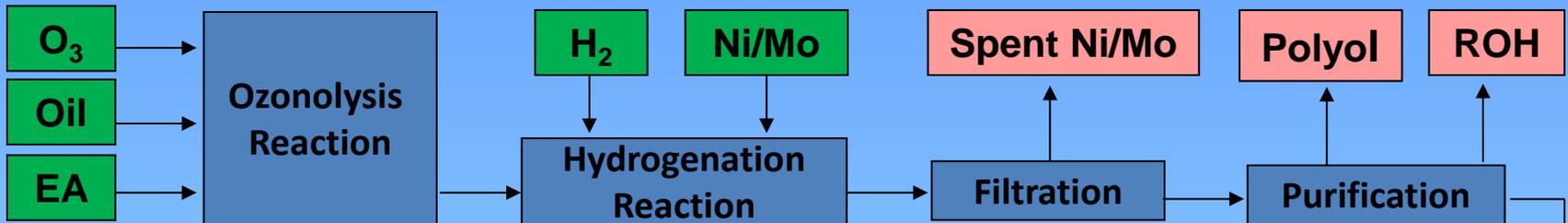
Hydroponics →



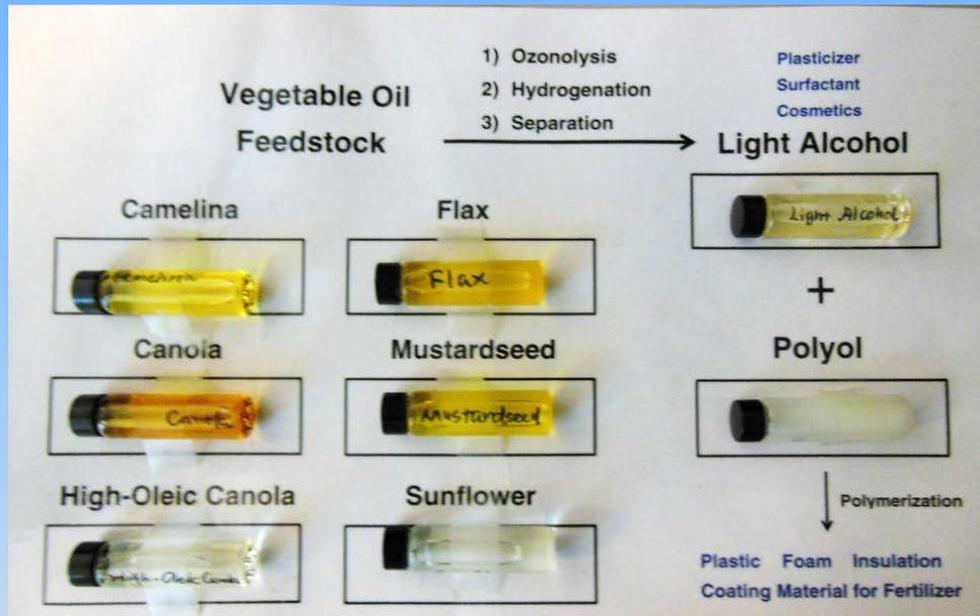
← Aquaponics



Polyol (Ozonolysis) Pilot Plant



Polyol Products



Potential bio-based products

- ❖ Bio-Diesel
- ❖ Adhesives
- ❖ Lubricants
- ❖ Polyurethanes & polyesters
- ❖ Foam insulation
- ❖ Other products requiring high temperature and high pressure



The Bio-Industrial Opportunities Branch

- We provide clients business, scientific & engineering cost-effective assistance to develop new products and processes from concept to commercialization.
- Our extensive business network allows you to be connected to potential partners and collaborators within Alberta and outside the province.
- We foster an environment to allow companies to convert current waste streams to value-added products in a wide range of industry sectors.
- Our expertise includes:
 - Bio-based materials, fuels, lubricants and adhesives
 - Non-traditional use of extrusion technologies
 - Extraction and purification of bio-based materials
- We welcome the opportunity to discuss how we can assist your company!



Thank you!

For more information:

- ❖ **Phone:** (780) 644-8118
- ❖ **Email:** biobranch@gov.ab.ca
- ❖ [http://www1.agric.gov.ab.ca/\\$Department/deptdocs.nsf/All/bt14861](http://www1.agric.gov.ab.ca/$Department/deptdocs.nsf/All/bt14861)

