BRAED-Camrose

Value-Added Agriculture Cluster Project - Phase 1

REPORT

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Executive Summary

This report summarizes the research that was conducted by Outlook Market Research and Consulting (OMR) with assistance from Acornhill Partners Inc. (Acornhill) and Shambrock Consulting Group Inc. (Shambrock) to identify the top processing opportunities for the BRAED region for crops that are currently grown or could be grown in or near the region including but not limited to:

- Canola (including value-added processing of meal streams);
- Hemp;
- Wheat, barley and oats; and
- Pulses and other crops

Methodology

The consulting team developed four different versions of interview guidelines for this project and conducted interviews with representatives of each of the four groups across the Prairies. The four guidelines were very similar except for specific questions that were tailored for the specific interviewees. The four groupings of interviewees were:

- Agricultural associations including provincial and pan-prairie or national
- Agricultural companies including local and national
- Agricultural researchers including product and process developers and innovators
- Government and other quasi-government officials

The total number of interviewees totaled 25. A detailed breakdown of the interviewees is shown in Section 2 – Methodology and Sample Characteristics in the table "Interviewee's Characteristics".

The interview data is augmented with information and analysis from an extensive literature review by the consulting team. The team are strategic advisors to SMEs and organizations in the agriculture; agri-food and agri-fibre; value-added agri-processing and supplying of inputs and services to agriculture producers throughout Western Canada and beyond for over 25 years. Many of the sources for this project are referenced throughout the report and listed in the Appendices.

Key Insights

The key insights that are shown below under a series of relevant headings were identified from summarizing the results from all twenty five interviews and combining those insights with those gained from the compilation of secondary research.

Two top value-added agriculture opportunities for the BRAED region

1. Plant-based protein opportunities for human consumption including:
    a. Protein isolate and concentrate production from pulses (especially from yellow peas). [1]

[1] Further relevant information regarding the market potential for these protein isolates and concentrates is presented in Appendix 4.3 – Beyond Meat and other meat substitutes and in Appendix 4.6 – (human) health benefits of yellow pea fibre consumption

b. Protein extraction from cold-pressed canola meal to produce "golden tofu", dairy substitutes, etc. [2]

2. Milling and fractionation of peas, fababeans and other pulses including:
    a. Production of protein concentrates and isolates for use in livestock and aquaculture feeds (aquaculture markets are still largely export oriented). The co-product streams could be used in livestock feeds, another way of adding value to crop production.
    b. Pulse flour production for inclusion at higher utilization rates in pastas and breads to increase fibre and protein (e.g. China is quite interested in a small inclusion rate of pulse flour in their 40 million tonne wheat flour market).
    c. Fababean fractionation:
        i. An AB company is working with Nestlé on fababean protein extraction (have been looking at it for a while).
        ii. Fababeans - Sask Pulse has funded research on faba utilization. There are tannins (in the faba seed coat) and vicine and convicine – Mediterranean people lack an enzyme needed to digest these amino acids in faba protein. Seed size and agronomic issues make seed coat removal challenging.

How well is the BRAED region suited to these two opportunities?

The BRAED region is very well suited for production of plant-based protein (opportunity 1 shown above) and pulse flours and starches (opportunity 2) because:

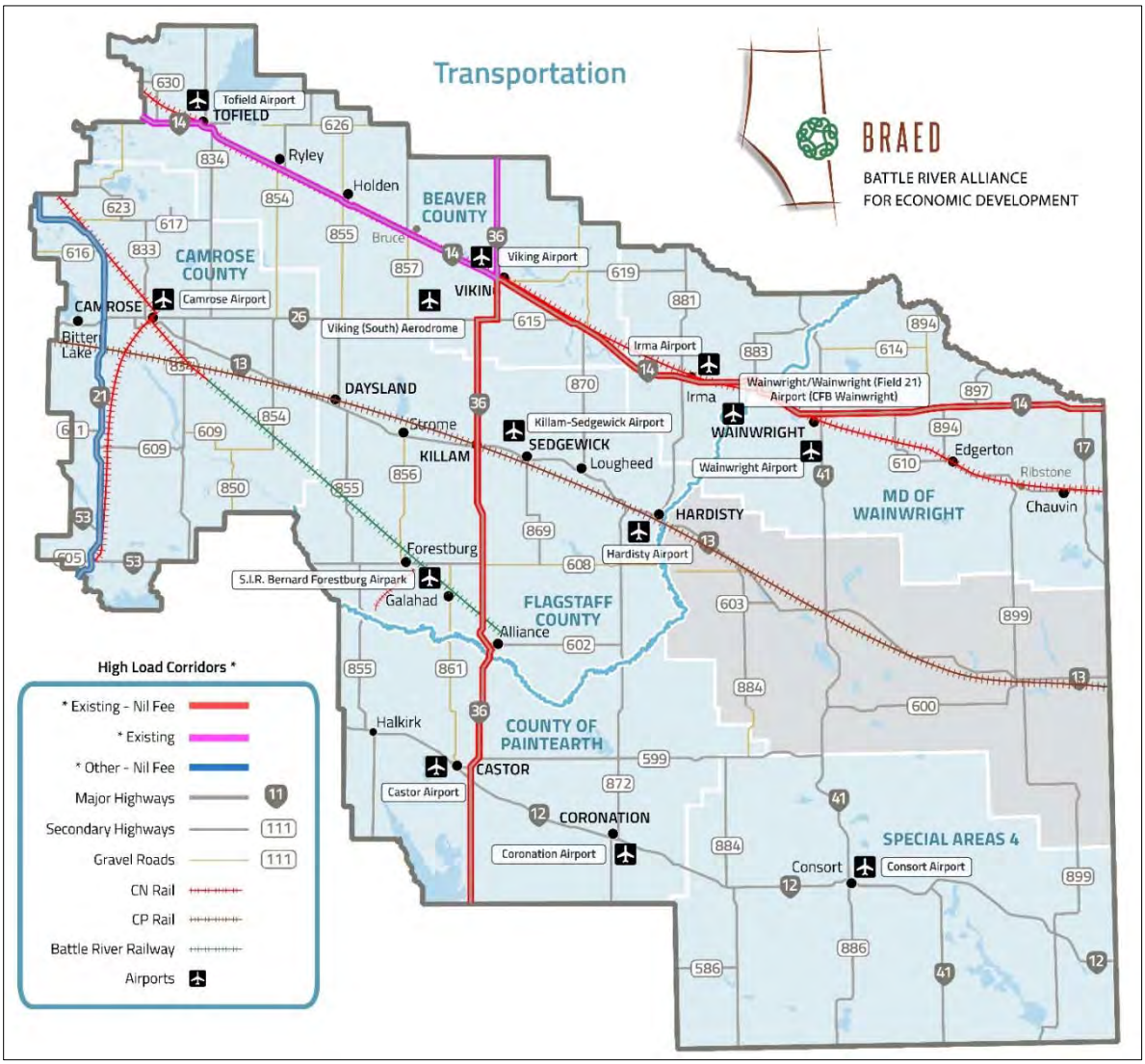
- There is ample production of peas and canola in the BRAED region and in regions that are within reasonable transportation distances from which to draw feedstock supplies. As displayed in Figure 1, BRAED region has extensive highway and rail transportation infrastructure to move feedstock to processing facilities within the region and to move finished product to markets. [3]

BRAED region's over 2.5 million acres of field crops can be moved via its extensive highway and rail transportation infrastructure.

[2] Further relevant information is presented in Appendix 4.9 – Technical brief – golden tofu canola meal milk

[3] Please see Appendix 4.1 – BRAED region maps for details of the highway system and rail lines and Appendix 4.2 – selected BRAED region profile 2016 for information by Census Division for population age and income levels; and workforce numbers and characteristics including education levels.

Figure 1



In addition to meeting the existing market requirements, farmers have shown their ability and willingness to expand pea acreage to meet increased demand (as they have done in the case of canola). The table below shows the acreages of the main crops grown in the BRAED area based on the 2016 Census.

BRAED region crop acreages in 2016

Crop	Acreage	Crop	Acreage
Wheat	930,306	Lentils	15,832
Canola	895,182	Flaxseed	11,448
Barley	332,670	Rye	9,431
Dry field peas	207,448	Other dry beans	8,471
Oats	99,482	Triticale	7,470
Mixed grains	40,472	Forage seeds	1,748
Corn	22,232	**Total field crop acres**	**2,582,232**

- Despite having several canola crushing plants in and nearby the BRAED region (including Cargill's plant at Camrose, Bunge's plant at Fort Saskatchewan and ADM's plant at Lloydminster), there is still ample canola production available to supply several smaller scale cold-press canola crushing plants that could supply the growing demand for cold-pressed canola meal from which to extract proteins with aqueous and other innovative extraction technologies. These are the types of processes that are being commercialized by Botaneco in Calgary [4] and Merit Functional Foods [5]in Winnipeg. Both these companies are likely to be expanding their production facilities in the future and, while Merit plans to maintain its roots in Manitoba, both companies may find the BRAED region to be a very attractive location in which to expand in the future.
- The BRAED region is well suited to production of fababeans and other pulse crops.
- The support that is available from Protein Industries Canada [6] to support the development of new plant-based protein production could be instrumental in the BRAED region's development of new crop production and processing businesses.

Third top value-added agriculture opportunities for the BRAED region

Whole plant utilization of hemp to produce oil, food, fibre and fractions (including CBD) including: [7]

- Production of cold-pressed oil and meal. The meal could be further processed to extract protein isolates.
- Production of hemp flour or hemp kernels/nuts/hearts from the seed.
- Production of CBD and other cannabinoids and polyphenol compounds from the flower parts and chaff. Chaff has been collected in 2019 during the seed threshing operation for extraction of CBD.
- Hemp fibre production from the straw. A biocomposites group located in Drayton Valley is taking the fibre that's produced at both Bruderheim and Innotech (Vegreville) and using it to make composites.
- Hemp chaff residuals will likely be used for livestock feed, but this use is not yet approved. Livestock feeding approvals will also create markets for off-grade seed and eventually the use of immature hemp for grazing. More research is needed to determine what may be contained in the plant at that early life stage.

Hemp chaff processing plants needed every 50 to 150 km from Edmonton to Lloydminster plus more in the Peace River area and southern Alberta.

[4] Please see Appendix 4.4 for information about Botaneco.
[5] Please see Appendix 4.5 for information about Merit Functional Foods.
[6] Please see Appendix 4.13 – Protein Industries Canada (PIC) for further details about their support programs and industry support initiatives.
[7] Further relevant information regarding the products from hemp whole plant utilization is presented in Appendix 4.7 and 4.8 - CBD, and Appendix 4.9 - Just BioFiber.

a. The Canadian Hemp Trade Alliance (CHTA) expects the main production areas in AB to be the irrigation area in Southern AB, the area along and north of Hwy 16 and also in the Peace River. Ideally, there would be a chaff processing plant every 50 to 150 km from Edmonton to Lloydminster plus one or more in the Peace River area and one in southern Alberta. Each hemp chaff processing plant could potentially include a cluster of spinoff businesses to process chaff for CBD extraction, plus pelleted residuals, graphene or biochar production. The True North at Oyen is currently pelletizing residue from hemp processing and using it in a co-generation power plant.
b. If there are significant economies of scale for residual processing, larger amounts of residuals could be collected from several plants at a central location for more efficient processing.
c. Ekoterre plans to build a world-scale decortication plant located within 100 km of Edmonton, but the site hasn't been chosen yet.
d. Breeding and approval of better hemp varieties bred for specific uses – i.e. seed only, dual purpose and fibre only.

How well is the BRAED region suited to hemp production and processing?

The third opportunity (hemp whole plant utilization) is very well suited to this region because Dr. Jan Slaski and others have shown that the area along and north of the Yellowhead Highway is among the best areas in Canada for hemp production. If Dr. Slaski's vision (and one that is shared by the Canadian Hemp Trade Alliance) of a hemp chaff processing facility every 50 to 150 kilometers from Edmonton to Dauphin were to come to fruition, BRAED could potentially see several of these plants (and their aligned spinoff businesses extracting CBD and processing residues) located in the region. [8]

Other noteworthy opportunities

Many other opportunities were mentioned less often. Some are innovative, but likely are several years from commercialization. Others may not be as innovative or new as the three opportunities noted above. However, they may be of interest to local groups or companies, potentially as an add-on to an existing seed cleaning plant or other type of grain handling business. These opportunities are shown in rank order from most-often to least-often mentioned.

- Canola-related opportunities including:
  - Additional canola processing locally to compensate for the loss of canola seed markets in China
  - Biodiesel produced from canola oil. A mandate requiring increased use would really increase potential market demand
  - Canola varieties with higher protein without sacrificing oil yield
  - Digestible fibre products from canola

[8] See Appendix 4.7 for the Canadian Hemp Trade Alliance's (CHTA's) $1 billion blueprint for the Canadian hemp industry

- Other opportunities include:
    - Wheat-related opportunities:
        - Specialty wheats including purple (high anthocyanin)[9] wheat and high-amylose wheat[10] for niche markets. These markets could take container lots of specialty wheats.
        - High-yielding wheat for ethanol production
        - Permolex (Red Deer) buys between 100,000 and 150,000 tonnes of wheat per year. They extract the gluten before processing the rest into ethanol.
    - Barley-related opportunities:
        - Malt barley to meet the growing demand for specialized malt for the craft brewing industry
        - Extraction of bioactive compounds from craft breweries' spent grains
    - Oat-related opportunities:
        - Oat processing - to produce ingredients for oat milk and cosmetics [11]
        - Oats - Tate & Lyle (major ingredient company) produces an oat protein and has demand that they can't fill [12]
    - Co-product stream opportunities:
        - Capturing more co-product value from pea fractionation (fibre, starch, etc. for innovative uses)
        - Capturing more co-product value from phenols and other bioactive compounds in hemp and other crops for use in pharma, food and cosmetics
        - Production of resistant starch from pea starch and maybe for its prebiotic benefits (similar to Manitoba Starch's MSPrebiotic natural health supplement using potato starch (this was mentioned by two food development centres)
    - Other opportunities were identified and are shown in the report under the heading "Miscellaneous other opportunities" in Section 3.1.

Suitability of these other opportunities to the BRAED region

The fourth opportunity (canola) is very well suited to this region. As mentioned earlier, canola is a crop that Alberta farmers will produce to meet market demands. Additional local processing facilities would increase the financial incentive for BRAED farmers to increase canola production.

Some of the other opportunities shown above may be of interest to existing BRAED region companies or may be investment opportunities for new players. In some cases (e.g. oat fractionation), the

[9] Anthocyanins and phenols are examples of highly beneficial bioactive ingredients. There is significant interest in expanding the supplies of food ingredients that contain higher levels of these bioactive ingredients. Research and development work is progressing in Saskatchewan and Ontario with support from several large companies (personal communication with David Shambrock, Executive Director, Food and Beverage Manitoba).

[10] High amylose wheats are high in dietary fibre whereas wheats generally are high in non-digestible fibre.

[11] See Appendix 4.12 for one company's (Chobani's) oat milk and oat-based snack offerings

[12] Research and development work is being completed by at least two major companies in western Canada now. Projects are underway at the University of Saskatchewan and at the University of Manitoba. WE understand that the Saskatchewan Food Industry Development Centre also looking at this for clients (personal communication with David Shambrock, Executive Director, Food and Beverage Manitoba).

technologies are fairly well developed and proven. In other cases, extensive work would be needed to more precisely define the opportunity (e.g. capturing more co-product value from phenols and other bioactive compounds in hemp and other crops) and to identify potential technologies to extract the compounds from the crop.

Benefits to the BRAED region

Farmers; processors/investors; local community residents; the general public/consumers; and governments/the economy would benefit from an increase in agriculture value-added processing in the BRAED region.

Farmers would hopefully share in the increased value that would be created from new demand for existing crops and/or from opportunities to grow new crops, which would diversify their cropping options. Having increased cropping options and local demand for their crops would be expected to increase market diversification and price stability. Some farmers may become investors in new processing businesses, thereby diversifying their operations and potentially creating new revenue/profit streams.

Processors would create new revenue, employment and profits by establishing or expanding their processing operations to meet new market needs for ingredients or products. Each new processing operation creates the potential to stimulate a cluster of related businesses. For example a new hemp chaff processing operation may support not only chaff processing, but a co-stream operation that would use the crop residues to make biochar or other valuable products. These businesses, in turn, would create new demand for trucking and other services in the local area.

The general public would benefit from increased employment opportunities and the economic impact of those activities through the multiplier effect of the related spinoff employment and tax revenues that would be created.

Consumers[13] would benefit by having new ingredients and products available for them to utilize. Two of the most significant beneficiaries may be those consumers that believe plant-based ingredients/products are more sustainably produced than animal-based products or those that have allergies to soy protein, peanut protein or gluten for which a pulse or oat ingredient might be substituted. Many consumers may believe that CBD produced from hemp is more sustainable than CBD produced from greenhouse-raised cannabis and would have very low levels of THC.[14]

Governments and the economy would benefit from the increased economic activity that would be created by the new production and processing activities. The resulting new tax revenues would support continued expansion of services that the citizens value.

[13] Consumers would get these benefits regardless of whether the ingredient production and processing activity takes place in AB. The group of consumers that will benefit the most is those that care about their food being both grown and processed locally. Fortunately this portion of the population is growing. These are the shoppers that go to Coops, Sobeys, and other specialty retailers, farmers markets, etc.; not those who primarily shop at Walmart or Superstore.

[14] The maximum level of THC that is allowed in CBD in Canada is 0.7%.

Crop, ingredient or end-use markets enhanced by value-added agriculture opportunities

The end products listed above include a diverse list of end uses for plant-based:

- Proteins:
  - meat substitutes and meat/plant-product hybrid products
  - milk substitutes and
  - supplementation/substitution for wheat flour in breads and pastas
- Starch:
  - modified starch for prebiotic and other food uses or industrial uses
  - bioplastic products
- high quality oils from hemp and flax
- bioactive compounds including CBD and other cannabinoids, phenols, etc. extracted from hemp and flax
- and fibre:
  - soluble fibres such as mucilage from flax
  - industrial fibres from hemp for textile and composite use

Research needed to move to commercial scale

The research needs are somewhat diverse. Many of the research needs relate to process development, testing and scale-up. Others are related to genetic improvements to attain better ingredient characteristics and processing efficiencies. A third type of research and development is focused on gaining market acceptance by end users (e.g. for biodiesel).

The research capabilities of the research and food processing development centres are also diverse when combined with the internal capabilities of the processing industry companies and the university-based research community.

There is an encouraging interest among the individual food development centres to work together to move projects forward as quickly as possible to commercialization. Each centre tends to excel at a different aspect of development (e.g. the Alberta Food Processing Development Centre is noted for its high pressure processing capabilities and its meat research unit; FPDC in Saskatoon is very strong in extrusion, Food Development Centre in Portage is mainly known for its fractionation and formulation expertise).

Facilities or organizations that would be best suited to conduct research

There is a large number of research and food development centres distributed across the Prairies. Each one has an area of specialization and multiple centres often work in collaboration on a development project. This may happen concurrently or sequentially.

No one expressed a need for more research capabilities. However, it is challenging for new start-ups to fund the development work that they need to complete while simultaneously building a company, funding working capital, etc. in order to commercialize new technologies and products.

Need for pre-competitive market development work

In most cases, the interviewees believe that the pre-competitive research that is/was needed has been largely completed and that companies will now have to drive the commercialization of those opportunities that are feasible.

Facilities needed to commercialize the identified opportunities

Except for the need for new processing facilities to meet demand for protein isolates and hemp-based products the only other serious infrastructure needs that were noted were for increased numbers of:

- Co-packing and toll processing facilities and
- Cold storage capacity

Interest from farmers and local investors to invest in processing businesses

Generally, there is expected to be cautious support for, and interest in investment in value-added processing opportunities among farmers, local businessmen and existing companies. This is due to awareness that there have been some unsuccessful projects in the past where local investors lost all or most of the money that they invested. That is not to say there isn't money available to invest in good opportunities that are identified – but it likely will be challenging to persuade groups of farmers and investors to bankroll new ventures if they are not soundly planned and effectively managed right from the start.

The most significant barriers in pursuing the opportunities

The most significant barriers in pursuing the commercialization of the identified opportunities include:

- Lack of critical support infrastructure including: toll processing and co-packing; human resources and management expertise; water and wastewater treatment capacity; and capital equipment;
- Lack of funding for start-ups to undertake product development; research (especially for genetics); and private sector investment;
- Trade and regulatory issues including: tariffs/trade barriers; lack of predictable markets and regulatory environment (especially for protein products and hemp-based CBD); and dealing with provincial and local governments regulations;
- Market access issues including: consumer skepticism regarding proteins extracted from GMO crops: trucking and equipment manufacturers skepticism about biodiesel and consumers' concerns about using food products to produce a fuel additive;

- Logistics issues including: rail service (many locations are captive to a single railway company); and challenges of collecting enough co-product at a central location to make processing feasible; and
- Attracting interest from large processing companies to pursue opportunities (especially for barley fractionation). It has been proven that large players can be attracted to invest in processing – e.g. Roquette's new pea processing facility is currently being completed in Manitoba. Richardson International and Paterson Global have both invested in oat processing capacity in recent years. We understand that multinational firms such as Unilever are interested in creating a western Canadian beachhead from which to expand their Canadian processing presence – where better to do that than in the BRAED region?

Other noteworthy points to consider

The most significant other noteworthy points to consider include:

- Co-product synchronization (balancing markets for multiple co-product streams)
- Market and market development issues
- Processing issues and
- Research and promotion needs and activities (genetic improvement, PIC funding support, food development capabilities)

Recommendation

The consulting team recommends that the BRAED region focus on developing opportunities in protein ingredient production (e.g. protein isolates and concentrates) from pulses (and possibly cold-pressed canola meal) combined with value-added uses of the co-product streams (starches, fibre, etc.) for human, aquaculture or livestock feed ingredients.

Protein Industries Canada continues to launch calls for proposals that seek projects to support additional plant-based protein production. They require local groups or SMEs to be part of each project. This creates an opportunity for groups like BRAED and local businesses to collaborate with other larger industry players.

At the same time, monitor progress of the hemp production and processing industry to gauge the size of the opportunity that may develop in that area. Within the next five to ten years there may be potential for the development of several hemp chaff processing plants along the northern edge of the BRAED region. However, this industry will face some growing pains and the early entrants may not flourish while the markets (and the related regulatory framework) are still being developed. [15] Therefore, caution in the area (e.g. CBD production from hemp) is advised.

[15] Please see Appendix 4.8 for details about the US FDA's recent prohibition of CBD for use in dietary supplements because an application has been filed to classify CBD as a drug.

Next Steps

The main deliverable of the BRAED - Camrose Value-Added Agriculture Cluster Project, Phase 1 is this detailed report summarizing all primary and secondary research. The report will serve as the building block for a potential second phase of the project: Developing the Value Proposition.

Phase 1 Completion: Supporting Communications/Marketing Tools

- Synthesizing the results of this Cluster project with the BRAED Value-Added Agriculture Phase 4 project that has just been completed by Serecon Consulting with provide BRAED with a wide-ranging foundational step to expanding investment opportunities in the sector. OMR will work with Serecon to develop tools like PowerPoints and Fact Sheets to help communicate the results of these two projects with BRAED membership in Spring presentations. OMR will also integrate these tools and project results into the BRAED website.

Phase 2: Developing the Value Proposition

- A second phase would capitalize on the in-depth knowledge and contacts from Phase 1 to form a value proposition of what Camrose and the BRAED region has to offer investors in the value-added agriculture and the Pan-Prairie Protein Industries Supercluster. These projects are the platform of which to build a true investor outreach program that will attract new value-added agriculture business to the BRAED region.
- Understanding the precise assets in each community to match the opportunities identified in Phase 1 will be a cornerstone of Phase 2. Working with each community to identify natural, human, capital, and infrastructure resources is essential to understanding where new investment should be researched and promoted. Developing an Opportunity-Asset Matrix will be an objective of Phase 2. See table below:

OPPORTUNITY-ASSET MATRIX - *Sample* E.g. Plant-Based Protein Opportunities for Human Consumption					
	Agriculture Inputs	**Labour**	**Transportation**	**Water**	**Power**
Community 1	• Assets • Ranking	• Assets • Ranking	• Assets • Ranking	• Assets • Ranking	• Assets • Ranking
Community 2	• Assets • Ranking	• Assets • Ranking	• Assets • Ranking	• Assets • Ranking	• Assets • Ranking
Community 3…	• Assets • Ranking	• Assets • Ranking	• Assets • Ranking	• Assets • Ranking	• Assets • Ranking

1. Objectives

The objectives of the primary research were:

- To gain a better understanding of the support available to the industry from the Protein Industries Canada supercluster initiative; and
- To focus on processing opportunities for crops that are currently grown or could be grown in the BRAED region including but not limited to:
    - Canola (including value-added processing of meal streams);
    - Hemp;
    - Wheat, barley and oats; and
    - Pulses and other crops.

2. Methodology and Sample Characteristics

OMR developed four different versions of interview guidelines for this project and conducted interviews with representatives of each of the four groups across the Prairies. The four guidelines were very similar except for specific questions that were tailored for the specific interviewees. The four groupings of interviewees were:

- Agricultural associations including provincial and pan-prairie or national
- Agricultural companies including local and national
- Agricultural researchers including product and process developers and innovators
- Government and other quasi-government officials

The number of people interviewed in each category and in each province is shown in the table below.

Interviewee's characteristics:

Interviewee Type	Location				Sphere of operation & influence		
	AB	SK	MB		Local*	National*	International*
Ag associations*	3	4	3		7	8	
Ag companies	0	0	2		1	1	
Ag researchers*	1	3	2		4	4	1
Government & quasi-government officials*	3	1	3		3	4	
Subtotals*	**7**	**8**	**10**		**15**	**17**	**1**
Totals	**25**				**33**		

* Some interviewee's organizations are included in multiple categories

3. Key Insights

The key insights that are shown below under a series of relevant headings were identified from summarizing the results from all 25 interviews and combining those insights with those gained from the compilation of secondary research.

Generally, the key insights under each heading are shown in rank order from most-often to least-often mentioned.

3.1. Top rated opportunities for the BRAED region

The section below shows the summarized responses from interviewees regarding the top agriculture value-added opportunities.

1. Plant-based protein opportunities:
    a. Protein isolate and concentrate production from pulses (especially from yellow peas) and from canola meal for plant-based food ingredients and end-use markets .
    b. Protein extraction from cold-pressed canola meal to produce “golden tofu”, dairy substitutes, etc.
2. Fractionation of peas, fababeans and other pulses:
    a. Livestock and aquaculture feeds from pulses (aquaculture markets are still largely export oriented). Livestock is also a way of adding value to crop production.
    b. Higher pulse flour utilization in pastas and breads to increase fibre and protein (e.g. China is quite interested in a small inclusion rate of pulses in their 40 million tonne wheat flour market).
    c. Fababeans:
        i. An AB company is working with Nestle on fababean protein extraction (have been looking at it for a while).
        ii. Fababeans - Sask Pulse has funded research on faba utilization. There are tannins (in the faba seed coat) and vicine and convicine – Mediterranean people lack an enzyme needed to digest these amino acids in faba protein. Seed size and agronomic issues make seed coat removal challenging.
3. Hemp and cannabis processing to produce oil, fibre and cannabinoids including CBD:
    a. Utilization of the whole plant to produce oil and protein from the seed; CBD from the flower parts and chaff; and fibre from the straw.
    b. Hemp seed processing for production of cold-pressed oil, protein isolates/flour, soluble fibre and for extraction of CBD oil and other cannabinoids and polyphenol compounds.
    c. Extraction products of cannabis seed (e.g. THC, CBD and other cannabinoids) using non-solvent processes for use in cannabis-based edibles. Food development centres are already working on formulations for drinks and gummies.
    d. Hemp fibre processing. A biocomposites group located in Drayton Valley is taking the fibre that’s produced at both Bruderheim and Innotech (Vegreville) and using it to make composites.

e. Extraction of CBD oil from hemp flowers/pollen/maybe leaves. Chaff is being collected during the seed threshing operation for extraction of CBD.
f. Hemp chaff residuals will be used for livestock feed but this use is not yet approved. Livestock feeding approvals will also create markets for off-grade seed.
g. Use of immature hemp for grazing, but there is concern because it is not known what may be contained in the plant at that life stage.
h. Canadian Hemp Trade Alliance (CHTA) expects the main production areas in AB to be the irrigation area in Southern AB, the area along and north of Hwy 16 and also in the Peace River. Ideally, there would be a fibre processing plant every 50 to 150 km from Edmonton to Dauphin plus one or more in the Peace River area and one in southern Alberta.
i. Each hemp fibre processing plant could potentially include a cluster of spinoff businesses to process chaff for CBD extraction, plus pelleted residuals, graphene or biochar production. The True North at Oyen is currently pelletizing residue from hemp processing and using it in a co-generation power plant.
j. If there are significant economies of scale for residual processing, larger amounts of residuals could be collected from several plants at a central location for more efficient processing.
k. Ekoterre plans to build a plant in Alberta; potentially a world-scale decortication plant. The Ekoterre plant will be located within 100 km of Edmonton, but the site hasn't been chosen yet.
l. Better hemp varieties bred for specific uses – i.e. seed only, dual purpose and fibre only.

4. Canola-related opportunities including:
    a. Additional canola processing locally to compensate for the loss of seed markets in China.
    b. Biodiesel produced from canola oil. A mandate requiring increased use would really increase potential markets.
    c. Canola varieties with higher protein without sacrificing oil yield.
    d. Digestible fibre products from canola.
5. Other opportunities include:
    a. Wheat-related opportunities
        i. Specialty wheats including purple (high anthocyanin)[16] wheat, high-amylose wheat[17] for niche markets. These markets could take container lots of specialty wheats.
        ii. High-yielding wheat for ethanol production.
        iii. Permolex (Red Deer) buys between 100,000 and 150,000 tonnes of wheat per year. They extract the gluten before processing the rest into ethanol.

[16] Anthocyanins and phenols are examples of highly beneficial bioactive ingredients. There is significant interest in expanding the supplies of food ingredients that contain higher levels of these bioactive ingredients. Research and development work is progressing in Saskatchewan and Ontario with support from several large companies (personal communication with David Shambrock, Executive Director, Food and Beverage Manitoba).

[17] High amylose wheats are high in dietary fibre whereas wheats generally are high in non-digestible fibre.

b. Barley-related opportunities:
    i. Malt barley to meet the growing demand for specialized malt for the craft brewing industry.
    ii. Extraction of bioactive compounds from craft breweries' spent grains.
c. Oat-related opportunities:
    i. Oat processing - to produce ingredients for oat milk and cosmetics.
    ii. Oats - Tate & Lyle (major ingredient company) produces an oat protein and has demand that they can't fill[18].
d. Co-product stream opportunities:
    i. Capturing more co-product value from pea fractionation (fibre, starch, etc. for innovative uses).
    ii. Capturing more co-product value from phenols and other bioactive compounds in hemp and other crops for use in pharma, food and cosmetics.
    iii. Production of resistant starch from pea starch and maybe for its prebiotic benefits (similar to Manitoba Starch's MSPrebiotic natural health supplement using potato starch - this was mentioned by two food development centres).
e. Miscellaneous other opportunities:
    i. Increased volumes of gluten-free and organic products and ingredients.
    ii. There are likely several commercially viable ingredient/product streams that will be commercialized by Merit Functional Foods using Burcon's large portfolio of patents. These are primarily protein extraction patents but may also include extraction/purification of other plant-based compounds.
    iii. Advancing agriculture technologies and food processing/packaging technologies.[19] This has been identified as a high priority by government of Canada. For example, remote sensing and driverless vehicles have been developed for the petroleum industry, but not so much for agriculture.
    iv. Higher value oils from hemp and flax; mucilage which has potential as a substitute for other ingredients; and proteins.
    v. Extraction of bioactive compounds from many different crops.
    vi. Farmers in the BRAED region will likely have the opportunity to grow more yellow field peas to supply the Roquette plant in Portage la Prairie, Manitoba. It is reported that there are not currently enough peas grown in Manitoba and Saskatchewan to supply the new processing plants requirements. This may also create opportunities for local large-capacity seed plants to contract pea production that they could clean to remove weed seeds and other foreign matter from the peas in order to minimize freight costs of shipping the peas to Manitoba.

[18] Research and development work is being completed by at least two major companies in western Canada now. Projects are underway at the University of Saskatchewan and at the University of Manitoba. WE understand that the Saskatchewan Food Industry Development Centre also looking at this for clients (personal communication with David Shambrock, Executive Director, Food and Beverage Manitoba).

[19] This could include robotics, sensor technology and other types of automation in general, blockchain technology for product tracking and traceability, etc.

Summary – top value-added agriculture opportunities for the BRAED region

The BRAED region is very well suited for the first (plant-based protein) and second (pulse milling and fractionation) opportunities shown above because:

- There is ample production of peas and canola in the BRAED region and in regions that are within reasonable transportation distances from which to draw feedstock supplies. The BRAED region has extensive highway and rail transportation infrastructure to move feedstock to processing facilities within the region and to move finished product to markets.
- Despite having several canola crushing plants in and nearby the BRAED region (including Cargill's plant at Camrose, Bunge's plant at Fort Saskatchewan and ADM's plant at Lloydminster), there is still ample canola production available to supply several smaller scale cold-press canola crushing plants that could supply the growing demand for cold-pressed canola meal from which to extract proteins with aqueous and other innovative extraction technologies. These are the types of processes that are being commercialized by Botaneco in Calgary and Merit Functional Foods in Winnipeg. [20] Both these companies are likely to be expanding their production facilities in the future and while Merit plans to maintain its roots in Manitoba, both companies may find the BRAED region to be a very attractive location into which to expand in the future.
- The BRAED region is well suited to production of fababeans and other pulse crops.

  In addition to meeting the existing market requirements, farmers have shown their ability and willingness to expand pea acreage to meet increased demand (as they have done in the case of canola). The table below shows the acreages of the main crops grown in the BRAED area based on the 2016 Census.

[20] Please see Appendix 4.4 for information about Merit Functional Foods and Appendix 4.5 for information about Botaneco

BRAED region crop acreages in 2016

Crop	Acreage
Wheat	930,306
Canola	895,182
Barley	332,670
Dry field peas	207,448
Oats	99,482
Mixed grains	40,472
Corn	22,232
Lentils	15,832
Flaxseed	11,448
Rye	9,431
Other dry beans	8,471
Triticale	7,470
Forage seeds	1,748
Total field crop acres	**2,582,232**

The third opportunity (hemp and cannabis) is very well suited to this region because Dr. Jan Slaski and others have shown that the area along and north of the Yellowhead Highway is among the best areas in Canada for hemp production. If Dr. Slaski's vision (and one that is shared by the Canadian Hemp Trade Alliance) of a hemp processing facility every 50 to 150 kilometers from Edmonton to Dauphin were to come to fruition, BRAED could potentially see several of these plants (and their aligned spinoff businesses extracting CBD and processing fibre and residues) located in the region.

The fourth opportunity (canola) is very well suited to this region. As mentioned earlier, canola is a crop that Alberta farmers will produce to meet market demands. Additional local processing facilities would increase the financial incentive for BRAED farmers to increase canola production.

Some of the other opportunities shown above may be of interest to existing BRAED region companies or may be investment opportunities for new players. In some cases (e.g. oat fractionation) the technologies are fairly well developed and proven. In other cases, extensive work would be needed to more precisely define the opportunity (e.g. capturing more co-product value from phenols and other bioactive compounds in hemp and other crops) and to identify potential technologies to extract the compounds from the crop.

3.2. Benefits to BRAED region

Based on the interviews, the ways in which benefits would be created within the BRAED region and in the surrounding area would include those shown below.

a. Farmers would (hopefully) benefit from:
    i. New market demand and the need for more production and/or higher crop values paid to them to fill new markets for protein and other ingredients
    ii. Biodiesel production = new demand for canola oil and hopefully farmers would share in the added value

iii. Increased market diversification and stability
iv. New extraction businesses and more predictable markets
v. Increased acreage of hemp seed production and hopefully a better price to farmers (with this new alternative to existing crops)
vi. Increased acreage of chickpeas and/or lentils, which would mostly be grown in SK and AB and hopefully a better price to farmers

b. Processors would benefit (otherwise they wouldn't invest):
    i. Companies that make investment in pulse processing to fill the demand for human and pet markets will be expected to benefit. There is expected to be high and increasing demand for plant-based protein in the coming years. Currently demand seems to be outstripping supplies[21]
    ii. Profitable extraction of high-value compounds for specialized medical and food/beverage end-use markets
c. The general public would benefit from:
    i. Higher employment, especially near the new processing plants and (hopefully) in rural areas through direct and indirect spending (e.g. transportation, supplies, etc.)
    ii. New CBD production (from hemp) would meet new demand from Millennials and seniors for CBD's benefits
    iii. Consumers with allergies would benefit from a wider range of products made with oat ingredients (e.g. oat-based dairy products, especially those with soy allergies)
    iv. Consumers who believe that oats (and other crops) are raised more sustainably than livestock would feel better about buying plant-based products
    v. Consumers may see this as a more sustainable source of bioactive ingredients (such as prebiotics) compared to animal-based alternatives
    vi. Consumers may see CBD from hemp as a more sustainable source than from cannabis produced in greenhouses
    vii. Consumers may see more convenience, less red meat, more sustainability
d. Governments would benefit through additional economic development and increased taxes
e. Our economy would benefit from replacing imports with locally grown and processed products

[21] **Caution**: If there is a backlash against the number of additives that are used in making plant-based products, this could (perhaps significantly) slow the growth of this market sector. For example, the Beyond Meat burgers have 26 ingredients compared to a beef burger that typically has one ingredient (or very few more if flavours are added).

Summary – benefits created and for whom in the BRAED region

Farmers; processors/investors; local community residents; the general public/consumers; and governments/the economy would benefit from an increase in agriculture value-added processing in the BRAED region.

Farmers would hopefully share in the increased value that would be created from new demand for existing crops and or from opportunities to grow new crops, which would diversify their cropping options. Having increased cropping options and local demand for their crops would be expected to increase market diversification and price stability. Some farmers may become investors in new processing businesses, thereby diversifying their operations and potentially creating new revenue/profit streams.

Processors would create new revenue, employment and profits by establishing or expanding their processing operations to meet new market needs for ingredients or products. Each new processing operation creates the potential to stimulate a cluster of related businesses. For example a new hemp fibre processing operation may support a chaff processing facility and a co-stream operation that would use the crop residues to make biochar or other valuable products. These businesses, in turn would create new demand for trucking and other services in the local area.

The general public would benefit from increased employment opportunities and the economic impact of those activities through the multiplier effect of the related spinoff employment and tax revenues that would be created.

Consumers[22] would benefit by having new ingredients and products available for them to utilize. Two of the most significant beneficiaries may be those consumers that believe plant-based ingredients/products are more sustainably produced than animal-based products or those that have allergies to soy protein, peanut protein or gluten for which a pulse or oat ingredient might be substituted. Many consumers may believe that CBD produced from hemp is more sustainable than CBD produced from greenhouse-raised cannabis and would have very low levels of THC.[23]

Governments and the economy would benefit from the increased economic activity that would be created by the new production and processing activities. The resulting new tax revenues would support continued expansion of services that the citizens value.

[22] Consumers would get these benefits regardless of whether the ingredient production and processing activity takes place in AB. The group of consumers that will benefit is those that care about their food being both grown and processed locally. Fortunately this portion of the population is growing. These are the shoppers that go to Coops, Sobeys, and other specialty retailers, farmers markets, etc.; not those who primarily shop at Walmart or Superstore.

[23] The maximum level of THC that is allowed in CBD in Canada is 0.7%.

3.3. Crop, ingredient or end-use markets enhanced by value-added agriculture opportunities

The end uses that were mentioned by the interviewees included a wide range of possibilities as shown below. Virtually all of these end uses dovetail well with the top opportunities that were identified for the BRAED region.

a. New (or new to Canada) ingredient/product combinations:
    i. An example of a value-added pulse end-use would be a product called dhal, which is similar to hummus, but made with pureed lentils
    ii. Hybrid products using plant-based proteins with either meat or dairy (e.g. chicken fingers and burgers). One of the benefits would be if there's a need for a clean label replacement for methyl cellulose which is used as a binder in food products
    iii. Plant-based protein/meat hybrids that offer convenience (e.g. Jerky-type products or bars)
    iv. Boutique (niche) foods using plant proteins
    v. Faba, oat, or hemp protein and fat emulsions for use in milk and meat analogs – almond and coconut milk are high in fat/oil content. Faba, oat and hemp would be more moderate
    vi. Hemp protein is easy to puff to make snack products
    vii. Consumer products (golden tofu or "milk" products) from canola protein
    viii. Meat and snack products from plant-based ingredients
    ix. Wheat and pulse flour blends for pastas and breads
    x. Oat protein is a good binder for use in meat analogues. The protein is similar to pea protein but has a neutral flavour and neutral smell.
    xi. Health products (e.g. CBD and other compounds derived from cold-pressed hemp oil)
    xii. CBD oil for edible products from hemp (perhaps a more sustainable production system with minimal THC)
b. New (or new to Canada) markets:
    i. Plant-based protein ingredient markets initially from peas and canola and maybe in the future from hemp and other crops
    ii. Flax (and hemp) fibre to make composite materials; these could be used in everything from cell phone covers to auto and equipment parts and other products[24]
    iii. A lot of markets for plant-based protein including high value aquaculture & livestock feeds; meat analogs; and sports drinks
    iv. Beyond Meat uses protein isolates and pea flour in their products. However, pea flour is a generic term that may contain any combination of protein and starch to meet the formulators' requirements

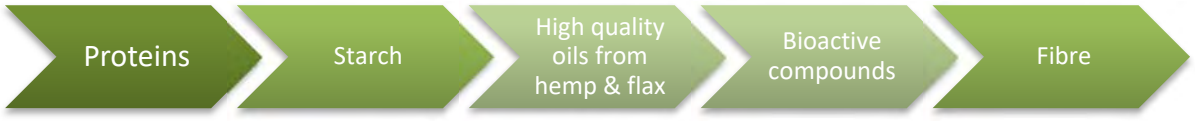
[24] Composite innovation centres in Manitoba and Alberta have been working on this type of new product development for years and some adoption has occurred with industry players (e.g. Buhler in Winnipeg has used natural fibre in composites to make hoods for tractors and other equipment).

v. Beyond Meat is the tip of the iceberg. Huge opportunity to blend plant-based protein with animal protein e.g. lentil and meat protein together in a meat product
vi. Bioplastics using starch from fractionation plants (some European bioplastics[25] companies are making enquiries about sources of starch in Canada)
vii. Perhaps egg white substitutes (especially with chickpea and other legume protein)
viii. Bioactives from spent grains sourced from the craft brewers
ix. Fermented products (e.g. sourdough products are growing in popularity as Michael Pollan is promoting them)

[25] Winpak, a major consumer packaging manufacturer with its head office in Winnipeg and plants located throughout North America, targets having all of their products being recyclable or derived from sustainable, renewable resources by 2025 (2019 Winpak Sustainability Report.

c. Increase of existing markets:
    i. Biodiesel for farm equipment & transportation industry; heating oil (east coast & north)
    ii. Functional foods and natural health products
    iii. Higher value protein markets for healthy foods
    iv. A new locally sourced prebiotic / resistant starch for healthy food products and supplements

Summary – crop, ingredient or end-use markets that would be enhanced by these new value-added agriculture opportunities



In summary, the end products listed above include a diverse list of end uses for plant-based:

- Proteins:
    - meat substitutes and meat/plant-product hybrid products
    - milk substitutes
    - supplementation/substitution for wheat flour in breads and pastas
- Starch:
    - modified starch for prebiotic and other food uses or industrial uses
    - bioplastic products
- high quality oils from hemp and flax
- bioactive compounds including CBD and other cannabinoids, phenols, etc. extracted from hemp, flax,
- Fibre:
    - soluble fibres such as mucilage from flax
    - industrial fibres from hemp for textile and composite use

3.4. Research needed to move to commercial scale

The research needs that were identified during the interviews included those shown below. Many of these research needs can be provided by Alberta-based research and food process development centres working with their counterparts across the Prairies.

The research needs that were identified included:

a. Food development research or scale-up process development:
    i. Increased equipment & resources for food development centres[26]
    ii. More sophisticated dry-milling techniques & equipment
    iii. Research that reduces the processing industry's environmental footprint – this could enhance Canada's production advantage (which needs to be clearly enunciated and promoted)
    iv. Production of protein isolates is a well-established technology, but there may be room to develop more sustainable processes to reduce large water and energy usage that is currently required; this would be a big advantage
    v. Protein isolate and concentrate production needs process optimization, product application/formulation R&D and market feasibility research
    vi. Increased starch research to optimize desired benefits (e.g. particle size and form needed to suit various application requirements)
    vii. Need for research on interactions of CBD when combined with things like chocolate in edible products
    viii. Co-product research to determine processing technologies, feasibility (both market demand and market development) and logistics
    ix. Characterization of ingredients for specific types of physical functionality (e.g. solubility, gelling, sheeting, etc.)
    x. Formulation work to develop ingredients and product formulations for plant-based products that are acceptable to consumers. For example, Beyond Meat spent millions of dollars and years of development to modify proteins to get rid of off flavours and aftertaste issues
    xi. Development of new extrusion products (e.g. burgers, nuggets, etc.)
    xii. Hemp protein may be the best for making milk substitutes because of its higher solubility
    xiii. Test lentil and chickpeas as source for protein isolate and determine applications for which the resulting isolates are best suited
    xiv. Scale up work needs to be done on aqueous extraction of canola protein
    xv. Basic research is needed to determine what could be available from spent brewers grains
    xvi. A lot of research is needed to determine the technical and commercial feasibility of CBD production from hemp. Much of this research is being done by the companies that are in the cannabis processing sector (e.g. Canopy Growth which recently purchased KeyLeaf Life Sciences in Saskatoon). The

[26] At the current time, the food development centre facilities are generally not strong in fractionation and separation of components to high levels of purity (e.g. protein concentrates and isolates). They focus on traditional food and beverage products formulations .A lot of the protein and bioactive ingredient opportunities that have been described in this report would require these core extraction technology capabilities and competencies. This was the work that POS Biosciences in Saskatoon provided in the past. Now they are part of Canopy Growth and are focused on cannabis and hemp research and development. There is a western Canadian gap in this kind of research and scale-up capabilities. The Food Development Centre in Portage la Prairie is adding equipment for protein extraction as part of the Manitoba Protein Advantage initiative and likely other centres in Alberta and Saskatchewan will as well.

food development centres across the Prairies either are currently, or will soon be gearing up to undertake formulation research for creation of CBD-infused edibles. The Cdn Hemp Trade Alliance is very interested in pursuing CBD extraction and has asked that CBD not be included under the same Cdn permits/regulations that cover THC (in the US they are not).

xvii. The FPDC (Saskatoon) specializes in extrusion technologies and they are doing extensive formulation development and scale-up on product with pulses (e.g. tofu products with 30% pea or faba protein). FPDC is also working on improving fractionation of pulses, hemp and cereals.

xviii. FPDC (Saskatoon) is working on development of some meat/plant-protein hybrids and some development of fermented meat products.

b. Genetics research and development:
    i. Pulses and hemp with improved amino acid profiles
    ii. More sophisticated seed genetics and selection
    iii. Ongoing need for variety development with improved processing and end-use characteristics
c. Other research and development needs:
    i. Biodiesel research/testing to persuade the trucking industry and machinery makers that it is good for (or at least won't harm) engines
    ii. Market development work on resistant starch / prebiotics; there is low knowledge among consumers of the benefits of dietary fibre and the ability of these compounds to provide the same benefits as dietary fibre

Summary – research needed to move these value-added agriculture opportunities to commercial scale

In summary, as shown above the research needs are somewhat diverse. Many of the research needs relate to process development, testing and scale-up. Others are related to genetic improvements to attain better ingredient characteristics and processing efficiencies. A third type of research and development is focused on gaining market acceptance by end users (e.g. for biodiesel).

The research capabilities of the research and food processing development centres are also diverse when combined with the internal capabilities of the processing industry companies and the university-based research community.

There is an encouraging interest among the individual food development centres to work together to move projects forward as quickly as possible to commercialization. Each centre tends to excel at a different aspect of development (e.g. the Alberta Food Processing Development Centre is noted for its high pressure processing capabilities and its meat research unit; FPDC in Saskatoon is very strong in extrusion, Food Development Centre in Portage is mainly known for its fractionation and formulation expertise).

3.5. Facilities or organizations be best suited to conduct research

a. CBD extraction:
    i. Extraction work at multiple centres (e.g. Food Development Centre (Portage); Richardson Centre for Functional Foods and Nutraceuticals (Winnipeg); and other provincial food processing centres). The Canadian Centre for Agricultural Research in Medicine (Winnipeg) can do testing of CBD effects. Israel has some of the best research on CBD.
b. Canola research:
    i. POS (KeyLeaf Life Sciences) had been the key R&D facility for canola. Now that it is owned by Canopy Growth it has changed focus to cannabis and hemp research for that company.
    ii. Science cluster at U of M including Dr. Rob Duncan canola breeder.
c. Fractionation and milling research:
    i. Buhler (a dominant flour milling equipment manufacturer and service provider).
    ii. PAMI (e.g. field equipment testing).
d. Pulse crop utilization research:
    i. Health research - Dr. Jenkins at U of Toronto (e.g. lentils to reduce blood sugar) – pulses are well-established as healthy products.

ii. Commercial development is largely driven by companies working with food development centres in general and the one in Saskatoon specifically. Saskatchewan Pulse donated $750,000.00 to the Saskatchewan Food Industry Development Centre in Saskatoon for equipment. Pre-competitive work has largely been done except for pulse flours.
iii. Food Development Centre in Portage will likely soon have pilot plant capability for protein extraction work.
iv. RCFFN, other food development centres (e.g. Richardson's corporate food facility (Winnipeg), centres in Saskatoon and Leduc). Each centre has its unique strength and clients often use multiple centres to do different types of development work.

e. Cereal crop utilization research:
i. Dr. Chen at U of A and also Dr. Ames at AAFC in Winnipeg (most of her work has been on noodles). Dr. Chen has been working on an oat beverage for cancer patients that are having nausea problems, sensitive stomach, etc. Prairie Oat Growers Association funds some utilization research. The Alberta Crop Industry Development Fund (ACIDF) funded this type of work, but it doesn't exist anymore. There is no provincial funding from AB for oat research. There is some from SK and MB governments.
ii. Dr. Hassan (U of S) is working with dietary surveys. Haven't shown any correlation between refined carbs and BMIs.
iii. The Healthy Grains Institute existed in the past, but disbanded and promotion and research related to cereal health benefits was taken over by Cereals Canada.
iv. The Alberta Wheat & Barley Commission funds breeding all across Canada. The main barley breeding programs are in Brandon, Saskatoon and Lacombe. The main wheat breeding programs are in Lethbridge, U of A, U of S and AAFC at Swift Current.
v. Dr. Temelli; Dr. Vasanthan at U of A.
vi. University of Manitoba, Innovate Alberta (varietal development and trials).
vii. Likely U of M and private sector research facilities/companies.

f. Formulation and other research:
i. Formulation research and recipe development – perhaps Paterson Global Foods Institute at Red River College, in Winnipeg
ii. The Saskatchewan Food Industry Development Centre (Saskatoon) collaborates with U of Alberta, U of Saskatchewan, U of Manitoba, AAFC at Lacombe, U of Guelph, and AAFC, St Hyacinthe on both meat and crops research projects

Summary – particular research facilities or organizations that would be best suited to conduct research for the identified opportunities

In summary, the list above shows that there is a large number of research and food development centres distributed across the Prairies. Each one has an area of specialization and multiple centres often work in collaboration on a development project. This may happen concurrently or sequentially.

No one expressed a need for more research capabilities. However, it is challenging for new start-ups to fund the development work that they need to complete while simultaneously building a company, funding working capital, etc. in order to commercialize new technologies and products.

3.6. Need for pre-competitive market development work

a. Associations are trying to support innovation as much as they can, but often their efforts get diverted to more pressing issues (e.g. royalties payable to genetics companies, etc.). It's good that many of the commodity groups have amalgamated to be more efficient.
b. Economic and market feasibility studies.
c. Market development.

Summary – need for pre-competitive market development work for the identified opportunities

In most cases, the interviewees believe that the pre-competitive research that is/was needed has been largely completed and that companies will now have to drive the commercialization of those opportunities that are feasible.

3.7. Infrastructure needed to commercialize the identified opportunities

a. Fractionation, milling and extraction:
    i. Buhler has invested $20 million to develop a pilot plant for pea processing in Minneapolis.
    ii. Moving from animal feed use to food grade use = upgrades to plants and lots of new equipment for protein extraction; possible need for identity preserved system.
    iii. Logistics efficiencies are critical in a commodity market where movement of large volumes at lowest cost is essential, but in a more specialized/niche market meeting customer demand for consistency, quality and timeliness are often more important than low-cost.
b. Collection, transportation and processing:
    i. There is a need for significant hemp seed processing facilities for new food ingredients in AB and SK. Examples of companies involved include Aliment Trigone, MB Hemp, and Aurora Hemp (in Edmonton area).
    There will be a need for chaff collection and processing every 50 to 100 kms from northwest of Edmonton to Dauphin, MB. Chaff has to be processed quickly as it comes off the field (collection, drying and conditioning). There are two operating facilities now for chaff: True North in Oyen, AB and Canopy Growth in Yorkton, SK. There have to be SOPs and they'll have to meet CFIA

and Health Canada standards because this is ultimately producing CBD and other cannabinoids that will be for human consumption.

ii. Merit Functional Foods plans to purchase its raw ingredient supplies through established grain companies and brokers to minimize the need for a large procurement staff.

iii. Rail service is a high priority for Alberta because they're so export oriented.

iv. There's generally good rail service but very few locations that have more than one railway serving them (i.e. captive shippers in terms of rail). One exception is Camrose – has both CN and CP serving their area.

v. Trucking has expanded to meet the needs.

vi. Calgary and Edmonton airports have focused on air transport with more direct freighter flights and are capturing some business because of that.

vii. There's a Vanhorn institute in Calgary that is Canada's leading think tank on transportation issues.

viii. Water supplies and wastewater treatment may limit suitable locations for processing plants.

c. Handling and storage of processed ingredients and products:

i. There is a serious shortage of cold storage infrastructure.

ii. There is a very serious lack of co-packing capacity and toll processing (a lack of toll processing capacity was mentioned as a critical issue by many interviewees).

d. Varietal research and selection:

i. Moving towards higher protein pea varieties. For pulses generally, increasing protein quantity and quality.

ii. Genetic improvement may improve protein quantity/quality and reduce fibre content – this would reduce water use during processing (e.g. breeders have developed soy varieties that are well suited to tofu production).

Summary – infrastructure needed to commercialize the identified opportunities

In summary, except for the need for new processing facilities to meet demand for protein isolates and hemp-based products the only other serious infrastructure needs that were noted were for increased numbers of:

- Co-packing and toll processing facilities and
- Cold storage capacity

3.8. Interest from farmers and local investors to invest in processing businesses

a. Farmers:
    i. Most associations, especially Alberta-based ones, said they would not be allowed by their charters/legislation to invest in a processing opportunity; they would leave it to their members to decide individually whether or not to invest in a new venture.
    ii. Most associations said they would encourage (or at least allow) proponents to publish articles in their association's newsletters where these proponents could inform members of new technologies and opportunities and could invite members to attend meetings at which new business opportunities would be promoted.
    iii. They would be cautious about seeming to endorse any business venture and, in many cases, they are forbidden by law to own any processing or grain handling assets.
b. Universities and development centre:
    i. The university may patent some process technologies and license them to private sector.
    ii. The food processing development centres have not taken ownership of intellectual property that they have developed in the past, but may be interested in doing so in the future as they are being encouraged to operate in a more self-sustaining way. The centres outside Alberta suggested that it may be more common for Alberta-based businesses to take an ownership interest in processing technologies that they develop.
c. Companies:
    i. They are certainly willing to consider taking an ownership position in viable opportunities with the right partner(s). They would evaluate each case on its own merits and look at the quality of the strategic alliance partners that are proposed or already engaged.
    ii. Merit Functional Foods feels that it is well positioned to capitalize on these opportunities without needing additional financial resources or partners other than Burcon.
    iii. Paterson Global Foods would consider the merits of each opportunity and the team that is developing it.

Summary – interest from farmers and local investors to invest in processing businesses

Generally, there is expected to be cautious support for, and interest in investment in value-added processing opportunities among farmers, local businessmen and existing companies. This is due to awareness that there have been some unsuccessful projects in the past where local investors lost all or most of the money that they invested. That is no to say there is not money available to invest in good opportunities that are identified – but it likely will be challenging to persuade groups of farmers

and investors to bankroll new ventures if they are not soundly planned and effectively managed right from the start.

3.9. The most significant barriers in pursuing the identified opportunities

a. Infrastructure and human resource issues:
    i. Lack of toll processing was mentioned several times. There might be a facility in BC that does toll processing, but it may not be logistically feasible for some processors to use it.
    ii. Water and waste water treatment capacity.
    iii. A senior government of Alberta (GOA) official commented that the heavy domination of small and medium sized enterprises (SMEs) in Alberta sometimes hampers product development and scale up because of a lack of resources and awareness as mentioned below.
    iv. SMEs tend to have a lack of managerial talent and lack of knowledge of export markets (true for all of Canada). The percentage of SMEs that export processed products is low.
    v. SMEs tend to utilize less automation and achieve less productivity improvement than larger businesses in the same sector. It is also true that Canadian companies do less well on this measure compared to US and European counterparts.
    vi. HR resources for processing plants may be a limitation, especially for process engineers and other technical staff to conduct basic technical research and testing of output products); lab technicians can likely be sourced in Canada or through immigration.
    vii. Fababean processing challenges. The seed size and the somewhat irregular seed shape make de-hulling somewhat difficult. On the other hand, it has the benefit of being whiter, blander and higher protein level than peas.
    viii. Funding for capital equipment costs.
b. Funding issues:
    i. Lack of funding for small companies to make needed investments in new technologies.
    ii. Funding for research (especially for genetics) is something that's lacking.
    iii. There is a lack of capital funding for groups that have strong hemp market connections.
    iv. Western Diversification is tapped out (except maybe for totally new technology) and many joint federal/provincial programs are as well. Financing is always hard unless principal has deep pockets and can proceed with or without grant support.
    v. The caution that's been caused by previous disasters (e.g. the plants that tried to make straw board out of wheat straw) has caused potential investors to be gun-shy of investing in new processing opportunities, but there is local money available for the right idea and lots of farmers looking for farm diversification opportunities.

c. Trade and regulatory issues:
    i. Tariffs and trade issues are always a threat.
    ii. Uncertainty about US borders and market access.
    iii. Market predictability and regulatory environments.
    iv. Contracting can be somewhat problematic for farmers because companies specify things like non-GMO and other production practices as well as specific quality and agronomic requirements.
    v. Dealing with local and provincial levels of government for water, power, transportation, etc. (e.g. Cargill's access to water for the Camrose plant was a big issue).
    vi. For hemp foods, processors need a license to process the seed. Standardization and a grading system may be needed.
    vii. Regulatory factors as it relates to labeling and evaluation processes – Health Canada is not in step with the needs for plant proteins. Products have to be judged as being equal to meat as far as protein content, etc.; the protein evaluation protocols are outdated.
d. Market acceptance issues:
    i. Consumer perception (almost all canola is GMO and GMO is found in the protein); non-GMO varieties have significant yield disadvantage.
    ii. Resistance from equipment makers & trucking industry officials to using biodiesel.
    iii. Consumers may resist food product being used for fuel (e.g. canola or soy oil) & cost of production may be too high.
    iv. With bioplastics there is some skepticism as to whether or not they are really biodegradable. In the current low-cost petroleum feedstock environment, bioplastics are nearly four times higher cost that the traditional materials that they would have to displace.
e. Logistics issues:
    i. For pulse shipments, logistics issues are being addressed by AGT and CN – developing a container facility in Regina area. Hopper cars are shipped to Montreal to load onto cargo ships
    ii. Transportation is a limiting factor, primarily rail; containers have been less of a problem as compared to bulk railcar movement. Rail service from AB into the US is particularly challenging.
    iii. The logistics to gather enough co-products into one location to process them economically; and the need for market research into the viability of the co-product streams.
f. Attracting interest from larger processing companies:
    i. For barley products, it has been challenging getting larger companies to consider commercialization.

Summary – the most significant barriers in pursuing the identified opportunities in the BRAED region

In summary, the most significant barriers in pursuing the commercialization of the identified opportunities include:

- Lack of critical support infrastructure including: toll processing and co-packing; human resources and management expertise; water and wastewater treatment capacity; and capital equipment.
- Lack of funding for start-ups to undertake product development; research (especially for genetics); and private sector investment.
- Trade and regulatory issues including: tariffs/trade barriers; lack of predictable markets and regulatory environment (especially for protein products and hemp-based CBD); and dealing with provincial and local governments regulations.
- Market access issues including: consumer skepticism regarding proteins extracted from GMO crops: trucking and equipment manufacturers skepticism about biodiesel and consumers' concerns about using food products to produce a fuel additive.
- Logistics issues including: rail service (many locations are captive to a single railway company); and challenges of collecting enough co-product at a central location to make processing feasible.
- Attracting interest from large processing companies to pursue opportunities (especially for barley fractionation). It has been proven that large players can be attracted to invest in processing – e.g. Roquette's new pea processing facility is currently being completed in Manitoba. Richardson International and Paterson Global have both invested in oat processing capacity in recent years. We understand that multinational firms such as Unilever are interested in creating a western Canadian beachhead from which to expand their Canadian processing presence – where better to do that than in the BRAED region?

3.10. Other noteworthy points to consider

Interviewees were asked if there was anything else that they felt was relevant to a discussion of value-added agriculture opportunities that we had not discussed. There wide-ranging responses are summarized below.

a. Co-product synchronization:
    i. Need to balance markets for protein & starch; in the future pea processing plants will need to segregate their inflow of peas based on protein and starch content.
    ii. Don't forget that feeding barley (or co-products) to livestock is also a value-added option.
    iii. Crops and livestock are compatible – if you could locate a processing business in an area with livestock may make good sense.
    iv. It is surprising to a food development centre manager that processing companies don't focus more resources on co-product value-added research. Sometimes they don't have enough volumes to make extra processing feasible and it's difficult to gather or store large enough amounts to process them.
b. Market and market development issues:
    i. Ted Haney (executive director, CHTA) foresees that the US will produce a lot of CBD but there won't be enough market channels/markets (at least in the short term).
    ii. The Canadian Hemp Trade Alliance is in the process of setting standards for grading criteria.
    iii. Aurora (a cannabis company) has established a big cannabis production facility near Edmonton airport. Bought an ingredient company called Radient Technologies and Extraction. It is being converted from a fee-for-service company to a producer of cannabis and hemp-based ingredients and formulations. Radient had been set up as a toll processing facility and was really struggling to get enough business to keep it going (ingredients in general, not just hemp – before purchase by Aurora).
    iv. Protein Industries Canada (PIC) works to support its members to help them both access information and funding.
    v. PIC is looking for alliances up and down the supply chain. Also looking for IP creation. Best if the owner of the IP and the licensee apply together and even better if they have suppliers and users as part of their application. Eligible costs include IP related costs, scale up and market studies.
    vi. The Government of Alberta's (GOA's) Investment Attraction department fields incoming requests and they're flexible in responding to those. They have 13 trade offices around the world. Some are totally agricultural (e.g. China and Japan). Others are partially agricultural (e.g. Korea). The department regularly buys data from ROI (a reliable data company) and from other sources. They participate in trade missions (those were on hold in September 2019 because the new government hadn't announced its plans yet – the throne speech and

budget were delivered in late October 2019). The department was facing travel restrictions. "If BRAED comes up with an idea, Dee can arrange for BRAED to work with their trade offices. The government of AB is involved with a trade mission to Asia in March of 2020" [27]

vii. Setting the stage comment: Alberta has a high number of companies and a high volume of sales which is the good news. The bad news is they're dominated by small and medium sized enterprises (SMEs) – this creates some challenges.

viii. It's a huge policy issue to encourage/ incentivize research and development.

ix. Universities are less effective at technology transfer to industry than they need to be, especially compared to universities in the US.

x. Generally there is less re-investment among companies in R&D and product development than would be ideal.

xi. Alberta government has pledged to reduce red tape for businesses.

xii. Over the next four years, the GOA plans to reduce the corporate tax rate to the lowest in Canada for all sizes of companies.

xiii. The GOA has given RMs freedom to use tax incentives to attract businesses.

xiv. The GOA has promised to bring in new immigrant attraction program.

xv. There is another group within Ag & Food that works with domestic processors.

xvi. The Prairie Biosciences Canada (PBC) membership includes the Biosciences Association of Manitoba, Ag West Bio in Saskatchewan and Bio Alberta. Its funding source is Western Diversification. It assists its members to attend international tradeshows and to upgrade their business skills.

xvii. PBC targets tradeshows that cover a broad cross section of Canadian cleantech and they subsidize companies to attend these shows (e.g. Expo West in Anaheim and Agritechnica in Hanover, Germany). The Anaheim show is primarily a food show and the Agritechnica show is primarily for equipment. The Clean Tech Forum in San Francisco is coming up in January.

xviii. Cleantech must have a biological component (e.g. not solar panels but it would include biomass energy). It includes agriculture and industrial biotech, sustainable protein and food production, water remediation, and some applications of IT related to agriculture.

xix. Exsteaminator – killing of weeds using steam is an example of ag cleantech.

xx. Demand for plant proteins will continue to increase because of desire for healthy eating and reduced environmental impacts.

xxi. The Richardson Centre for Functional Foods (RCFFN) is doing ongoing human feeding trials using hemp seed in a semi-frozen smoothie to lower blood pressure.

[27] Personal interview with Devinder (Dee) Pannu, Director, Investment Attraction, Alberta Agriculture and Forestry, Policy, Strategy and Intergovernmental Relations

xxii. Protein ingredients could be modelled on how the soybean isolate business has developed (i.e. very specific end user needs are met by tailoring the ingredient specifications to the need).

xxiii. FDC received funding from Western Diversification (WD) to train entrepreneurs, especially females. Females are at a disadvantage when seeking venture capital funding.

xxiv. The growth in the plant-based protein market seems like a recent phenomenon but Shaun (Hemp Oil Canada) first saw Beyond Meat's Burgers being promoted at the Anaheim food showcase in 2009 and every year since then. Every year there was tremendous interest in their product.

xxv. The biggest risk for many companies is that they won't stay focused. They'll try to be all things to all people. This has led to the downfall of many ventures that initially seemed sound.

xxvi. Kelvin (Paterson Global Foods) was quite open about discussing whether or not they might be willing to work with a local investor group. He said they would entertain an arrangement where they could identify long-term sustainable demand for a product stream. I said they would likely be sought as a "partner" for their international market reach. I mentioned a few specific areas (protein, hemp CBD) as examples of some of the ideas that we are hearing mentioned.

xxvii. I spoke about how early we are in the process of narrowing down a wide list of possibilities to make sure that we don't miss something that has potential to come up with a small number that are worthwhile doing far more research and feasibility assessment on.

xxviii. I asked if, in the past, Paterson had worked together with local communities. Kelvin said when he was still with Ernst & Young, Paterson had been part of the Dynamic Pork Network that built several hog barns in southwestern MB. Paterson built the feed mill at Killarney to support the network's feed needs. The network did not survive the downturn in the hog industry. We agreed to speak again when we are further along in our process and looking for specific types of support.

c. Processing issues:

i. Environmental impact will take on new importance. Sustainability/carbon footprint will become more significant in the future. This will have an impact on wet fractionation (takes a large quantity of water and has some real sustainability implications).

ii. Different products require different protein content levels; "It's not about feeding the world, it's about supplying what they want and are willing to pay for."; supplying export markets no longer makes sense with increasing trade protectionism[28].

iii. Rocky Mountain Soap – they do some toll processing as well.

[28] Personal interview with Gordon Bacon, CEO of Pulse Canada

iv. Pleasant Valley Oils – a number of Hutterite colonies are producing cold-pressed canola oil and may also be interested in doing some toll processing (of ingredients).
v. Hutterites need value-added businesses in order to provide jobs for their people and they currently produce about half of AB's hogs. They are already doing some meat processing. MNP works with almost all of the Hutterite colonies and has good connections.
vi. The Plant Protein Alliance of Alberta (PPAA) is running fractionation 101 courses in Southern AB for RMs and counties in November 2019.

d. Research and promotion needs and activities:
i. Barley Breeding - the objective is yield. Barley is losing its competitive position compared to other crops such as canola. The Barley Commission funds both malting and feed barley development. It spends about 1.5 million dollars/year, which gets leveraged about 3 to 1 from other sources. The Malting Barley Institute spends about another 100,000 dollars, which also gets leveraged. They're trending towards more focus on malting barley (70 to 90% of most of the programs are dedicated to malt barley research), but are also looking at high yielding feed varieties as well. They're also doing some research on use of barley for distillery and other alcohol products and a small portion goes to food barley varieties. There is no significant private sector varietal development happening.
ii. Disease Resistance - Fusarium head blight is huge in MB and SK and spreading to AB so it's a very high priority. 100 million dollars is allocated in the US to controlling fusarium head blight in cereals. Secondary diseases are leaf diseases e.g. scald.

iii. Prairie Oat Growers Association's (POGA's) board is keen to promote oat production and utilization. AB production is increasing and markets are becoming more diversified (50% of the milling oats are grown in AB). POGA supports oat breeders in Western Canada and in Ottawa (Dr. Beatty and Dr. Dyck at U of S). POGA is hoping to increase the number of oat breeders.
iv. Wheat - just sequenced wheat genome in 2017. Every geneticist is trying to identify groups of genes and related traits. The biggest advancement is that they can clip a seed and analyze on a breeder chip to identify the traits that are exhibited. Using clip technology they can take seeds from tens of thousands of potential varieties and know before they grow them, what the traits would be. The challenging thing about the wheat genome is while people have two sets of genes related to each trait – wheat has six genes related to each trait.
v. Wheat has unique characteristics and attributes in food processing. Pulses and oilseeds have a lot of catching up to do. There's a need for gluten that creates less sensitivity to celiac.
vi. Warburton's has been working with a blend of pea flour and wheat flour to make scones, etc. for the UK market. There's still too much wheat in them to be appropriate for celiac.
vii. Wheat is contained in most products. Removing allergen would avoid celiac issues.
viii. Wheat genetic improvements: Yield protection (disease resistance, frost resistance, drought resistance).
ix. Sask Wheat does not encompass winter wheat.
x. Varietal registration requires a variety license, which is issued by CFIA and a classification which is designated by the Canadian Grain Commission. New varieties must be equal or better in yield, disease resistance, and protein quality to others in the same class. Varieties that don't meet a class can be grown in a closed-loop system (e.g. for feed, ethanol, or some other special use).
xi. Taurine – a component in Red Bull – is derived from a seafood source. The only non-aquatic source of Taurine is in wheat protein. If we could breed high taurine content wheat it may be quite valuable.
xii. Tom Steve, general manager of Alberta Barley, was with Viterra when they bought the Carrington pasta plant in North Dakota. He maintains that there is a healthy skepticism of value-added because of the money he has seen lost with hogs, ethanol, and bio-diesel over the years.
xiii. Hemp genetics - there are new varieties that need to be registered with low THC, but higher CBD. Right now there are about 20 cultivars registered for production.
xiv. Protein Industries Canada (PIC) is interested in funding some commodity crop research, but only for those crops that have had less research and development funding in the past (e.g. canola protein, hemp, oats, and flax).
xv. Work needs to be done to better use byproducts – e.g. soluble and insoluble fibres have dietary benefits that are not generally recognized.

xvi. Also needs to be research done to extract CBD and other polyphenols from hemp oil.

xvii. Chlorophyll consumption is good for the microbiome. Hemp seed is a source of chlorophyll, as is broccoli.

xviii. Distinct peptides can be produced through hydrolysis of proteins. They have high solubility and functionality (enzyme hydrolyzed proteins have been shown to lower blood pressure in rats).

xix. The Food Development Centre (Portage) makes ingredients at the lab scale but also runs a pilot plant. They do meat products, extruded products, and are licensed for dairy, seafood and honey processing.

xx. FDC's (Portage, MB) big strengths are extrusion and air classification (all part of fractionation). Maximum protein levels achievable from air classification are approximately 50%.

xxi. FDC has incubation suites and daily rental facilities available.

e. General comments regarding opportunities:

i. "There's no silver bullet. Cathy and BRAED are very good. The best opportunity is probably to grow an existing business rather than attract someone from outside e.g. there are several seed plants that could build on adjacent businesses. One is at Ryley. Another at Alliance." [29]

Summary – other noteworthy points to consider

In summary, the most significant other noteworthy points to consider include:

- Co-product synchronization (balancing markets for multiple coproduct streams)
- Market and market development issues
- Processing issues
- Research and promotion needs and activities (genetic improvement, PIC funding support, food development capabilities)

3.11. Other people we should speak with

Interviewees were asked if they would suggest that we speak with anyone else to gain a more complete understanding of the opportunities and issues. The list below was compiled from these responses.

a. Chris Vervaet at the Canadian Oilseed Processor Association (COPA) 204-956-9500
b. Sally Vail (U of A)
c. LeeAnn Murphy
d. Steve Pratte
e. Dr. Sue Arntfield (University of Manitoba - food scientist who retired a couple of years ago)

[29] Personal interview with Alan Hall, COO, Plant Proteins Alliance of Alberta

f. The Ag ministry group. There's a new division titled value-added something or other. Darren Chase – policy head (Alberta Ag)
g. Protein Industries Canada – Bill Greuel
h. Jan Slaski – Vegreville (research facility). He sits on the board of the Canadian Hemp Trade Alliance (CHTA).
i. Keith Jones at Birwin Farms at Taber – they grow 7,000 to 8,000 acres of hemp under irrigation.
j. Trevor Pizzey – had been with Permolex and then in SK somewhere
k. Kim McConnell – did some work with Richardson's related to oat processing
l. Dr. Vasanthan has launched a company called Grain Frac (a spinoff from the work that he's done on fractionation, particularly oats and perhaps barley)
m. Dr. Leeyun Chen – chair at U of A in agriculture
n. Rob Stoddart at Bio Alberta. They're part of the Alberta Cleantech Industrial Alliance.
o. Mr. Ted Haney, Executive Director, Canadian Hemp Trade Alliance
   200, 6815 - 8 Street NE, Calgary, AB T2E 7H7
   403-219-6262
   ted@hemptrade.ca
p. Barry Tomiski, Co-CEO of Merit Functional Foods Corp

Summary – other people that interviewees suggested that we should speak with

Additional contacts were suggested that will be useful during the next phase of this project.

4. Appendices

1. The BRAED map: updated map with new rail markings; also, on BRAED website.

2. Regional Profile: Selected regional demographic information from 2016

3. Beyond Meat and Other Meat Substitutes Articles
   - Beyond Meat partners with Canadian production facility
   - Ontario to host global test for McDonald's pulse burger
   - Beyond Meat, KFC develop fake chicken

4. Merit Functional Foods
   - Merit Functional Foods' Announces Protein Portfolio is FDA GRAS Notified
   - Merit Functional Foods disrupts plant-based protein industry with better-tasting, more functional pea and canola proteins

5. Botaneco Webpage: Botaneco canola and other oilseed products

6. Health Benefits of Yellow Pea Fibre Consumption Article: Consuming yellow pea fiber reduces voluntary energy intake and body fat in overweight/obese adults in a 12-week randomized controlled trial

7. Canadian CBD Articles
   - Health claims for pain and other uses
   - Hemp producer signs UFC deal in fiscal year that saw sales soar 349%
   - CHTA PowerPoint presentation - $1 Billion Blueprint

8. U.S. CBD Articles
   - Just Fiber – Structural Solutions
   - Airdrie company employs hemp to go green

9. Technical Brief – Golden tofu canola meal milk

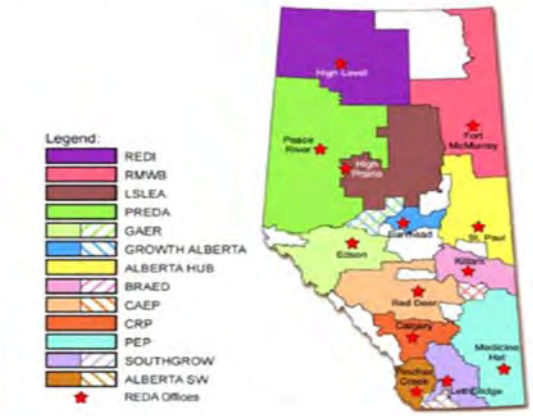
10. Paterson Global Foods (PGF) Press Release: PGF is pleased to announce the construction of Canada's most innovative oat processing facility.

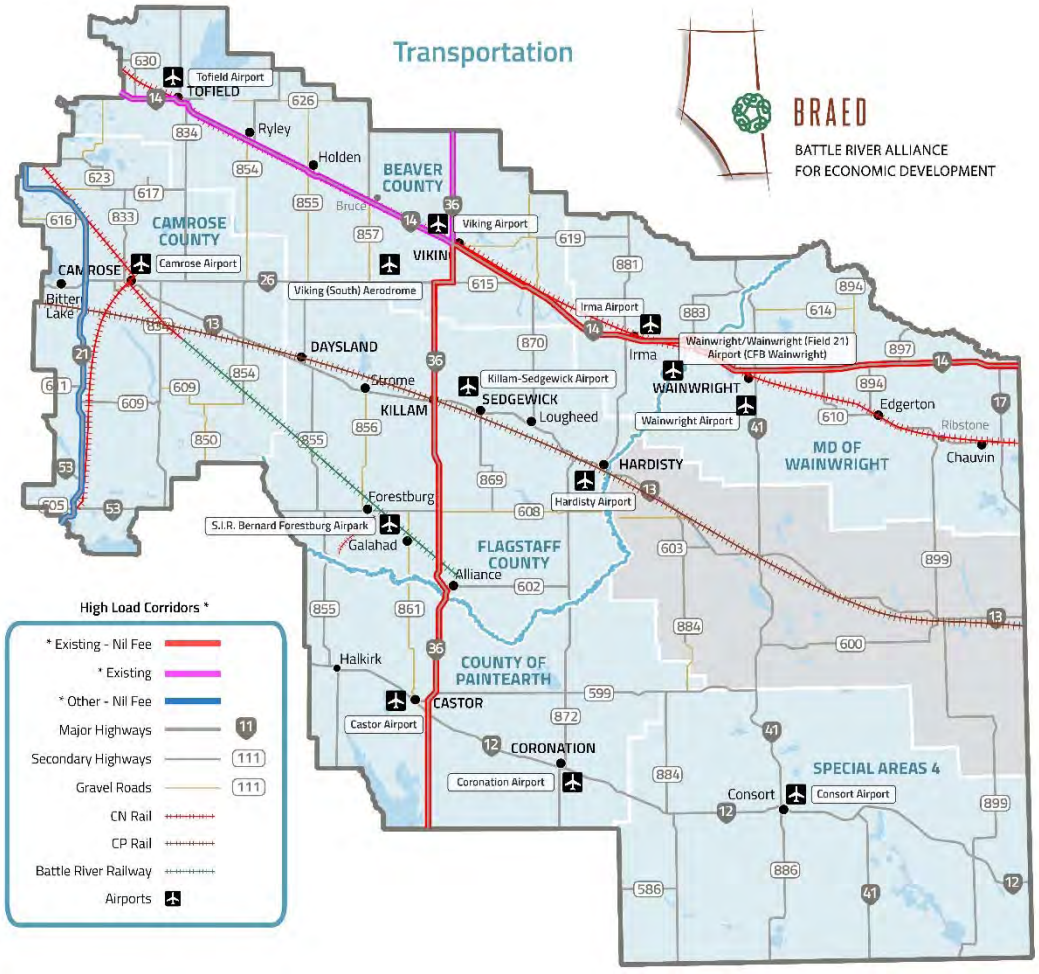
11. Chobani Webpage: Chobani oat-based drinks and snacks

12. Protein Industries Canada (PIC) Information
   - Results from PIC Stakeholder Survey
   - Building on our Natural Advantages" PIC PowerPoint presentation to CHTA conference November 2019
   - Article – Protein supercluster aims to transform food processing in Western Canada
   - PIC's Five-Year Supercluster strategy

4.1. BRAED Region Maps

REDA MAP:
BRAED is East Central – Pink (Killam)





4.2. BRAED Selected Regional Profile Information 2016

Census division	Popula-tion	% Pop change 2011 - 2016	Median age	Avg 2015 total per capita income	Post-secondary certificate, diploma or degree	Apprentice-ship, trade certificate or diploma
Alliance	154	-11.5	58.3	x	80	45
Beaver County	5,905	3.8	42.1	53,710	2,220	740
Bittern Lake	220	-1.8	40	x	65	30
Camrose	18,742	8.4	41.9	51,869	7,370	1,715
Camrose County	8,458	5.7	42.3	54,272	3,320	1,065
Castor	929	-0.3	54.3	41,377	350	125
Chauvin	335	0.3	40.9	103,145	95	30
Coronation	940	-0.7	44	48,673	320	110
Daysland	824	2.1	52.2	45,991	265	60
Edgerton	384	21.1	39.8	53,280	145	40
Flagstaff County	3,738	4.1	45.1	51,648	1,255	370
Forestburg	875	5.3	46	51,272	370	140
Halkirk	112	-7.4	53.8	x	40	15
Hardisty	554	-13.3	47.3	60,256	215	85
Holden	350	-8.1	51.5	41,057	105	55
Irma	521	14	38.2	50,732	240	65
Killam	989	0.8	38.1	52,158	360	120
Lougheed	256	9.9	39.3	x	55	30
Paintearth County No. 18	2,102	3.6	40.1	50,567	720	175
Ryley	483	-2.8	45.6	42,448	190	70
Sedgewick	811	-5.4	40.8	50,893	310	85

Tofield	2,081	-4.6	43	49,049	690	210
Viking	1,083	4	52.6	43,328	315	70
Wainwright	6,270	5.8	37.5	52,065	2,340	595
Wainwright	4,479	8.2	36.2	55,854	1,375	365
BRAED TOTAL	**61,595**	**0.051**	**44.436**	**44,146**	**22,810**	**6,410**
Census division	**Labour force**	**Employee**	**Self-employed**	**Management occupations**	**Business, finance and administra-tion occupations**	**Natural and applied sciences and related occupations**
Alliance	105	80	25	0	10	10
Beaver County	3,370	2,295	1,025	580	390	160
Bittern Lake	105	100	0	20	20	0
Camrose	9,825	8,670	1,020	1,010	1,270	340
Camrose County	4,860	3,390	1,430	1,050	655	135
Castor	435	380	55	35	40	20
Chauvin	195	165	35	20	15	10
Coronation	475	390	80	30	60	20
Daysland	335	265	70	30	60	10
Edgerton	240	200	45	40	15	0
Flagstaff County	2,075	1,270	795	645	260	40
Forestburg	405	370	30	25	35	10
Halkirk	85	70	15	0	15	0
Hardisty	370	300	65	65	50	50
Holden	170	140	30	35	20	0
Irma	280	235	45	25	20	10

Killam	520	470	50	50	90	0
Lougheed	125	90	25	0	25	0
Paintearth County No. 18	1,125	680	435	340	115	30
Ryley	230	200	35	20	50	0
Sedgewick	410	335	80	40	50	15
Tofield	1,025	875	125	90	145	45
Viking	475	435	45	30	45	15
Wainwright	3,610	3,185	385	410	380	110
Wainwright	2,345	1,560	770	530	385	35
BRAED TOTAL	**33,195**	**26,150**	**6,715**	**5,120**	**4,220**	**1,065**
Census division	**Sales and service occupa-tions**	**Trades, transport and equipment operators and related occupa-tions**	**Natural resources, agriculture and related production occupa-tions**	**Occupations in manufac-turing and utilities**		
Alliance	30	10	35	10		
Beaver County	375	960	275	85		
Bittern Lake	0	40	10	10		
Camrose	2,485	1,655	350	490		
Camrose County	670	1,080	375	170		
Castor	80	110	25	20		
Chauvin	20	55	20	25		
Coronation	85	115	60	20		

Daysland	75	45	25	25		
Edgerton	40	70	15	25		
Flagstaff County	255	385	205	60		
Forestburg	75	120	20	55		
Halkirk	20	20	15	0		
Hardisty	65	55	25	15		
Holden	30	45	10	10		
Irma	45	95	30	0		
Killam	105	85	75	10		
Lougheed	20	50	10	0		
Paintearth County No. 18	125	165	105	50		
Ryley	25	70	10	15		
Sedgewick	70	125	30	20		
Tofield	195	250	35	25		
Viking	115	120	35	10		
Wainwright	915	715	250	110		
Wainwright	300	375	235	65		
BRAED TOTAL	**6,220**	**6,815**	**2,280**	**1,325**		

4.3.Articles – Beyond Meat and Other Meat Substitutes

1. Beyond Meat partners with Canadian production facility
2. Ontario to host global test for McDonald's pulse burger
3. Beyond Meat, KFC develop fake chicken

Beyond Meat partners with Canadian production facility, plans to bring more products to Canada in 2020

SUSAN KRASHINSKY ROBERTSON › RETAILING REPORTER

PUBLISHED 15 MINUTES AGO

FOR SUBSCRIBERS

In 2020, Canada will be a strategic focus, Beyond Meat founder and chief executive Ethan Brown, seen here on May 2, 2019, said in an interview on Wednesday.

MARK LENNIHAN/THE ASSOCIATED PRESS

Beyond Meat Inc. will bring some of its production to Canada next year as the company seeks to aggressively expand in this market.

The company that peddles imitation burgers, sausages and other meat alternatives says that Canada has grown to be its second-largest market outside of the United States, out of more than 50 countries where it currently sells its products. In 2020, Canada will be a strategic focus, founder and chief executive Ethan Brown said in an interview on Wednesday.

“It’s a very progressive market for us. The consumer is moving very quickly toward a flexitarian diet, where there’s an increasing number of meals per week that are based on non-animal sources,” Mr. Brown said. “We want to commit to the Canadian consumer in a way that’s more powerful than we have to date. And we’ll do that in 2020.”

The partnership with the as-yet-unnamed Canadian company will mean that Beyond Meat products that are to be sold in Canada will be formed and packaged at a facility outside Montreal. The company’s products get their protein from pulses such as peas, lentils and mung beans – the processing of those pulses still occurs at Beyond Meat facilities in the U.S., and the resulting material will be sent to Canada for mixing, forming into products, and packaging. Over time, the company could move the earlier stages of production to Canada as well, but Mr. Brown did not provide a timeline for that.

“You’ll see us continue to put production in the markets where the consumers are responding to our products,” he said.

The company is also planning to introduce Beyond Beef, an imitation ground beef, in grocery stores in Canada. Beyond Meat has been selling its burger patties in grocery stores in Canada since the summer, and is now distributed in more than 4,000 stores. On a global basis, roughly 50 per cent of the company’s sales come from retail stores, while the other half is from food service such as fast-food restaurants.

But choosing those Beyond Meat patties at the meat counter is not cheap: They can sell for around $8 for two patties, something that Mr. Brown said he wants to change by growing big enough to find economies of scale.

“We’re going to be able to under-price animal protein sooner than everybody thinks,” he said, citing a partnership with Dunkin’ Donuts in the U.S. where the Beyond Meat breakfast sandwich is selling for the same price as its meat equivalent.

Mr. Brown is also hoping to expand food-service partnerships. In September, McDonald’s Corp. announced it would test a Beyond Meat burger in 28 restaurants in Southern Ontario. That test is continuing.

“We’re not allowed to comment on the actual test results, but I feel very confident that we’ll continue to grow with McDonald’s and continue to pursue additional markets," Mr. Brown said. "But it’s really up to them.”

Also in September, Tim Hortons said it would remove Beyond Meat breakfast sandwiches from its menus except in British Columbia and Ontario. Mr. Brown said that he was not disappointed with the results, pointing out that more than half of Tim Hortons’ Canadian locations are in the two provinces that continue to sell the breakfast sandwich.

Going forward, Beyond Meat plans to increase its marketing efforts in Canada, including working with Canadian “influencers” and athletes to push the message that plant-based foods are healthier than meat. Imitation-meat products are still highly processed, and often contain high levels of salt and fat. Mr. Brown said that the company is focusing on developing its recipes so that the product is “indistinguishable” from meat and on improving nutrition.

Mr. Brown said he also wants to push the message that meat alternatives use less land, water and energy to consumers who are increasingly focused on the consequences of climate change.

Ontario to host global test for McDonald's pulseburger

By GFM Staff

Published: September 26, 2019
Crops, **Peas**, **Pulses**

The biggest quick-service dining chain on the planet is set to use southwestern Ontario as the global test market for its first foray into Beyond Meat.

McDonald's announced Thursday it will run a 12-week test for a plant-based burger it calls the "P.L.T." exclusively at 28 restaurants in the region starting Monday.

"This test allows us to learn more about real-world implications of serving the P.L.T., including customer demand and impact on restaurant operations," Ann Wahlgren, McDonald's vice-president of global menu strategy, said in a release Thursday.

"McDonald's Canada has a proud legacy of innovating across our menu and we're excited that Canadians will be the first in the world to try the P.L.T.," McDonald's Canada chef Jeff Anderson said in a separate release from the chain's Canadian arm.

"We're eager to hear what our customers love about the P.L.T. to help McDonald's around the world better understand how a plant-based burger works in our restaurants."

The P.L.T., short for "Plant. Lettuce. Tomato" is to be made with a plant-based patty developed "exclusively by McDonald's, for McDonald's," using product from Los Angeles-based meat-substitute processor Beyond Meat.

The sandwich "enables us to assess Canadian's growing demand for plant-based protein options as well as restaurant experience," Michaela Charette, head of consumer insights for McDonald's Canada, said Thursday. "During this test we'll continue to listen to our guests to understand their tastes."

Already available both at retail grocers and at other quick-service chains, Beyond Meat's product lines are made with plant-based ingredients including pea, mung bean and rice protein, canola oil, coconut oil, potato starch, sunflower lecithin and beet juice, among others.

Publicly traded Beyond Meat's shares — which had slipped earlier this month, after Tim Hortons announced it would pare back its Beyond Meat offerings in Canada to the Ontario and B.C. markets only — rose to around US$152 in Nasdaq trading Thursday morning, up from Wednesday's close of US$138.32, its lowest level since June.

McDonald's Beyond Meat burger is a relatively late entry in Canada's dining market, where chains including A+W, Tim Hortons, Subway and White Spot have already launched or are testing Beyond Meat-based products on their menus. Another Canadian chain, Harvey's, recently launched a plant-based burger developed with Maple Leaf Foods subsidiary Lightlife.

McDonald's today has about 1,400 stores in Canada, which became the chain's first market outside the U.S. when it opened a restaurant in Richmond, B.C. in 1967.

The company has also been a staunch promoter of Canadian beef, billing itself as the largest buyer of ground beef in the Canadian restaurant industry at more than 67 million pounds per year.

The chain in 2014 also undertook a 30-month Verified Sustainable Beef Pilot project in Canada, which it billed as the first program to make the criteria of the Global Roundtable for Sustainable Beef actionable up the entire beef value chain.

That program involved 121 ranches, 34 backgrounders, 24 feedlots, two beef processing plants and a burger patty plant, the company said, all verifying their operations as sustainable through third-party assessment. — *Glacier FarmMedia Network*

Beyond Meat, KFC develop fake chicken

LOUISVILLE, Ky. — It's finger-lickin' fake chicken.

Kentucky Fried Chicken plans to test plant-based chicken nuggets and boneless wings today at one of its restaurants in Atlanta. Depending on customer feedback, the chain could expand the test to other markets.

California-based startup Beyond Meat said it developed the new product specifically for KFC. It's made with wheat protein coated in a proprietary breading.

Beyond Meat also sells plant-based burgers, sausages and meat crumbles at grocery stores and some fast food chains like Carl's Jr. and Del Taco. Frozen plant-based chicken strips were the first product Beyond Meat sold, starting in 2012. But the company pulled them off the market earlier this year because it wanted to improve the recipe.

Restaurants are responding to a surge in consumer demand for plant-based meats as people seek healthier, more sustainable food. U.S. sales of meat substitutes are expected to jump 78 per cent to US$2.5 billion between 2018 and 2023, according to Euromonitor.

Beyond Meat already has some serious competition in the plant-based chicken market. Tyson Foods, one of the world's largest meat producers, recently announced plans to sell nuggets made from pea protein. Chicken producer Perdue Farms is also making nuggets, tenders and patties from a blend of chicken and vegetables.

— The Associated Press

4.4. Articles – Merit Functional Foods

Merit Functional Foods' Announces Protein Portfolio Is FDA GRAS Notified

Press Release

Nov. 14, 2019 at 3:37 pm

WINNIPEG, Canada— Merit Functional Foods has announced that its high-protein product portfolio has obtained Generally Recognized As Safe ("GRAS") status from the US Food and Drug Administration ("FDA"). This announcement comes on the heels of the company's debut at the 2019 SupplySide West trade show.

The newly launched Merit Functional Foods is seeking to uproot the food and beverage industry's perception of plant-based proteins, producing high-quality plant protein ingredients that exceed standards for purity, solubility, taste, and more.

Merit is a joint venture between former executives of Manitoba Harvest Hemp Foods and Burcon NutraScience Corporation. Merit is investing in a 88,000 square foot production facility in Winnipeg to produce high-quality pea and canola proteins. The state-of-the-art facility, which is scheduled to be completed by the fourth quarter of 2020, will be the only commercial facility in the world with the capability to produce food grade canola proteins. Merit's commercial-scale protein extraction capabilities allow the company to meet market demand for specialty protein ingredients, which have been in development for more than 19 years.

Merit's product portfolio currently consists of three product family offerings, sourced and produced in Canada: pea, non-GMO canola, and MeritPro™, a unique lineup of nutritionally complete proteins. Merit's ingredient portfolio aligns with numerous key consumer concerns, including clean label, allergen free,

gluten-free, non-dairy, non-GMO, vegan, and, now, GRAS. Its canola protein received GRAS notification in August 2010, and now GRAS notification was extended to Merit's pea protein ingredients, Peazazz® and Peazac®.

"We're thrilled to have received this designation from the FDA, as it is a significant milestone in the introduction of our plant protein ingredients to the industry," Merit Co-CEO Ryan Bracken said. "This substantiates the extensive amount of development, research, and review that has been invested in these game-changing ingredients."

Burcon's President and CEO Johann F. Tergesen adds, "Now that Peazazz and Peazac pea proteins are GRAS notified, Merit's pea and canola novel plant proteins are FDA GRAS. It is exciting to have achieved this significant commercial milestone, which is important for the acceptance and use of these proteins by global food and beverage companies."

Through its GRAS notification program, the FDA reviews all scientific data that companies submit for their ingredients and issues a Letter of No Objection confirming that they do not have any concerns or questions regarding the ingredients' safety.

For more information on Merit Functional Foods, visit meritfoods.com.

About Merit Functional Foods

Established in 2019, Merit Functional Foods is committed to exceeding expectations for plant based protein, providing the market with the highest quality protein ingredients and blends that offer unmatched purity, exceptional taste, and excellent solubility.

About Burcon NutraScience Corporation

Burcon is a global technology leader in the development of plant-based proteins. The company has developed an extensive portfolio of composition, application, and process patents originating from a core protein extraction and purification technology. For more information about the company, visit burcon.ca.

4.5. Webpage – Botaneco canola and other oilseed products

Source: https://www.botaneco.com/food-and-feed

BOTANECO SEES GOLD IN CANOLA AND OTHER OILSEED CROPS

Posted: **Oct 25, 2018** | Category: PIC in the News

'Our core philosophy is that nature is perfectly designed. We don't have to manufacture or reinvent it'

Western Canada has a well-earned reputation as a heavyweight commodity producer, and no homegrown crop has made a bigger splash in recent decades than canola.

accounting for $20.7 billion of revenues in 2017 or a quarter of all farm cash receipts.

Nearly 90 per cent of those revenues emanate from Alberta, Saskatchewan and Manitoba, where thousands of producers have capitalized on growing global demand for canola's protein-rich oilseed as a source of heart-healthy vegetable oil or high-quality feed for cattle, poultry, swine and fish.

It's a remarkable growth story, but it's far from over. The next chapter in the evolution of canola and other oilseed crops is now underway, as the focus shifts from conventional production, crushing and distribution to value-added processing and specialty-product marketing.

A new generation of innovative players are developing less energy intensive, more environmentally friendly ways to extract high-value, high-functionality components from canola and other oilseeds, and marketing those ingredients to major consumer products firms.

Botaneco Inc. is one of the emerging stars. The small but rapidly growing Calgary-based company gently isolates unique components of plants as ingredients used in branded personal-care, food and animal-feed products. The 35-employee firm has been turning heads since winning the 2017 BioAlberta Life Sciences Company of the Year Award.

Botaneco sees its process as core to solving some big challenges for the delivery of natural and sustainable sources of protein. To support this mission, Botaneco has joined the Protein Industries Canada (PIC) supercluster and its affiliate, Plant Protein Alliance of Alberta (PPAA), in an effort to position Canada globally as a leading source of high-quality plant protein.

proteins. This initiative in protein processing and formulation as it relates to food and feed is a major focus for Botaneco today.

"We've taken a really innovative technology and focused our efforts on pulling out these amazing ingredients from oilseeds, just the way that nature made them. When you do that there is great functionality around them," says company CEO James Szarko, a veteran entrepreneur who launched Botaneco in 2013.

His goal: to ensure that Botaneco plays a leading role in mobilizing innovation and driving Canada's success in the plant-protein space.

"Traditionally, the technology around oilseed innovation involves crushing seeds and extracting oil and meal. Often it requires a lot of heat and results in a denaturing of the proteins (i.e. rendering them insoluble), and the oil is essentially sold as a commodity. Our company is focused on isolating natural ingredients in oilseeds that are incredibly functional."

Botaneco uses four key oilseed crops to produce its high-value ingredients, including canola, hemp and sunflower for food products, and safflower for the personal-care market.

square foot Calgary production plant, where no harsh chemicals or solvents are used in the manufacturing process, only water.

CapSol is a stable, safflower-based ingredient used in sunscreens to meet or exceed specified SPF (Sun Protection Factor) values, while reducing the need for chemicals like OMC (Octyl Methoxycinnamate), which is used to filter out UVB (the sun's short-wave rays), and Avobenzone, which filters out UVA (long-wave rays.)

"We're able to reduce the chemical ingredients while getting virtually the same performance benefits," says Szarko.

Karmyn, Botaneco's second key personal-care product, is a water-dispersible safflower storage protein containing high levels of arginine, an amino acid that hair-care product makers value for its hair strengthening and damage-prevention qualities. Karmyn also helps freshly dyed hair retain its colour longer, when used as an ingredient in conditioners.

Botaneco ingredients can be found in some of the world's most well-known personal-care brands on the market today. "They buy our product because it meets the criteria they have, which is to get as truly natural as they can possibly be," says Szarko.

The company's third key product, Hydresia, is a specialized spherical-shaped oleosome (a cellular subunit) that's found naturally in oil-bearing plant seeds such as safflower and sunflower. Oleosomes act as reservoirs to protect the emollient (skin softening) plant oil and vitamin E. The result is a "next-generation encapsulation system" that can deliver the oil and vitamin to the skin over time, in a controlled-release manner, yielding longer-lasting moisturizing benefits, while absorbing and protecting fragrances and essential oils.

their integrity. If you keep things the way nature made them, you can deliver tremendous functionality," says Szarko.

Although Botaneco is growing fast it's still a small company, with annual revenues of less than $10 million. But it has big future growth plans, notably in the food and feed markets.

In particular, Botaneco sees sizeable growth potential as a supplier of oilseed-based ingredients to the acquaculture feed industry. Botaneco and an unnamed partner are currently collaborating on the development of a "substantial" commercial plant to supply the growing industry as early as 2020.

"Today our production capacity is 3,000 tonnes and our facility is primarily geared towards the personal-care market. But we have plans to build a 50,000-tonne facility in the not-too-distant future, and personal care will probably be a tenth the size of our food and feed business," says Szarko.

"We'd love to build it in Alberta, right in our backyard. If we built a 300,000-tonne facility, which is not inconceivable in terms of what we're planning for, one plant alone could generate more than half a billion dollars of revenue."

*Gary Lamphier, former business columnist for the Edmonton Journal, is principal of **Lamphier Communications**.*

*Article originally posted by **Plant Protein Alliance of Alberta***

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By becoming a member of Protein Industries Canada, you will have the opportunity to be involved in collaborative projects that will transform Canada's agriculture and food processing sectors. Together, we will build a shared competitive advantage for Canada.

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4.6. Research report – health benefits of yellow peas fibre consumption

Clinical Nutrition
Volume 36, Issue 1, February 2017, Pages 126-133

Randomized control trials

Consuming yellow pea fiber reduces voluntary energy intake and body fat in overweight/obese adults in a 12-week randomized controlled trial

Jennifer E. Lambert [a], Jill A. Parnell [b], Jasmine M. Tunnicliffe [a], Jay Han [c], Troy Sturzenegger [c], Raylene A. Reimer [a, d]

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Received 20 April 2015, Accepted 28 December 2015, Available online 11 January 2016.

https://doi.org/10.1016/j.clnu.2015.12.016

Summary

Background & aims

The purpose of this randomized, double-blind, placebo-controlled study was to assess the effects of yellow pea fiber intake on body composition and metabolic markers in overweight/obese

adults.

Methods

Participants (9 M/41 F; age 44 ± 15 y, BMI 32.9 ± 5.9 kg/m^2) received isocaloric doses of placebo (PL) or pea fiber (PF; 15 g/d) wafers for 12 weeks. Outcome measures included changes in anthropometrics, body composition (DXA), oral glucose tolerance test (OGTT), food intake (*ad libitum* lunch buffet), and biochemical indices.

Results

The PF group lost 0.87 ± 0.37 kg of body weight, primarily due to body fat (–0.74 ± 0.26 kg), whereas PL subjects gained 0.40 ± 0.39 kg of weight over the 12 weeks (P = 0.022). The PF group consumed 16% less energy at the follow-up lunch buffet (P = 0.026), whereas the PL group did not change. During the OGTT, glucose area under the curve (AUC) was lower in PF subjects at follow-up (P = 0.029); insulin increased in both groups over time (P = 0.008), but more so in the PL group (38% higher AUC vs. 10% higher in the PF group). There were no differences in gut microbiota between groups.

Conclusions

In the absence of other lifestyle changes, incorporating 15 g/day yellow pea fiber may yield small but significant metabolic benefits and aid in obesity management.

Clinical Trial Registry: ClinicalTrials.gov NCT01719900.

Previous Next

Keywords

Legume; Dried peas; Obesity; Body weight; Functional food

Abbreviations

DXA, dual X-ray absorptiometry; tAUC, total area under the curve; OGTT, oral glucose tolerance test; PF, pea fiber; PL, placebo; VAS, visual analog scales

Recommended articles Citing articles (12)

4.7. Articles – CBD Canadian

1. Health claims for pain and other uses
2. Hemp producer signs UFC deal in fiscal year that saw sales soar 349%
3. CHTA PowerPoint presentation - $1 Billion Blueprint

CBC

Health

'You must be very careful': Common questions about CBD health claims for pain and other conditions answered

Doctors weigh the science behind cannabidiol claims

CBC News · Posted: Sep 18, 2019 4:00 AM ET | Last Updated: 10 hours ago

An oral administration syringe loaded with CBD hemp oil for treating a severely-ill child is shown at a home in Colorado Springs, Colo., in 2014. (Brennan Linsley/The Associated Press)

comments

Cannabidiol, or CBD oil, is promoted for a wide range of medical conditions. Recently, a review for doctors weighed the science behind the claims.

The Clinicians' Guide to Cannabidiol and Hemp Oils was published earlier this month in the journal Mayo Clinic Proceedings.

CBD is a compound found in the cannabis plant. It is not intoxicating, Health Canada said.

As of October 2018, the sale of dried cannabis, fresh cannabis, cannabis oil, cannabis plants and cannabis seeds are permitted under the the Cannabis Act.

As consumer interest in CBD grows ahead of the Oct. 17 legalization of cannabis edibles, extracts and topicals, here's a primer to answer common questions about its health claims for seizures, pain and other conditions.

What is CBD approved to treat?

Epidiolex, a purified form of plant-based CBD, is the only CBD-related treatment approved by the U.S. Food and Drug Administration (FDA). It is used to treat severe forms of epilepsy. Epidiolex isn't listed in Health Canada's database of medications approved for use in this country.

Health Canada assigns a drug identification number (DIN) to all drug products evaluated and authorized for sale in this country. To qualify, a drug manufacturer needs to provide information including dosing, strength and how it's taken.

"Currently, there are two cannabis-related drugs that have a DIN and are authorized for sale in Canada," a spokesperson for Health Canada said in an email.

Nabilone, a synthetic tetrahydrocannabinol, or THC, product is approved to treat nausea. THC is the main psychoactive component in cannabis that gives users a high.

The other drug with a DIN is Sativex, which is manufactured from whole botanical extracts and contains THC and CBD, according to Health Canada. Sativex is added to treatments aimed at relieving spasticity in adults with multiple sclerosis. Spasticity is a muscle-control disorder.

No CBD-specific product has a DIN.

As well, no other "cannabis-related drug (including fresh or dried marijuana or cannabis oil) has been approved to be marketed as a drug for therapeutic use and sale in Canada," Health Canada said.

What is CBD commonly used for?

There are anecdotal reports from users of CBD helping with certain types of pain, such as nerve-related back pain.

"Chronic pain management continues to challenge patients and physicians alike, and investigation into potential therapies such as CBD and hemp oils is a promising area for the future of clinical pain management for both pain relief as well as addiction management," Dr. Karen Mauck, an internist at Mayo Clinic, and her co-authors wrote.

Dr. Hance Clarke, director of pain services at Toronto General Hospital who wasn't involved in the U.S. paper, said he starts by asking patients what symptoms they want to use CBD to treat.

> “It's one of the first times in Canadian history where a medication has made it to the population without the science actually leading us there.”
>
> *- Dr. Hance Clarke, director of pain services at Toronto General Hospital*

"The evidence has not caught up to the story that's in the public," Clarke said. "It's tricky. It's one of the first times in Canadian history where a medication has made it to the population without the science actually leading us there."

The world is looking to Canada for answers on CBD, said Dr. Hance Clarke. (University Health Network)

Physicians need to work with patients to figure out what people are using, the levels in their body and what's actually helped and what hasn't.

"The world is looking to Canada over the next five to 10 years," Clarke said. An evidence-based perspective on cannabis is needed rather than solely industry's, he said.

Canada's Arthritis Society said there's limited clinical evidence so far on the relative benefits and risks of medical cannabis to treat osteoarthritis and rheumatoid arthritis.

> "CBD now is widely used by people for all kinds of disease, in particular anxiety, panic attack, bipolar disorder, depression. But we don't know if CBD is really good for these kind of diseases."
>
> *- Dr. Gabriella Gobbi*

In January, research into CBD's effects on pain and anxiety in lab rats was published in the scientific journal Pain.

"CBD now is widely used by people for all kinds of disease, in particular anxiety, panic attack, bipolar disorder, depression," said Dr. Gabriella Gobbi, the study's author and a psychiatrist at McGill University's faculty of medicine in Montreal. "But we don't know if CBD is really good for these kinds of diseases."

Only clinical trials in humans can show if CBD is really effective for an illness, Gobbi said.

In Canada, pharmaceutical companies are sponsoring clinical trials to test CBD products in people.

How do you know what's in the product?

Depending on what part of the plant is extracted, different components will be present in the oil, the Mayo Clinic authors said. Their list of what clinicians should look for include:

- Manufacturing standards certification, such as pesticide or herbicide testing.
- European Union, Australian or Canadian organic certification.
- Lab testing to confirm cannabinoid levels and the absence of heavy metals.

"We see variations from batch to batch where patients are doing well on something, and potentially the next time they seek that same product, potentially they're not seeing the same effects," Clarke said.

A research letter published in 2017 in JAMA found nearly 70 per cent of CBD extracts sold online were mislabelled.

"A lot of CBD oil can have very little or contain lots of THC, so you must be very careful," Gobbi said. "We need more quality control."

What side-effects have been reported?

In larger studies on CBD treatment for epileptic patients, it was associated with drowsiness, decreased appetite and diarrhea in up to 36 per cent of people, the Mayo Clinic authors said,

adding the side-effects were less severe and frequent compared with a conventional anticonvulsant medication.

CBD oil products can have very little of the active ingredient or contain a lot of THC, the main psychoactive component in cannabis that gives users a high. (Tijana Martin/The Canadian Press)

The FDA said its review of a marketing application for Epidiolex suggested potential for liver injury associated with CBD.

> “You can't just self-treat.”
>
> *- Dr. Gabriella Gobbi*

"You can't just self-treat," Gobbi said.

What about drug interactions?

The main drug interactions doctors and pharmacists look for are drugs, such as morphine, oxycodone, sleeping pills, antidepressants or antipsychotics, that already make you sleepy, confused or impair co-ordination.

"If you're taking those medications to begin with and you use cannabis, we'd expect that those side effects would get worse," said Kelly Grindrod of the University of Waterloo's School of Pharmacy.

Doctors should look for lab testing to confirm cannabinoid levels when looking for products for patients, researchers say. (Guillaume Payen/SOPA Images/LightRocket/Getty)

People should talk to their physician, nurse or pharmacist to discuss potential drug interactions when determining whether to try CBD.

Maddie Brown, a registered practical nurse and cannabis consultant based in Ottawa, helps patients with medical cannabis prescriptions understand how CBD works and obtain it.

"I'm definitely most concerned about blood thinners," Brown told CBC Radio's *White Coat, Black Art*. "CBD can make Coumadin [a blood thinning medication] more potent."

The general advice is to start low and go slow, especially if taking medications that are known to interact, Grindrod said.

With files from CBC's Christine Birak

NUTRA
ingredients-usa.com

Hemp producer signs UFC deal in fiscal year that saw sales soar 349%

By Hank Schultz
16-Sep-2019 - Last updated on 16-Sep-2019 at 12:44 GMT

Hemp/CBD player Aurora Cannabis announced a huge gain in sales in a fiscal year that saw the company sign a 'research partnership' with the UFC, a combat sports league.

Aurora is a company that until recently was focused primarily on the medical and then later consumer cannabis markets. The Canadian company has expanded its greenhouse produciton faclities, and grew almost 60,000 kg of cannabis in its fiscal 2019

In its recent year ending earnings statement, Aurora, which manufactures medical marijuana and vape prodicts, announed a 349% rise in sales. The company is positioning itself for wider legalization of edible products, specifically those focused on CBD.

UFC partnership

To that end, Aurora announced in July a partnership with UFC, a combat sports league that promotes mixed martial arts events. The aim of the research partnership is to investigate the effects of CBD on pain and recovery for high stress athletes

"This groundbreaking research will generate the data required to establish CBD as an accepted therapeutic ingredient," said Aurora chief corporate officer Cam Battley.

"The intellectual property from this research will lead to the creation of science backed, hemp derived CBD products that will combat the rapidly growing market of untested CBD treatments. We're excited about the opportunities

ahead for us in the U.S. market and we'll continue to take a measured, but strategic approach to how we enter this space," he added. Battley made his comments as part of an earnings call with analysts that was posted in transcript form on the site seekingalpha.com.

"We are laser focused on CBD derived from hemp and the various opportunities that exist in that. When USA passed the Farm Act they leapfrogged across the rest of the world or over the rest of the world in CBD derived from hemp," added Aurora CEO Terry Booth.

Acquisitions to speed market entry

Booth said Aurora will be investigating further acquisitions in the US market to speed its market entry. But decided where to place its focus will be tricky while the regulatory situation remains unclear. The US Food and Drug Adminstration is in the process of wading through more than 4,000 comments that it received in the wake of the May 31 meeting it convened in Washington DC on CBD. The agency has said it intends to make a statement on CBD regulation sometime in the fall. At teh moment the agency's postion is that CBD is not a legal dietary ingredient and should not be used in dietary supplements or foods. That determination is ranked against the stark reality of a huge market that has grown up in recent years that has paid little to no heed to FDA's stated position.

"We are anticipating that to be isolate will be the first step from the FDA as an ingestible mainly because there are 112 or 113 cannabinoids in cannabis and they have not been tested by the World Health Organization. The WHO has come out and said that CBD is safe as an ingestible, but they've put brackets around that sentence. This is only for pure CBD," Booth said.

"And I think the phrase is commonly misused, 'a broad spectrum CBD.' There is no such thing. It's broad spectrum cannabinoids minus the THC derived from hemp and/or cannabis. So we are hoping the broad spectrum is something that is approved for ingestibles as we feel it's more effective, but the first step in those ingestibles may indeed be an isolate. So we're making sure both of those bases are covered in our review of companies that participate in that industry in the United States," he said.

Earnings details

Aurora announced sales of $249 million CAD ($188 million USD) in its fiscal 2019. Despite the rapid rise in sales, the company has continued to lose money, reporting losing more than $11 million CAD in the fourth quarter, which was a significant improvement over the third quarter, which the company reported a loss of $36.6 million CAD.

RELATED TOPICS: Markets, Financial focus, Regulations, Legislation & Enforcement, CBD / Hemp, Botanicals, Cognitive function, Sports nutrition, Inflammation

CANADIAN HEMP TRADE ALLIANCE

$1 BILLION BLUEPRINT

Speech Resource
September 2019

CHTA ACCC
Canadian Hemp Trade Alliance
Alliance Commerciale Canadienne du Chanvre

HEMP IS CANNABIS, BUT ITS NOT MARIJUANA

- Cannabis Sativa L. with less than 0.3% THC in the leaves and flowering head
- Multiple market opportunities
- Hemp seed for food
  - Dehulled Hemp Seed
  - Hemp Seed Oil
  - Protein Concentrate
- Other compelling opportunities on the horizon
  - Feed
  - Fibre
  - Fractions … Many Active Ingredients!

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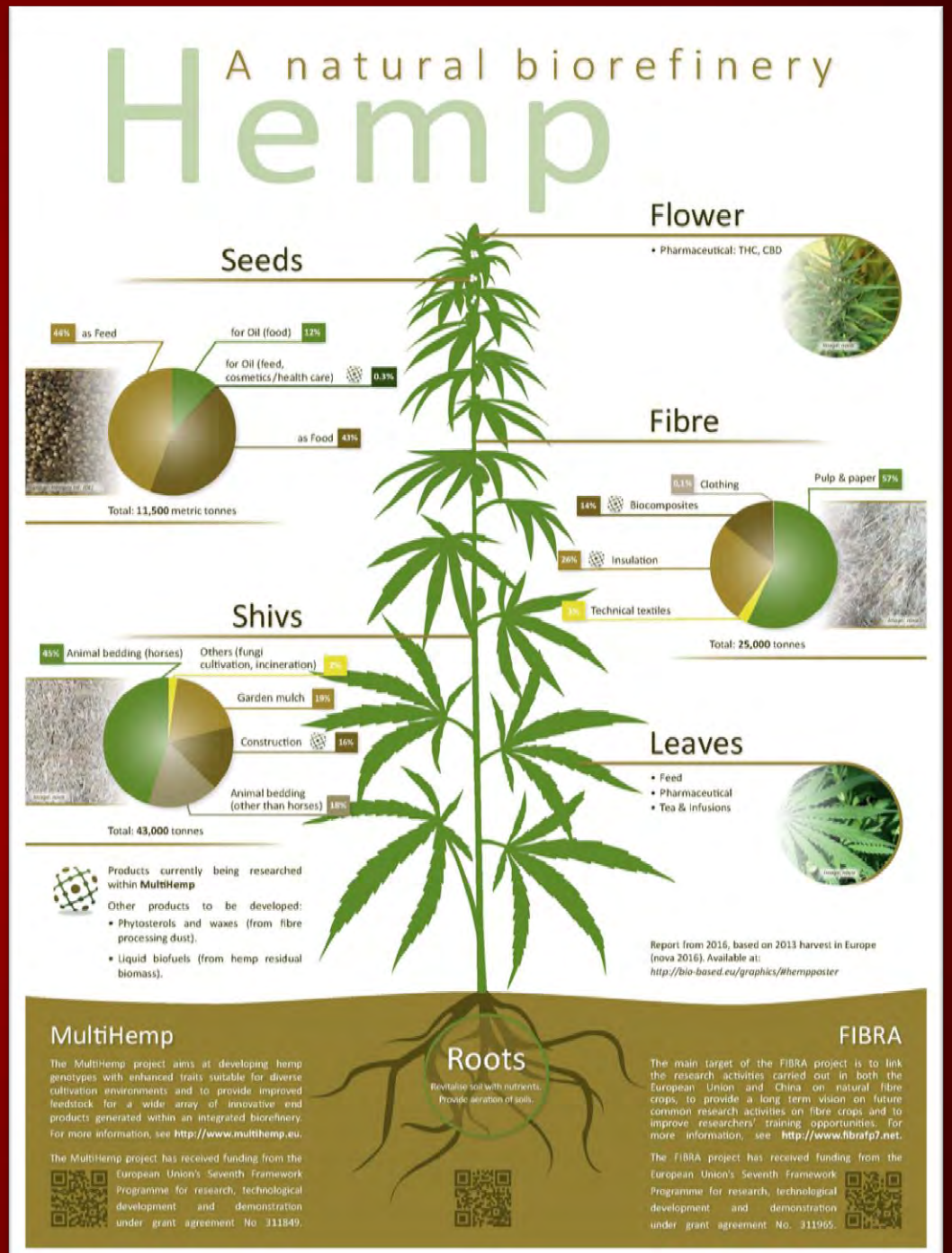

WHO IS THE CANADIAN HEMP TRADE ALLIANCE?

The Canadian Hemp Trade Alliance (CHTA) is a federally-registered not-for-profit corporation. It was incorporated in 2003 and has developed a strong membership base and program of work. The business of CHTA is directed by the Board of Directors and implemented by management with the support of committees.

Vision

CHTA will become the "go to" organization for industry, government, and consumers looking for expertise and insight into Hemp Food, Fibre, Feed and Fractions in Canada, creating a $1B industry by 2023.

Mission

To champion a diverse and robust Canadian hemp industry which benefits all stakeholders along the value chain.

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CANADIAN HEMP TRADE ALLIANCE PRIORITIES

1. Governing with Excellence – Board Governance and Committee Structure
2. Government Relations – Clear Communication and Advocacy Goals
3. Promotion and Research Agency Support – Administration Support
4. Public Trust – Education and Awareness
5. Membership – Inform, Communicate and Grow
6. Research Development – Science and International Market Development
7. Risk Management – Standards and Specifications

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COMMITTEES: WHERE THE WORK IS DONE

1. Executive – Supporting the Board
2. Governance – Home of Policies and Procedures
3. Audit and Finance – Keeping the money organized
4. Government Relations – Policy and Regulatory Advocacy
5. Market Development – Promotion and Trade Programming
6. Research – Genetics and Product Enhancement
7. Standards – Domestic and International

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CHTA IS MEMBER DRIVEN

- 394 members from across the hemp value chain:
  - Farmers (198);
  - Manufacturers/Processors (88);
  - Wholesale/Retail (47);
  - Research (12);
  - Hemp Breeder/Seed Supplier (12);
  - Governments (14); and
  - Consultants (23)
- Members from 9 of 10 Canadian provinces
- Directors are elected by the members
- Officers are elected by the Board

Province	Members	2018	
		Acres	Hectares
Saskatchewan	82	27,119	10,975
Alberta	107	30,670	12,142
Manitoba	58	11,549	4,674
Other	147	8,590	3,746
Total	394	77,928	31,537

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CANADIAN HEMP INDUSTRY SWOT ANALYSIS

- STRENGTHS
  - Current global leadership position in hemp food production
  - Knowledge and experience of stakeholders since IHR 1998
  - Industry driven, industry focused, entrepreneurial energy
- WEAKNESSES
  - Still a small, emerging industry with limited resources for the many jobs to undertake
  - Lack of stable funding for industry development

CHTA ACCC
Canadian Hemp Trade Alliance
Alliance Commerciale Canadienne du Chanvre

CANADIAN HEMP INDUSTRY SWOT ANALYSIS

- OPPORTUNITIES
  - Emerging market demand for many hemp-derived products
  - Investor interest stimulated by regulatory changes
  - Cannabis discussion at federal level with renewed political interest
- THREATS
  - Still a small, emerging industry – lack of awareness with consumers
  - Foreign competition – EU, China looking at food market, US cultivation in the future…"window of opportunity" for leadership could close quickly
  - Confusion in the "cannabis" space – fighting to distinguish between hemp and marijuana

CHTA ACCC
Canadian Hemp Trade Alliance
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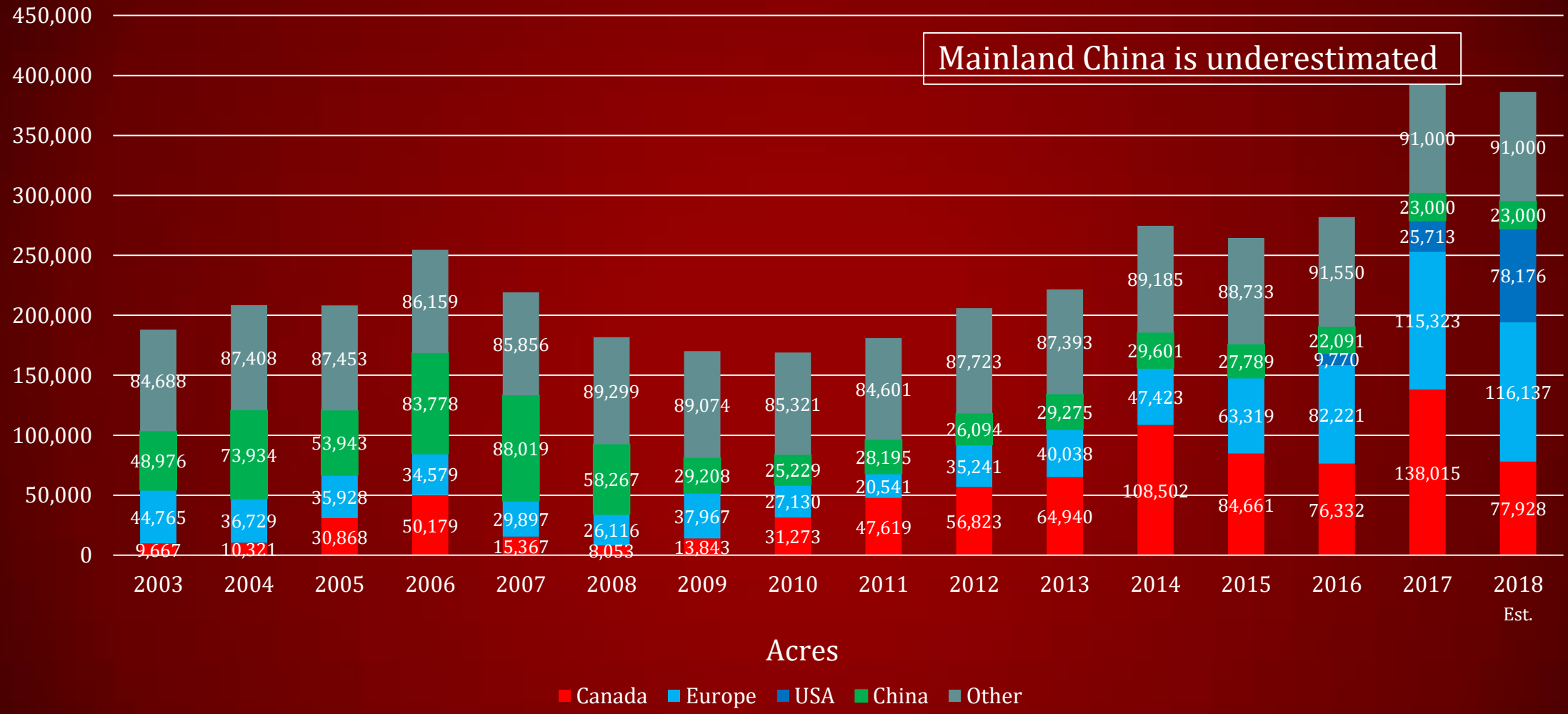
HEMP IS GROWING WORLDWIDE…
PROPELLED BY FOOD, FEED, FIBRE AND FRACTIONS



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Canadian Hemp Trade Alliance
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…by seizing the value of the whole hemp plant

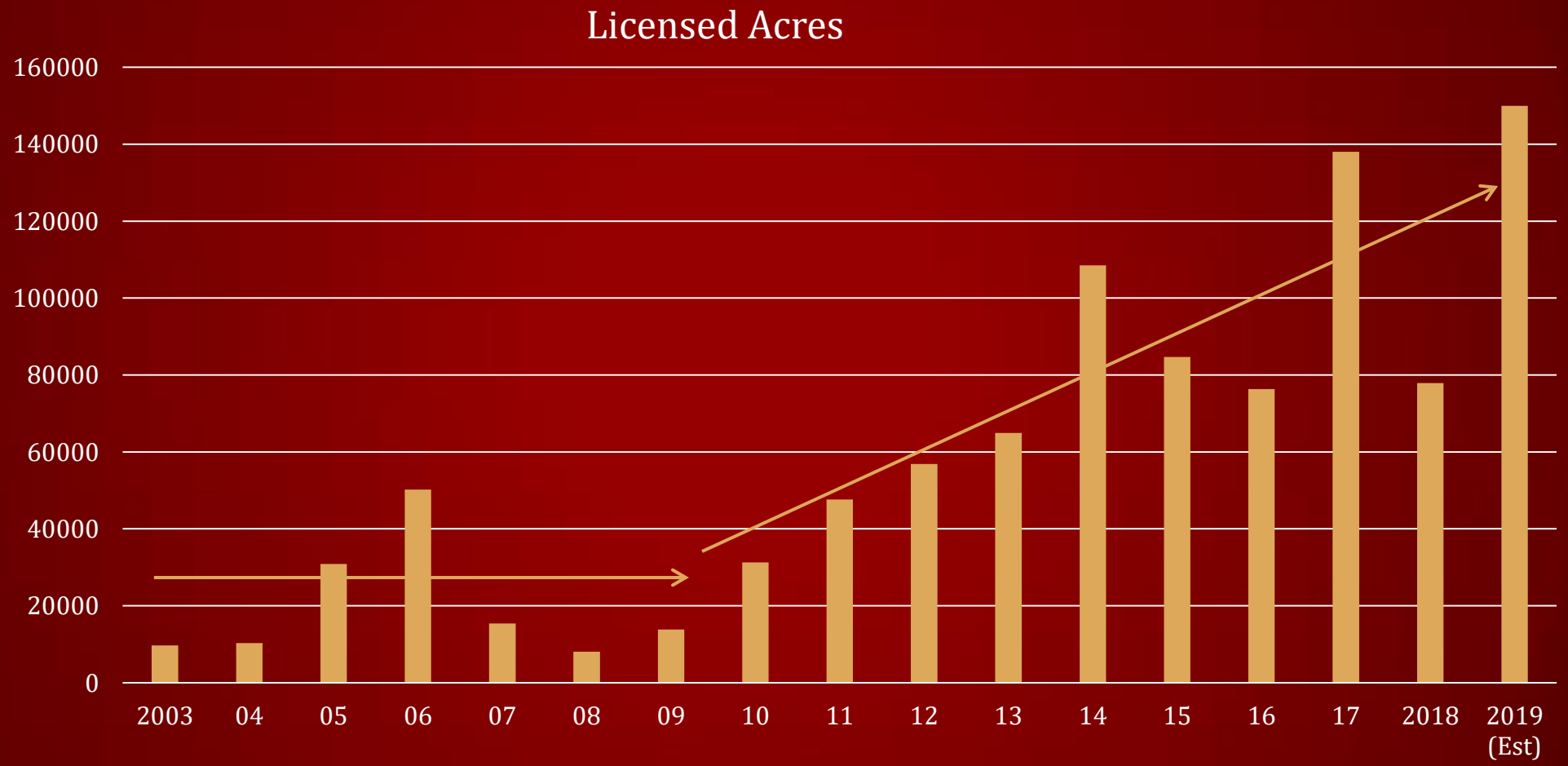
HOW LARGE IS THE CANADIAN HEMP INDUSTRY?

Metric	2018	Source/Assumption
Export Sales	$96 million	Statistics Canada
Domestic Sales	$42 million	Estimated from industry interviews
Jobs	$94 million	9.5 FTE/$1M wholesale sales @ $72,000 TC/FTE
Invested Capital	$53 million	2.7x wholesale sales*, amortized over 7 years
TOTAL INDUSTRY	$285 million	

* Average valuation of 3 Canadian acquisitions

CHTA ACCC
Canadian Hemp Trade Alliance
Alliance Commerciale Canadienne du Chanvre

HEMP IS EXPANDING IN CANADA… PROPELLED BY FOOD MARKET DEMAND



1 hectare=2.47 acres

CHTA ACCC
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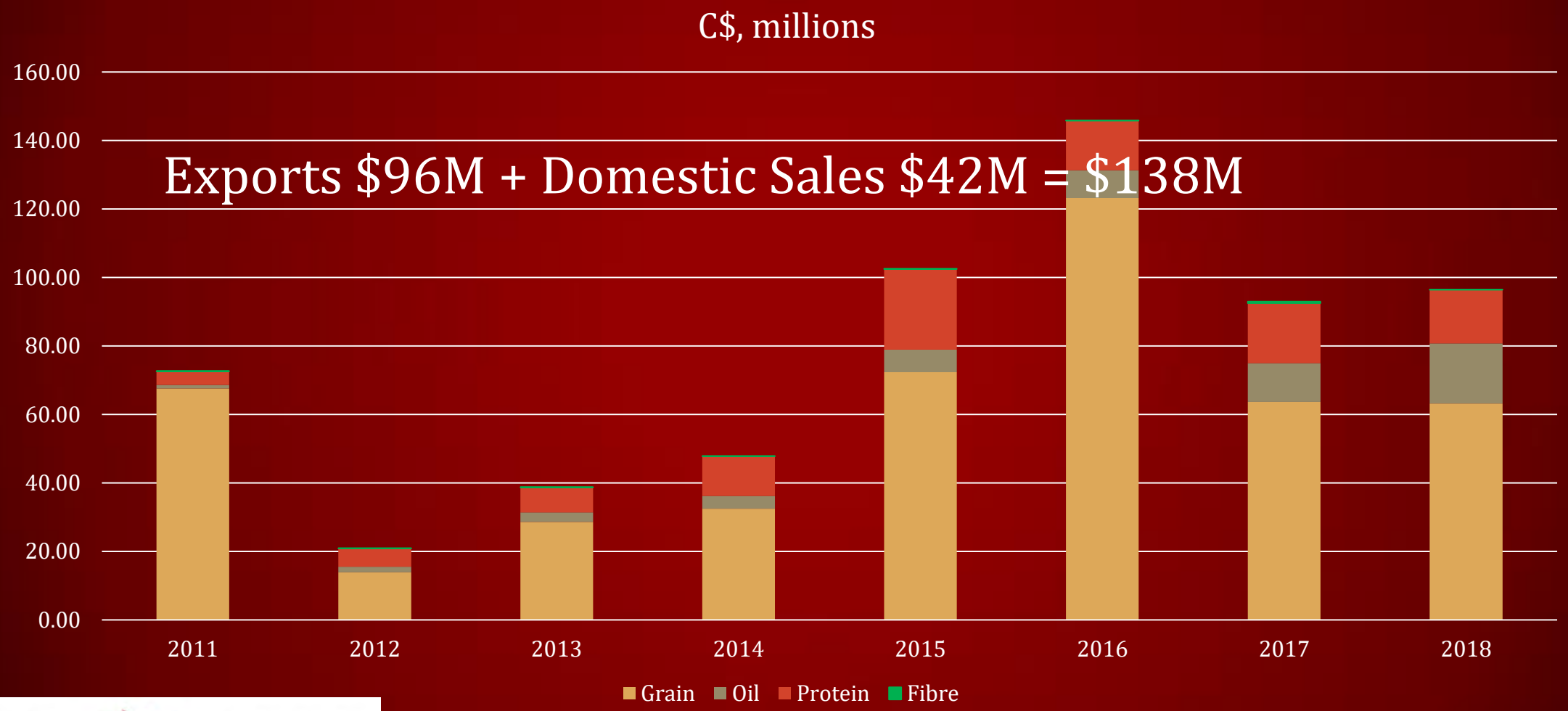
CANADIAN HEMP EXPORTS 2011 TO 2017



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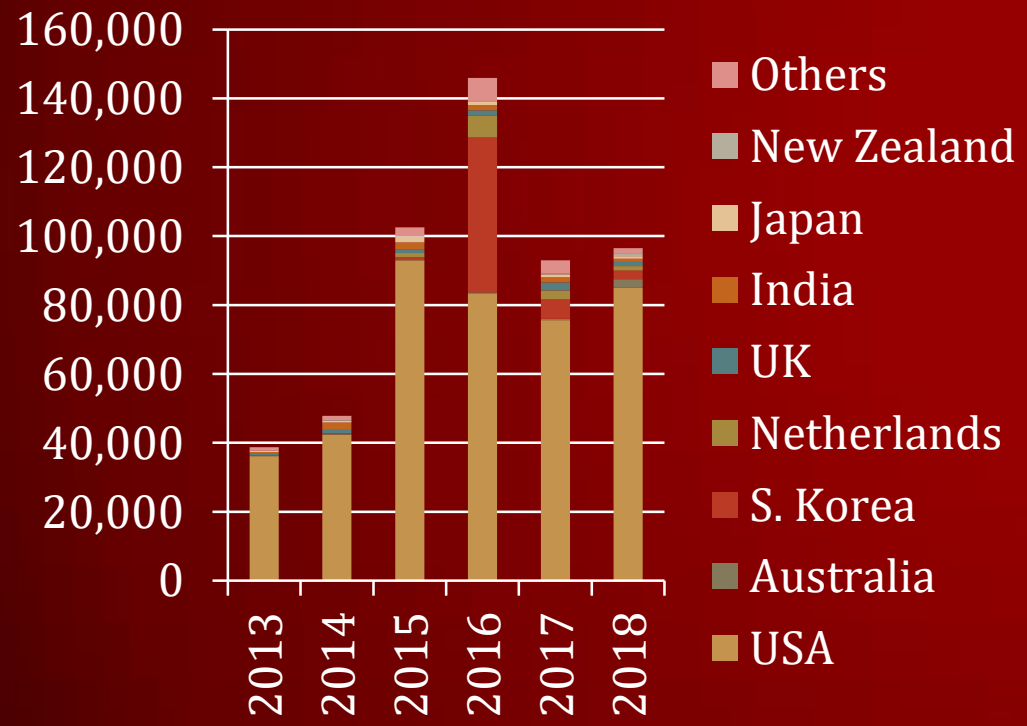
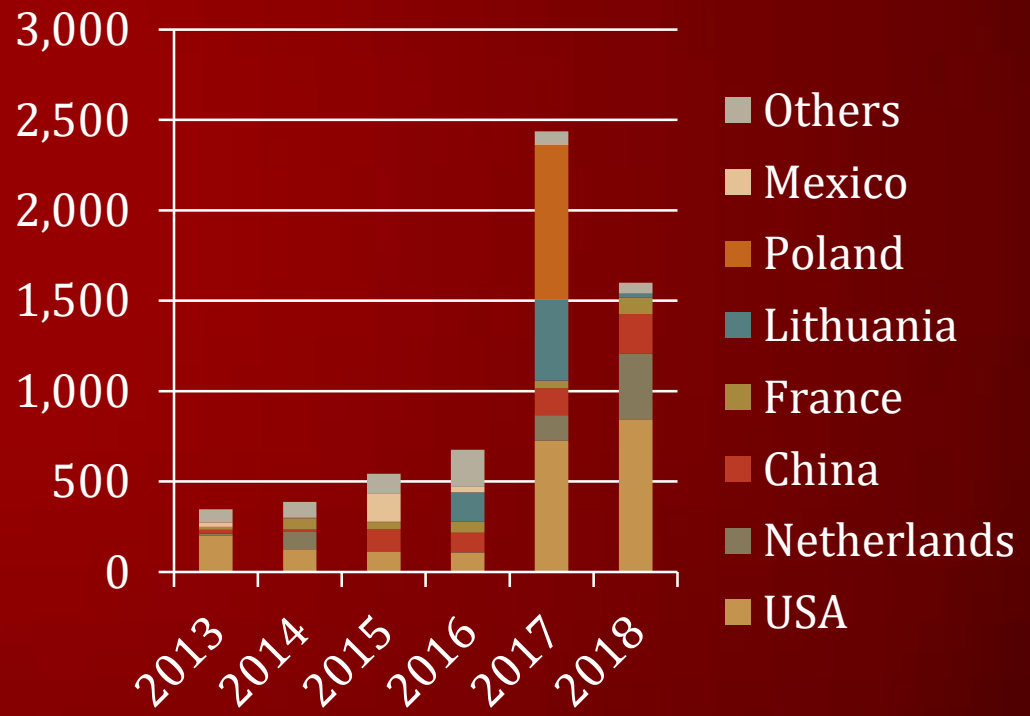
CANADIAN HEMP TRADE 2013-2018

Exports (C$'000)



Imports (C$'000)



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4 REASONS CANADIAN HEMP IS SUPERIOR FOOD

1. Canadian hemp grain is grown specifically for food
   - Varieties, seeding, harvest techniques to optimize grain quality
2. Grown and handled under "Good Agricultural Practice" and GMP protocols
   - Strict standards, testing, training to prevent microbial contamination
3. Cold Canadian climate an advantage
   - "Cold" suppresses microbials, insects, fungal diseases
4. Growers and growing sites licensed by federal government
   - Facilitates traceability and identity preservation

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FOUR PILLARS OF $1B HEMP INDUSTRY BLUEPRINT

- Food – well developed in Canada, still growing, developing standards, domestic and export food ingredient opportunities
- Feed – need regulatory approvals with CFIA
- Fibre – lots of interest, but need critical mass to attract decortication and value-added capital investments
- Fractions – tightly restricted due to current Cannabis Act and Industrial Hemp Regulations

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BLUEPRINT FOR A $1 BILLION HEMP INDUSTRY

1. Enable all four market opportunities (food, feed, fibre and fractions) through research, education and trade promotion.
2. Influence cannabis policy and regulation to liberalize hemp-derived cannabinoid (CBD) extraction and sale.
3. Establish standards for the industry - food, feed, fibre and fractions.
4. Create a stable funding platform for industry development
   - Cooperate/collaborate with future PRA
   - Establish strategic relationships (eg. DFCC and PIC)
   - Enhance member funding resources
5. Establish long term international strategy.

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CANADIAN HEMP REGULATIONS: CANNABIS AND HEMP

- The Canadian hemp industry is regulated by the Government of Canada – Health Canada.
- Cannabis Act of 2018 specifies all regulations covering the production, storage, transportation, sale, and processing of hemp and cannabis.
- Most hemp-related activities are exempt from Cannabis regulations, and are controlled under the Industrial Hemp Regulation.

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CANADIAN HEMP REGULATIONS: HEMP FARMING

- Farmers must obtain a Hemp Grower License in order to plant industrial hemp in Canada.
- Farmers are allowed to grow, harvest, store hemp seed, straw and roots, and chaff (flowers, leaves and stems) once they have a license.
- Farmers must report seeded area and locations to Health Canada within 30 days of planting.
- Only approved hemp cultivars registered on Health Canada's List of Approved Cultivars (LOAC) may be planted in Canada. Further, only pedigreed seed, of at least Certified status, can be used to grow hemp in Canada. This seed must be purchased from a member of the Canadian Seed Growers' Association.
- The use of herbicides and pesticides on hemp is controlled by the Industrial Hemp Regulation and the Canadian Food Inspection Agency (CFIA).

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CANADIAN HEMP REGULATIONS: HEMP SEED FOR FOOD

- Farmers may sell hemp seed to Canadian licensed hemp food processors.
- Farmers may also export hemp seed, once they obtain a Health Canada export permit.
- Hemp food processors, buying viable hemp seed, must obtain a Hemp Processing License.
- All processed hemp foods (dehulled seed, hemp seed oil, protein concentrate, and toasted hemp seed) can be sold in Canada and exported without a license.

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CANADIAN HEMP REGULATIONS: HEMP SEED FOR LIVESTOCK FEED

- Livestock feed ingredients are regulated in Canada under the Feeds Act and Regulations administered by the CFIA.
- All feeds must be safe to livestock; to humans (by the potential transfer of residues into human food, that is, meat, milk and eggs, and via worker/bystander exposure); and to the environment.
- Hemp seed is not currently registered as a feed ingredient in Canada, which excludes a large market opportunity for Canadian hemp farmers.
- CHTA is seeking registration of hemp seed and its derivatives for all major livestock species in Canada.

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CANADIAN HEMP REGULATIONS: HEMP STRAW FOR FIBRE

- The transportation, sale, and export of hemp stripped hemp stalks (straw) and processed hemp fibre do not need a license.
- Hemp straw is generally worked back into the soil by farmers in order to improve soil structure (moisture holding capacity) and nutrition (particularly nitrogen).
- There is a growing hemp processing industry in Canada. As the primary processing capacity (decortication) matches the supply of straw, a viable national market will emerge.
- Secondary processing of hemp fibre is also growing. Companies are focusing on non-woven (insulation and germination mats), hempcrete (spray insulation and bricks/blocks), bio-composite (panels and hemp reinforced concrete), textile (cottonized fibre), and absorbent (livestock bedding, pet litter and commercial) products.

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CANADIAN HEMP REGULATIONS: HEMP CHAFF FOR FRACTIONS

- Licensed Hemp Growers are allowed to harvest and sell hemp chaff (flowers, leaves and branches) to Canadian Licensed Cannabis Processors.
- Licensed Cannabis Processors are allowed to extract cannabinoids (i.e. CBD) for sale to 3 markets:
  - Canadian medical marijuana program (direct to patients issued a prescription by a medical doctor);
  - International medical marijuana programs that have been recognized by Health Canada; and,
  - Provincial government regulated retail buyers (age restricted) in Canada.
- Export of hemp chaff is not currently allowed, as Health Canada considers this product to be covered by the UN 1961 Single Convention on Narcotic Drugs. The World Health Organization's Expert Committee on Drug Dependence (Session 41) recommended the removal of all hemp extracts and tinctures from this convention.

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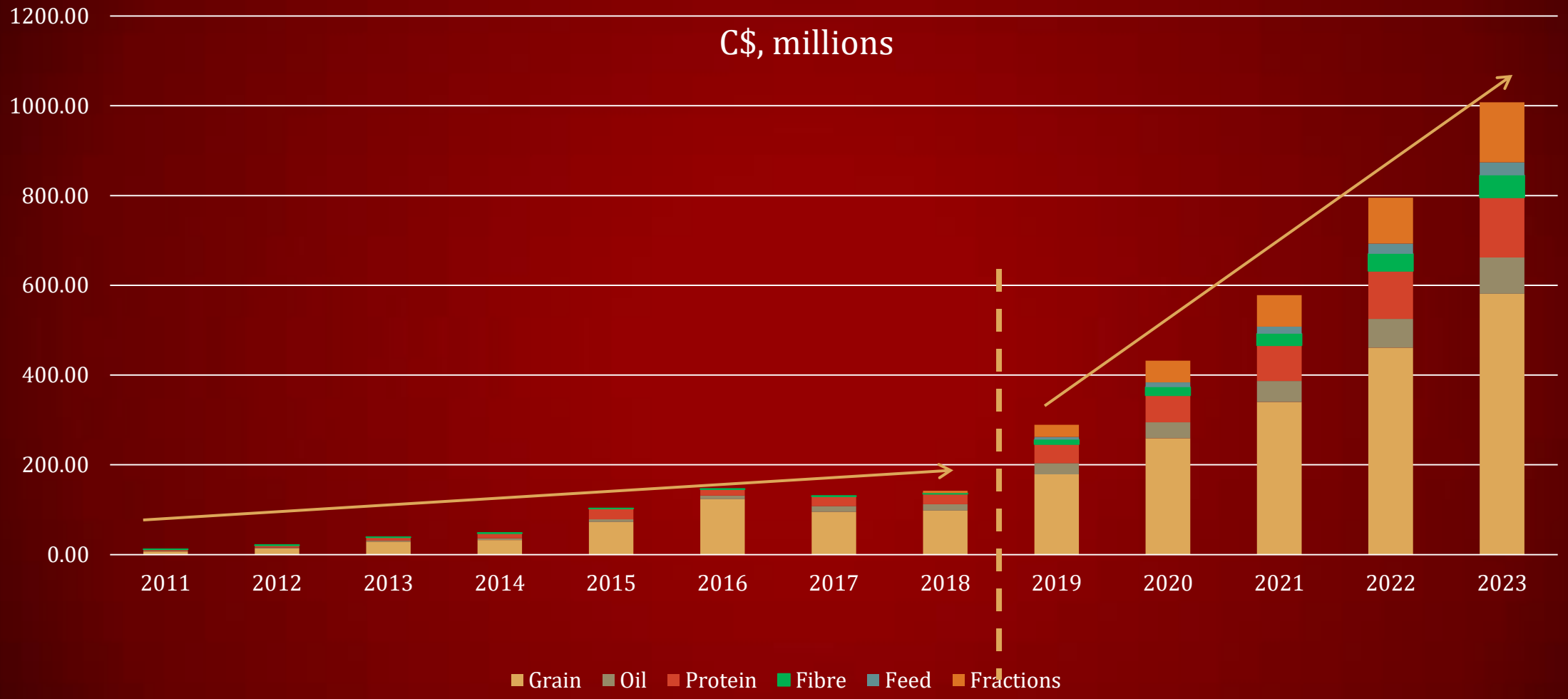
GROWING A $1B HEMP INDUSTRY BY 2023



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…by seizing the value of the whole hemp plant

TREMENDOUS ECONOMIC CONTRIBUTION

Annual KPIs	2018 Baseline	2023 Projected
Sales (C$, m)	138	1,008
Jobs (FTE)	1,311	9,576
Payroll (C$, m)	94	689
Annual Invested Capital (C$, m)	53	389
Seeded Acres	77,928	450,000
R&D Investment C$, m	7	40

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WORKING RELATIONSHIP: CHTA AND PRA

- Each entity is independent and maintains an arms-length working relationship:
  - Two independent Boards of Directors and Memberships
  - Two independent Business Plans
- Cooperative/collaborative working model:
  - CHTA will provide operational services to PRA (cost recovery basis)
  - CHTA/PRA intend to financially collaborate in strategic market development (promotional) and research initiatives

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STRENGTHENING INDUSTRY CAPACITY

- The CHTA has operated as a successful industry association for 15 years;
  - Producers, processors and other industry leaders have worked collaboratively and done the heavy lifting to build the industry.
- The net effect of the PRA will be to increase the total availability of financial resources available to the Canadian hemp industry for market development and research purposes.

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CHTA BUSINESS PLAN

- Government Relations
  - Communicate industry needs for specific regulatory reform to enhance industry competitiveness and wealth generation;
- Standards
  - Developing domestic and international standards for hemp food, feed, fibre and fractions;
- Research
  - Supporting the development of new hemp genetics and revision of feed and cannabinoid regulations. Supporting the expansion of hemp as a food ingredient (GRAS, PER and PDCAAS);
- Market Development
  - Promoting hemp food and fibre products at key domestic and international trade shows;
- Engagement
  - Promoting the consumption of hemp food as part of a health balanced diet; and,
  - Developing enhanced working relationships with domestic and international industry and regulatory players to facilitate the removal of barriers to industry expansion.

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RESOURCES FOR THE HEMP GROWER

- CHTA eGuide – Provides practical information for growers who are planning to enter the industry

http://www.hemptrade.ca/eguide

- Health Canada - Industrial Hemp Licensing Application Guide

https://www.canada.ca/en/health-canada/services/publications/drugs-health-products/industrial-hemp-licensing-application-guide.html

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5 BIG PROJECTS + 1 MASSIVE EFFORT

CBD:
Food and NHP Supplements

Hemp Seed:
Livestock Feed

ASTM:
International Hemp Standards

Genetics:
Field Trials & New Registration

Hemp Chaff:
Post Harvest Preservation

Bioactivity Research

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THE FOUR FACES OF HEMP:

- Food
  - Dehulled Hemp Seed
  - Hemp Seed Oil
  - Hemp Protein Concentrate
- Feed
- Fibre
- Fractions (CBD)

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THANK YOU!

Questions

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FOOD: DEHULLED HEMP SEED GOT IT STARTED….

- Becoming mainstream
- Here are four products, from three different suppliers
- Branded products are from CHTA member companies
- Private label product on right is store brand product

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FOOD: HEMP SEED OIL IS ALL ABOUT HEALTH!

Nutrition Facts
Valeur nutritive
Per 1 tbsp (15 mL) / pour 1 c. à soupe (15 mL)

Amount / Teneur	% Daily Value / % valeur quotidienne
Calories / Calories 121	
Fat / Lipides 13 g	**20** %
Saturated / saturés 1 g + Trans / trans 0 g	**5** %
Polyunsaturated / polyinsaturés 10 g	
Omega-6 / oméga-6 8 g	
Omega-3 / oméga-3 2 g	
Monosaturated / monoinsaturés 2 g	
Cholesterol / Cholestérol 0 mg	
Sodium / Sodium 0 mg	**0** %
Carbohydrate / Glucides 1 g	**0** %
Fibre / Fibres 0 g	**0** %
Sugars / Sucres 0 g	
Protein / Protéines 0 g	
Vitamin A / Vitamine A	0 %
Vitamin C / Vitamine C	0 %
Calcium / Calcium	0 %
Iron / Fer	0 %

…has the optimum Omega 6-Omega 3 balance with low Saturated Fat content

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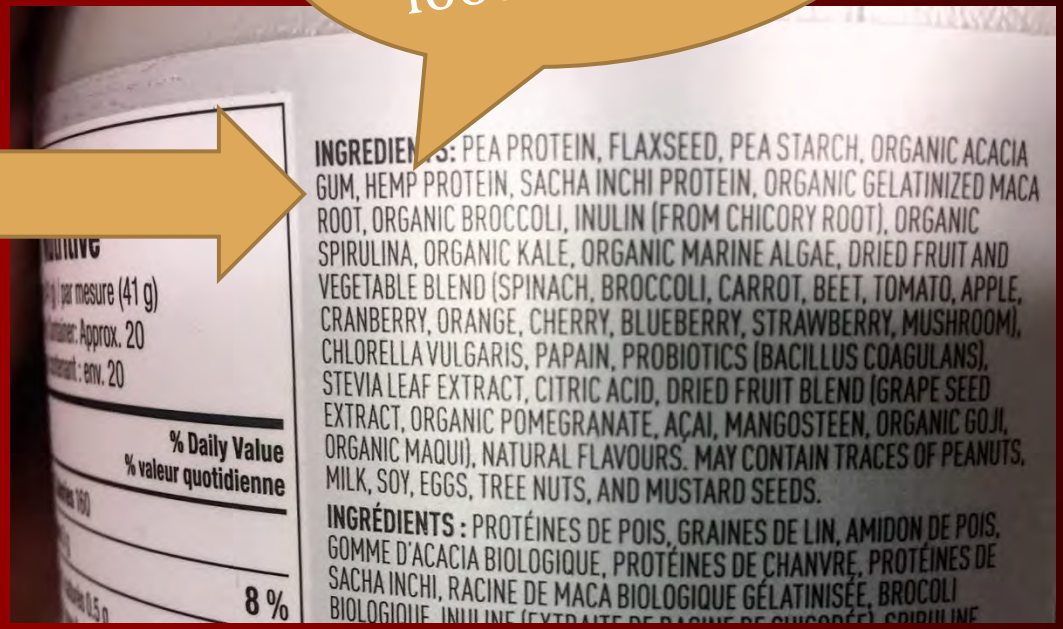
FOOD: HEMP PROTEIN IS “HOT”…

Hemp Protein a highly desired food ingredient



…as North American consumers seek alternatives to animal, whey and soy protein supplements

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LIVESTOCK FEED

- Robust livestock industry in Canada
- Hemp prohibited as livestock feed; market for non-food grade hemp seed, hulls, screenings not currently accessible
- Research required to support CFIA approvals for hemp as feed ingredient
- Eventually, “restricted” plant parts such as leaves, flowers, chaff for forage

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FIBRE

Hemp straw is primarily a “waste product” in Canada today

Most produced hemp straw is burnt or stockpiled

Limited processing established to date

Establish opportunities to use all fractions from straw resource; bast and hurd.

Difficult to “scale match” to use all fractions, and raise money to build a viable processing/supply chain

VALUE ADDED FIBRE

A versatile and sustainable replacement for petrochemicals, glass, carbon, cotton and more …

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FRACTIONS:
NATURAL HEALTH PRODUCTS

- Cannabinoids (CBD) highly restricted
- Licensed hemp growers can harvest and sell chaff (flowers, leaves and stems) to licensed cannabis processors (LPs)
- LPs are restricted to selling CBD to the domestic Medical Marijuana and Provincially Licensed Retail sectors
- Exports allowed only for registered Medical and Research purposes
- CHTA is seeking the liberalization of regulations related to hemp-derived cannabinoids (CBD) in order to access domestic and international food (low daily intake), supplements (moderate daily intake) and pharmaceutical (high dosage) markets.

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THANK YOU!

End

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4.8. Articles – CBD
US CBD production and regulatory issues

1. US FDA warning letter to food and supplement makers re: CBD inclusion
2. Massive CBD extraction facility opens in Colorado

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The FDA issues a stern warning on CBD… but does it signal a change in approach?

By Elaine Watson

27-Nov-2019 - Last updated on 05-Dec-2019 at 04:32 GMT

RELATED TAGS: Cbd, Hemp, Cannabis

While penning 15 warning letters about CBD in one day (more than the FDA has sent in three years) attracted a lot of media attention, does it signal a change in enforcement priorities for the agency, which has repeatedly warned that cannabidiol is not permitted in foods and supplements, but to date has only cracked down on a handful of brands making egregious disease claims?

Speaking to FoodNavigator-USA after the FDA **warned 15 companies** about "*illegally selling products containing cannabidiol,"* and threated "*legal action, including product seizure and/or injunction,"* William Garvin, shareholder at Buchanan Ingersoll & Rooney PC, said*: "It increases the risk that FDA might take enforcement action against you.*

"While it is true that FDA has been consistent on the illegality of CBD in foods and dietary supplements, FDA previously had greatly restrained its enforcement action in this space and today's announcement is a departure from that enforcement position with much stronger language.

"This suggests a serious change in enforcement priorities for the agency."

So what happens next? "*I expect there will be a lot of pushback from consumers, companies, and politicians against FDA on this issue,"* predicted Garvin, who expects to see *"a lot more lobbying from companies and consumers that support CBD… to see if they can get Congress to support legislation to resolve these FDA issues."*

'FDA simply wanted to re-emphasize what it's been saying all along'

However, other legal experts we contacted played down the FDA's **announcement**, with Brian P. Sylvester, special counsel at Foley & Lardner LLP, telling us the agency "*simply wanted to re-emphasize what it's been saying all along: Under current law, it is currently unlawful to add CBD to food or dietary supplements, and that FDA continues to have concerns around the safety of CBD."*

The warning letters all focused on firms making unsubstantiated disease claims, he observed. "*I don't think that practically speaking it changes FDA's enforcement posture. But I think the FDA is increasingly concerned about the safety of CBD."*

But by saying CBD is not GRAS, is the FDA effectively closing off the GRAS affirmation pathway for CBD, as UNPA president Loren Israelsen **suggested to our sister site NutraIngredients-USA?**

"*Not exactly,*" said Sylvester. *"FDA simply stated that it is not aware of any basis to conclude that CBD is GRAS among qualified experts for its use in human or animal food. It's not inconceivable that, in the future, data could be brought to bear before the FDA to support GRAS status."*

Aside from one prescription drug [Epidiolex] approved to treat two pediatric epilepsy disorders, says the FDA, CBD products have "*not been approved by the FDA and we want to be clear that a number of questions remain regarding CBD's safety, including reports of products containing contaminants, such as pesticides and heavy metals.*

"There has been no FDA evaluation of whether these unapproved products are effective for their intended use, what the proper dosage might be, how they could interact with FDA-approved drugs, or whether they have dangerous side effects or other safety concerns."

In comments that immediately **provoked pushback from CV Sciences**, which has self-affirmed that its hemp extract is GRAS, the FDA added that it "*cannot conclude that CBD is generally recognized as safe (GRAS) among qualified experts for its use in human or animal food*."

'FDA still keeps the letters aimed at the fringe companies'

Todd Harrison, partner at law firm Venable, in turn, said that the announcement was not the bombshell some commentators have suggested it is: "*I do not attach any great significance as FDA still keeps the letters aimed at the fringe companies, although it will still continue to have a chilling effect on major outlets. With that said, FDA knows it will not get voluntary compliance based on these warning letters and in many ways shows the agency's tenuous position."*

So does this change anything on a practical level? *"It does not,"* argued Harrison. *"There is not anything new here but a simple recitation of the law that is required for all ingredients. Again instead of complaining, FDA is not being fair. Submit the safety data and take the agency to task on its questionable position of permissibility. Win the safety argument and the preclusion issue disappears."*

So what does he expect will happen next? *"At some point, someone will submit* [a GRAS determination or NDI notification to the agency] *and I believe the agency will back down or face Congress' wrath,"* he predicted.

Burying your head in the sand is simply not an option any longer

He added: *"Given the filing of numerous class action lawsuits over the presence of CBD in dietary supplements, it is time to address the issue of preclusion head-on with FDA. Waiting for the agency to act the way the industry wants it to act is simply not going to happen. It is time to file an NDIN and make the agency deal with the issue of preclusion.*

"Otherwise, we will continue to live in limbo and be vulnerable to unfounded class action lawsuits. Burying your head in the sand is simply not an option any longer. The fact is full and broad spectrum hemp extracts are not the same as Sativex or Epidiolex and the agency's pronouncements on this issue strains credulity."

> *"This is a significant, concerted and highly orchestrated effort by FDA to put the brakes on the CBD market."*
>
> *Loren Israelsen, president, United Natural Products Alliance*

Why issue the letters now?

As to the timing of the announcement, Jonathan Havens and Lauren Farruggia at law firm Saul Ewing Arnstein & Lehr LLP, noted in a **blog post** that given the uncertainty over how the yet-to-be-confirmed FDA commissioner Dr Stephen Hahn will approach CBD, "*It is possible FDA pushed out this new round of enforcement and guidance ahead of Hahn joining the Agency as a way to preserve the FDA's position.*"

Havens and Farruggia also noted that in *"a potential foreshadowing of expanded enforcement, the agency indicated that, in addition to continuing to pursue such products* [making egregious and unsupported health claims], *it will also monitor the marketplace for any product that poses a risk to public health, including those with dangerous contaminants (pesticides, heavy metals, THC) and those marketed to vulnerable populations such as the elderly, children, adolescents, pregnant, and lactating women."*

Steve Mister: 'FDA's inaction for the past year has facilitated an unregulated marketplace'

Steve Mister, president and CEO at the Council for Responsible Nutrition, said the FDA's "*headline-grabbing announcement*" had "*unnecessarily alarmed consumers*," arguing that the agency had not cracked down on irresponsible players but at the same time had failed to give responsible firms with safety data a clear route to market.

Steve Mister: “The agency has repeatedly said CBD must be treated like any other ingredient, but it has refused to do just that."

“FDA’s inaction for the past year has facilitated an unregulated marketplace—which is bad for consumers and bad for business. FDA has the authority to mandate recalls, to begin seizures of potentially harmful products, and to issue injunctions, but instead, the agency is choosing to issue tepid warning letters about CBD while the market of poorly made products continues to explode.”

The FDA cites potential adverse effects from CBD, but does not distinguish between the high doses delivered in Epidiolex, and the low levels typically used in supplements, said Mister, noting that the *“dose makes the poison.”*

‘The agency has repeatedly said CBD must be treated like any other ingredient, but it has refused to do just that’

There are already mechanisms in place to regulate CBD like any other ingredient (NDI notifications, GRAS determinations), he added: “*The agency has repeatedly said CBD must be treated like any other ingredient, but it has refused to do just that.*

“FDA continues to call on industry to produce safety research for the public docket but to dismiss NDI notifications and GRAS declarations for CBD. It is not too late for FDA to do the right thing: it should explicitly open the dietary supplement lane to CBD and be the ‘cop on the beat’ enforcing the whole range of dietary supplement laws and regulations against those products."

If the FDA does not act soon, he argued, Congress should get involved to “*direct the regulator to open the supplement lane to CBD and to police these products with the ample enforcement tools at its disposal.”*

NPA: 'Letters to a handful of companies and bureaucratic head scratching helps no one'

Natural Products Association president and CEO Daniel Fabricant, Ph.D, said: *“CBD is as common as bottled water in the US, and letters to a handful of companies and bureaucratic head scratching helps no one. It is well past time to bring science into the equation as federal rules require and as the US House of Representatives directed. Safety and consumer protection must come first.”*

"The FDA's November 25, 2019 news release fits in line with its strategy of (1) issuing strongly-worded press releases; but (2) policing only against what it considers truly egregious conduct.

"The release gives an important clue as to what the FDA would consider beyond the pale: 'We remain concerned that some people wrongly think that the myriad of CBD products on the market, many of which are illegal, have been evaluated by the FDA and determined to be safe, or that trying CBD 'can't hurt.'

"It is doubtful the FDA will take a more aggressive enforcement role as it works with stakeholders to set a regulatory framework."

Angela Spivey, partner, Alston & Bird

- **Read the FDA consumer statement HERE.**
- **Read the FDA press release and warning letters HERE.**

RELATED TOPICS: Regulation, CBD / Hemp, Botanicals

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EDITOR'S SPOTLIGHT

Massive CBD extraction facility opens in Colorado

By Hank Schultz

09-Oct-2019 - Last updated on 09-Oct-2019 at 19:16 GMT

RELATED TAGS: Cbd, Extraction, Hemp, regulations

On Tuesday, Oct. 9 Mile Hi Labs opened what the company calls the country's largest CBD extraction facility in Broomfield, CO.

The facility was purchased by the company after its second round of venture capital funding this year. It is a building purchased from pharmaceutical company Novartis and was repurposed from the manufacture of the antidepressant drug Xanax. The building had stood idle for several years before the sale.

Economies of scale

The newly repurposed factory will allow Mile Hi Labs to get a jumpstart on the supply end of the CBD industry. The company can easily accommodate economies of scale in its new facility, which at the moment it is only using a fraction of.

The hemp-derived CBD manufacturing space is moving at light speed. New facilities come online almost monthly. So claims of who's the biggest are hard to vet.

But what is clear from the tours of the facility the company offered yesterday is that this place is BIG. The warehouse alone could house a football field. It's easily the largest facility devoted to the manufacture of a (as yet illegal) dietary ingredient that this reporter has personally toured.

And Novartis left behind a mountain of pharmaceutical manufacturing equipment as part of the sale, as much as $160 million worth. In addition to mixing and drying machines, the facility came replete with six bottling lines as well as tableting machines and the capability of expanding into capsule filling as well.

Meteoric growth

At the opening ceremony which was attended by Colorado Gov. Jared Polis, founder and CEO Steve Mueller said the company's growth has been meteoric. He founded the company more than three years ago as a one man shop. Mile Hi Labs had about 35 employees in January and now employs more than 200 people.

"I'm excited by the ambition and the scale of this place," Mueller said. "*I think it changes how people think about the CBD industry. "*

Stephen Mueller

Mueller said that the 2014 Farm Bill pared with state legislation really jumpstarted the industry in Colorado. But that didn't mean his path of business development was without its pitfalls. At first, his lab was qualified as a "MRB," or marijuana related business, meaning his company was ineligible for banking services.

"It was so frustrating to have a desk full of checks and no bank account and no way to pay my employees," Mueller said.

Room for new ideas

Mueller said one of the things that excited him about the hemp/CBD realm was there was so much white space to play in. Big problems that needed to be solved and few solutions on the table.

It contrasted starkly with his academic training, where he received a bachelor's degree in physics.

"It physics, there was so much study to make tiny changes in a problem," Mueller told the audience of more that 100 people.

"In this business, every week we are making huge developments. As an engineer, when you look at this industry you see that so little work had been done. There was so much opportunity to develop the technical side of things," he said.

Supply chain rationalization

Among the technical developments of the company are the use of mobile crude processing units, said chief operating officer Philip von Mecklenburg, PhD. The units can be transported on flatbed trucks and can be fairly quickly erected on site. That allows the processing of hemp biomass from the field to a crude oil state before the material even enters the extraction facility in Broomfield.

At the moment the field processors are working fields in Colorado, both because there is a significant amount of hemp grown in the state and also because not taking the material across state lines eliminates a certain amount of residual legal risk. But Von Mecklenburg said having the processors mobile means the company can go to where it makes the most sense to acquire its biomass in the future as the regulatory picture becomes clearer.

Von Mecklenburg has a background in logistics, and at his last professional stop had created what he called an *"Expedia for the freight industry."*

"You have 10 packages that say want to go to Shanghai," Von Mecklenburg said. *"So my platform gave you multiple options for that shipment, just like buying a plane ticket."*

Scale needed to satisfy big CPG customers

Von Mecklenburg said similar issues will need to be solved in the CBD space. At the moment a number of the companies in the industry are still at cottage scale. That was true of the dietary supplement industry as a whole for a number of years, but the picture is changing at an order of magnitude faster within the hemp realm, where sales still seem to be heading for the stratosphere.

The new facility will put Mile Hi Labs on the map when the regulatory picture becomes clearer and the big CPG companies start to launch products. Word heard through the grapevine is that many such products are under development. Those companies will be buying at scale, so being able to reliably meet big orders will be paramount, Von Mecklenburg said.

"The business has been a little bit amateurish," Von Mecklenburg said.

"We will have the mass scale and the quality that can be used by FDM companies," he said.

Concentrating on CBD isolate

Mile Hi Labs is concentrating on the products of CBD isolate, which will have the most formulation adaptability, Von Mecklenburg said. The company also says it has a water soluble powder for beverages.

In addition, the company will start offering white label services for CBD products, whether as tinctures, tablets or eventually capsules.

Another way in which company officials say the firm is differentiating itself is in the realm of quality. As a result of taking over the Novartis facility the company now has an almost embarrassment of riches when it comes to lab space. There will be enough room for application labs, too, where brand partners to develop test batches of proposed new products.

Compliance and Regulator Direct Wendi Young said she believes Mile Hi Labs with the new plant and the processes that were put into place there can lay a claim to the highest quality standards in the industry.

"I was hired at the beginning of the year to create quality standards that are the highest in the cannabis industry," Young said.

Young previously was quality director for a smaller pharmaceutical firm in Colorado. She said Mile Hi Labs' Broomfield facility is ISO 9001 certified and the plan is to acquire additional certifications.

RELATED TOPICS: Financial focus, Manufacturers, Supply Chain Management, Regulations, Legislation & Enforcement, M&A, CBD / Hemp, Cognitive function, Inflammation, Botanicals, Skin health

4.9. Articles - Just BioFiber

1. Just BioFiber's modular construction blocks made from hemp fiber
2. Builders are swapping cement for hemp to reduce pollution

Builders are swapping cement for hemp to reduce pollution

JEREMY HODGES AND KEVIN ORLAND

THE hemp fields sprouting in a part of Canada best known for its giant oilpatch show how climate change is disrupting the construction industry.

Six years after setting up shop in the shadow of Calgary's oilsands, Mac Radford, 64, says he can't satisfy all the orders from builders for Earthfriendly materials that help them limit their carbon footprints. His company, Just BioFiber Structural Solutions, is on the vanguard of businesses using hemp — the boring cousin of marijuana devoid of psychoactive content — to mitigate the greenhouse gases behind global warming.

Around the world, builders are putting modern twists into ancient construction methods that employ the hearty hemp weed. Roman engineers used the plant's sinewy fibres in the mortar they mixed to hold up bridges. More recently, former White House adviser Steve Bannon weighed in on using so-called hempcrete to build walls. Early results indicate it's possible to tap demand for cleaner alternatives to cement.

"We have way more demand than we can supply," Radford said from his plant in Airdrie, Alta., which is undergoing expansion and soon expects to churn out enough Lego-like hemp bricks each year to build 2,000 homes.

Greener alternatives to cement add to the pressure on companies including LafargeHolcim and Votorantim Cimentos as the global economy pivots toward dramatically lower emissions.

adopted the modular, interlocking bricks he invented for their projects. "Our old practices, we have to change."

While architects and developers have traditionally concentrated on the energy used by their buildings once they're are standing, it's actually the materials required in their construction that represent the brunt of a structure's lifetime carbon footprint. Replacing high-carbon-intensity materials like cement with greener alternatives like hemp can dramatically reduce or even offset greenhouse gas pollution.

Hemp fields absorb carbon when they're growing. After harvest, the crop continues to absorb greenhouse gases as it's mixed with lime or clay. Hempcrete structures also have better ventilation, fire resistance and temperature regulation, according to their proponents.

Numbers across the industry vary depending on the process, but Just BioFiber says its hemp captures 130 kilograms of carbon dioxide for each cubic metre it builds. Those structures made with their bricks will sequester more greenhouse gases than they emit in production. By contrast, each ton of cement produced emits half a ton of carbon dioxide, according to the European Cement Association.

First developed in France more than 30 years ago, hempcrete was initially used for renovating old houses since it mixed well with stone and lime. That has progressed to building new homes, offices and municipal buildings some as tall as seven floors, according to Quentin Pichon, founder of CAN-Ingénieurs

That ability to quickly ramp up local cultivation virtually anywhere in the world is one of hemp's appeals, according to Alex Sparrow, the managing director of U.K. Hempcrete.

"Demand is rising steadily, but we need to accelerate this as currently, the U.K. construction industry accounts for approximately seven per cent of GDP and 50 per cent of total U.K. carbon emissions," Sparrow said.

One of the principle challenges his U.K. company faces are legal hurdles imposed on hemp cultivation — British farmers can only grow hemp building materials, but can't profit from the oil extracted from seeds.

Back near Calgary, the black denim-clad Radford is already turning a profit from his hemp venture and is preparing to invest another $37 million to expand production to 3.5 million bricks a year. He credits his children with convincing him to go green after four decades in commercial development.

"They think that finally it's not about money, it's about doing good for the planet," he said.

— Bloomberg News

Terry Radford, vice-president of business development and sales at

Cement makers are responsible for about seven per cent of global carbon dioxide emitted into the atmosphere every year, with copious volumes entering via limestone kilns needed to produce the material. Manufacturers say they've struggled to find markets for greener alternatives, giving easy entree to entrepreneurs like Radford who cater to customers concerned about their effect on the Earth.

"They love it once they understand it," Radford said of the builders who've Architectes, which specializes in hempcrete buildings.

Hemp growth in France has grown by fifth in the past decade as a result of an increase in its construction use, but also because seeds from the plant that can be used to make cannabidiol, he said. Hemp sales in Canada could hit $1 billion within five years from $140 million last year, according to the Northern Alberta Institute of Technology.

Just BioFiber Structural Solutions, poses beside the company's hemp bricks in Airdrie, Alta.

TODD KOROL / BLOOMBERG FILES

Airdrie company employs hemp to go green

Just BioFiber's modular construction blocks look like oversized Lego — but they're made from hemp

By Alexis Kienlen
Reporter

Published: October 16, 2019
News

Reading Time: 4 minutes

The legalization of marijuana has — oddly enough — been good for business for one Alberta producer of construction materials.

That's because Airdrie-based Just BioFiber makes modular building blocks out of hemp fibre.

Prior to pot's legalization a year ago, people in the construction industry used to jokingly ask if their hempcrete products could be smoked.

"The snicker factor has been lost," said Terry Radford, the company's sales director VP of development.

“It took us awhile to get over that stigma. The legalization of marijuana helped distinguish the difference between hemp and marijuana. It helped field those questions.”

Hempcrete is not a new product. The basic recipe is to mix fibres from the inner woody core of the hemp plant with a lime-based binder to produce a material that is non-combustible, breathes and has a high insulation value. The hemp used by Just BioFiber is first processed at InnoTech Alberta’s decortication plant at Vegreville and then at another facility Maskwacis.

“We use the straw part of the hemp,” said Radford. “The first step is to separate the fibre from the woody core and it has to be sized correctly. We need a nice particle distribution, around two centimetres, something in that range. And then we develop our binder that we use around the hemp, and we put that in a mould around our structural frame.”

This structural frame makes the blocks look like a child’s snap-together building blocks. Radford’s brother, Mac, came up with the idea for these blocks while he was helping a friend build a hemp house in B.C.

“He liked the characteristics of the material, but it took a long time to build,” said Radford. “Mac wanted to build with it economically, so that’s where he got the idea to make a structural block that you could just stack up and dry.”

This video still shows the construction of a Vancouver Island home built with Just BioFiber’s modular blocks. *photo: justbiofiber.ca*

Mac Radford, who has four decades of industrial and commercial construction experience, also wanted a product that was quick and easy to build with and cost effective. InnoTech Alberta helped with the research and development.

The result is a system using modular blocks, which are roughly 21×11 inches and eight inches high and can be sawn.

The price for the blocks is about the same as insulated concrete forms.

“It’s about $30 to $35 a square foot. It’s in the middle of the price range,” said Radford.

So far, most of the demand for its products has come from B.C., with four homes so far built there with the blocks.

“We built one small building in Ontario and we’re building two more on Vancouver Island this year,” said Radford.

Although it employs full-time engineers as well as plant and production managers, the company is fairly small, focusing on product testing and introducing the product to the marketplace.

“We have talked to a lot of construction guys and they have all told us the same thing — they will build whatever a customer wants them to build,” he said. “This is where we have to educate the builders on our material, but also educate the consumers to create the draw and want to build a house that is sustainable; that has less of a carbon footprint.”

Builders are also hesitant to use the material because there hasn’t been enough data collected on how it performs in a real-life environment. Just Biofiber is trying to make up for this lack of knowledge by collecting data on the houses built with its blocks.

“One of the first houses we’ve built, we have six months of data on that one, and they’re not using any energy to heat or cool their home,” said Radford.

The company has tested hemp in different climates (including Edmonton, Seattle, Anchorage, Miami and Arizona) and the material performs well in all of them, he said.

Hemp displaces moisture in a home. The homes in Vancouver Island will be at 90 per cent humidity in the mornings, and the houses will stay about 50 to 60 per cent humidity during the day.

“It’s very slow to wick away any heat and moisture in the building. It normalizes the material as well as inside the home,” said Radford.

Hempcrete also has the ability to stabilize a building’s temperature because it retains heat.

Building with hemp also has environmental advantages.

“Per acre, you’ll get like three tonnes of hemp straw,” said Radford. “It’ll sequester about 1.6 times its weight in CO2 while the plant is growing. It’s a really good CO2 sink.”

The hemp fibres also come from the inner core of the plant, “which is considered to be kind of a waste material,” he added.

“The other benefit is that in Alberta, it’s plentiful and we’ve got a good supply of it, which is why we’re here.”

Just BioFiber currently has enough hemp supply and will need to increase demand before it requires more growers.

“We will need to get up to a billion blocks per year before we look at our own decortication process,” said Radford.

But that hinges on the product making a name for itself.

“It takes a long time to get any product in the construction business. We just need to get homeowners to do a little more research into what they want to build. Whatever a homeowner wants to build, the builder will build it.”

4.10. Technical brief – golden tofu canola meal milk

Market Overview

The global protein ingredients market represents a multi billion-dollar industry, dominated by dairy-based ingredients, eggs, gelatin, soy-based and wheat-based proteins. Food processors are shifting towards a growing demand for vegetable proteins. They are also seeking alternatives to soy and wheat proteins because of allergy and gluten concerns. Despite the increased demand for plant-based proteins, their widespread use has been hindered by reduced solubility and functionality relative to animal-based proteins and strong flavours associated with some plant proteins.

Canola meal represents a large and growing source of plant-based protein, with Canada alone producing over 5M metric tonnes in 2017 (COPA, 2017). Diverting canola meal from livestock use represents an important and as yet uncaptured opportunity to provide high quality protein-based food ingredients and food products.

Technology Description- Production of Canola Meal Milk and Protein-rich Curd

Ground canola meal is mixed with water, filtered and the aqueous portion is heated to induce protein unfolding. The resulting 'curd' can be used as a substrate for further processing or directly form a food product.

Advantages over current marketplace plant protein technologies

1. The natural golden colour has been described as 'food friendly' with a neutral taste and pleasant mouth feel.
2. The technology can use solvent extracted as well as cold pressed canola meal as raw material, providing an important new source of plant protein to food processors and consumers.
3. Canola meal contains over 33% protein. Based on the World Health Organization (WHO) requirements, canola meal protein exceeds required levels for indispensable amino acids and is therefore considered to have a well-balanced amino acid profile.

Overcoming Technological Barriers

1. Supply chain- This technology represents a novel source of high protein human food from an underutilized commodity crop co-stream. In the 2015-16 crop year, over 68 million metric tons of canola/rapeseed was harvested globally. (USDA, 2016)
2. Processing- The technology allows the production of familiar food formats from the high fiber and highly soluble protein in canola meal. The higher level of fat typically found in the cold press meal is an advantage in terms of the quality of the final product.
3. Sustainability- the technology utilizes an existing processing co-stream
4. End Uses-The golden 'curd' is the base for the development of ingredients as well as products with characteristics similar to current consumer-accepted plant protein products. For example, a product with the hardness and elasticity of silken soybean tofu can be produced directly. Additional application concepts include a shelf stable powder version; a dry snack and a meat mimic.

Patent status

"Canola based tofu product and method" international (PCT) patent filed on February 24, 2016.

- Notice of Allowance (Canada) for patent application 2935745 issued March 2017.
- Acceptance (Australia) for application 2016240054 granted September 2018.
- US patent application 20180070619 published March, 2018
- National Phase filings in EU underway.

Business objective

Partner with leading food processors and food companies for the production and marketing of unique plant-protein based products for the global marketplace.

Contact for further information

Lee Anne Murphy, PhD PAg
lm@murphyetal.com (204) 228-3971

4.11. Article – Paterson Global oat plant nearly went to the US

Source: Paterson Global Foods news release October 3, 2019

PATERSON GLOBALFOODS OAT MILL

October 3, 2019 (2019-10-03T10:06:11-0500)
PRESS RELEASE

Paterson Global Foods
22nd Floor – 333 Main Street
Winnipeg MB, Canada R3C 4E2

October 3, 2019

Paterson GlobalFoods Oat Mill

PATERSON GLOBALFOODS (PGF) IS PLEASED TO ANNOUNCE THE CONSTRUCTION OF CANADA'S MOST INNOVATIVE OAT PROCESSING FACILITY.

The facility will be located on PGF's 600 acres adjacent to its existing inland grain terminal and ancillary businesses in northwest Winnipeg.

The new oat mill to be known as O Foods Ltd. when completed, will annually process up to 250,000 metric tonnes of raw oats from Western Canadian farmers. The oat mill will produce a full range of high health oat products for the world market. The mill will be situated on Manitoba's largest private rail siding, consisting of 260 rail cars serviced by Canadian Pacific, Canadian National and BNSF. This exceptional rail service will offer the greatest access possible to the North American market.

Construction will commence immediately.

Mr. Andrew Paterson, PGF's President and Chief Executive Officer, has stated:

"Paterson's new oat mill will allow PGF to continue to diversify its commodity business with value added products for the benefit of consumers and farmers alike."

"Paterson Global Foods is a Manitoba success story that has helped make our province a great place to live, work and do business," said Manitoba Premier Brian Pallister. "Manitoba is leading the nation in private sector capital investment and our government is committed to building off that momentum to create 40,000 private sector jobs over the next four years. I want to thank Paterson for their historic investment today, and for their continued confidence in the growth of our province."

Media Contact: info@patersongrain.com – For more information about Paterson Grain please contact the head office located in Winnipeg, MB by calling 204-956-2090.

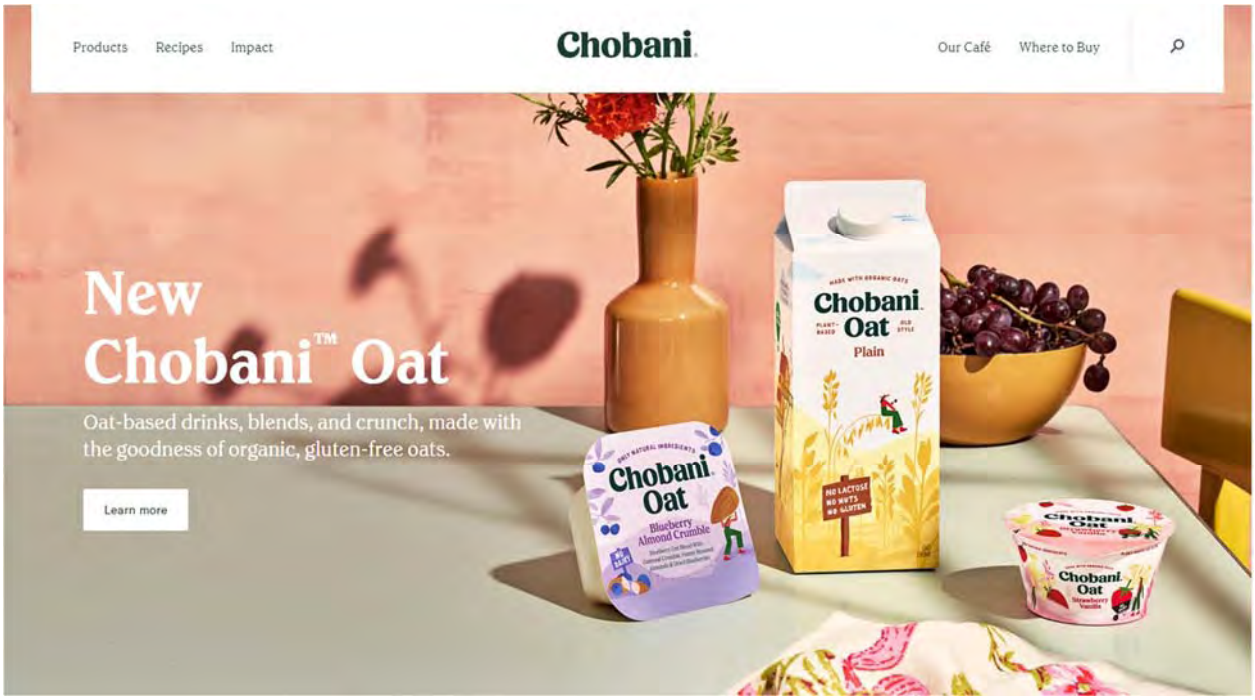
About Paterson GlobalFoods Inc.

PGF is a private, family owned business with a long-standing history deeply rooted in Canadian agriculture. Originally established in 1908 as N.M. Paterson & Company Limited, PGF attributes its success and esteemed reputation for service and commitment to shipping high quality agricultural commodities and food products to consumers across North America and the world. Today, PGF is a conglomerate of international businesses. PGF prides itself on efficient use of large scale operations and vertical integration of its resources. These practices continue to allow PGF to achieve competitive advantage in international agricultural commodities and food products by using a unique efficiencies and commodity growing, gathering, trading, processing, transporting and milling.

« Paterson Grain Ships Canadian Pacific's First Alberta HEP Train from Bowden to Vancouver

4.12. Webpage - Chobani oat-based drinks and snacks

Source: https://www.chobani.com/products/oat-based/

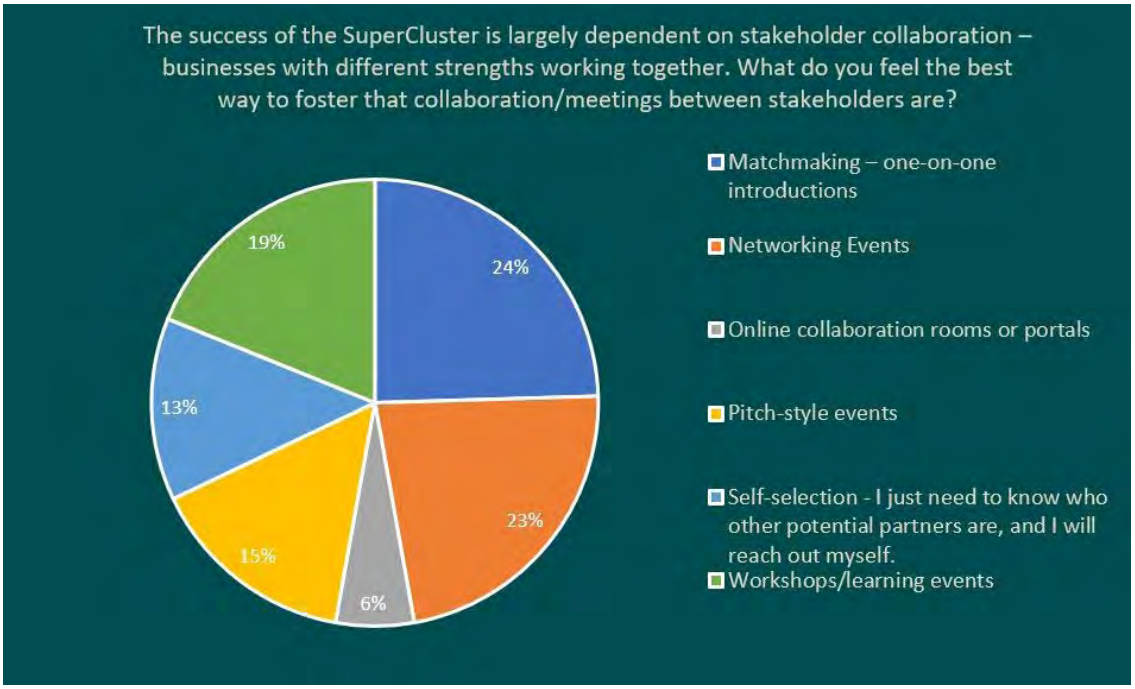

Products
Recipes
Impact
Chobani
Our Café
Where to Buy
New
Chobani™ Oat
Oat-based drinks, blends, and crunch, made with the goodness of organic, gluten-free oats.
Learn more
Chobani Oat
Blueberry Almond Crumble
Chobani Oat
Plain
NO LACTOSE
NO WHEY
NO GLUTEN
Chobani Oat
Strawberry Vanilla

4.13. Protein Industries Canada (PIC)

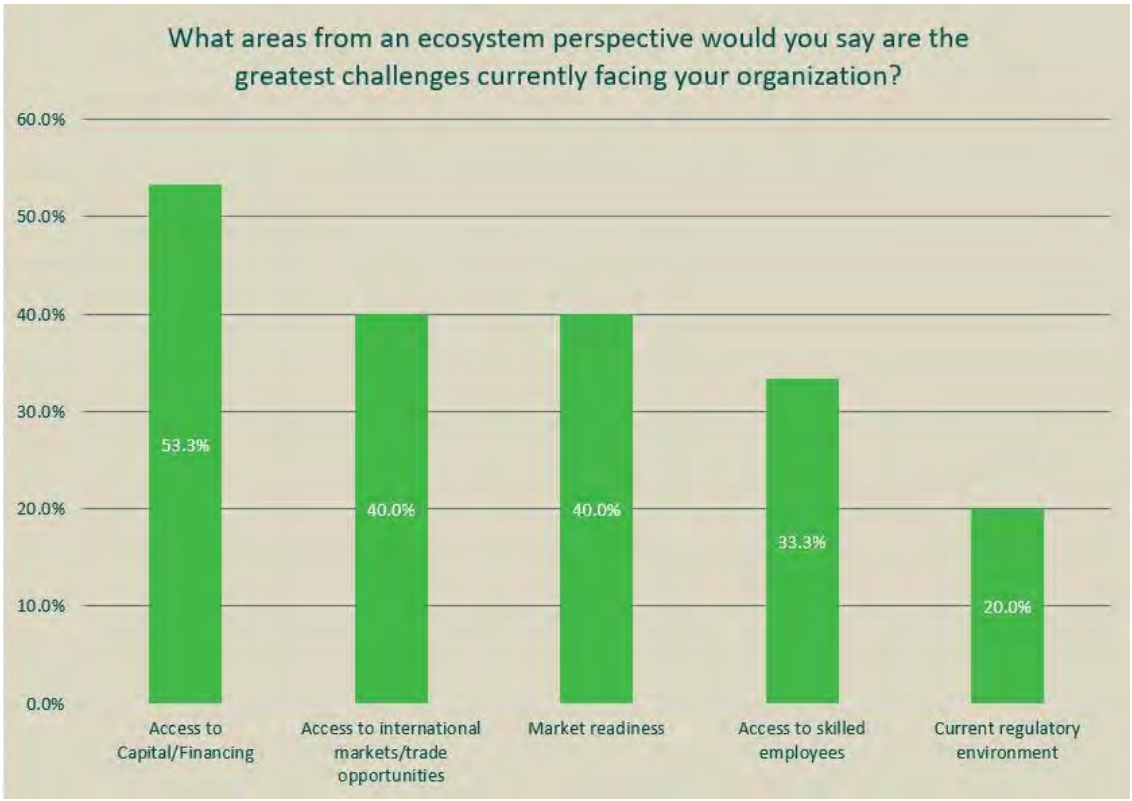
1. Results from Protein Industries Canada Stakeholder Survey
2. “Building on our natural advantages” PIC PowerPoint presentation to CHTA conference November 2019
3. Article – Protein supercluster aims to transform food processing in Western Canada
4. PIC’s Five-Year Supercluster strategy

Results from Stakeholder Survey

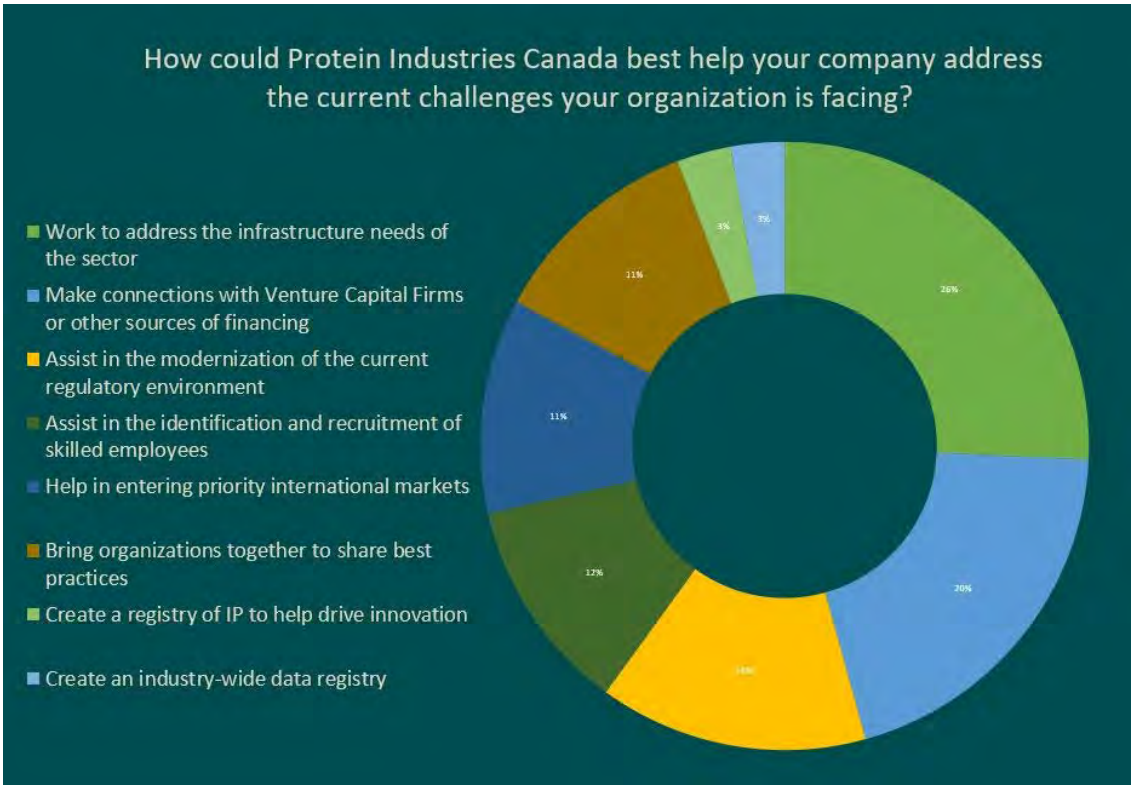
In August we launched our first stakeholder survey. The purpose of the survey was to help determine industry priorities and how Protein Industries Canada should focus our efforts to best help industry. A sampling of the results are below.



- Members prefer in-person collaboration and learning events;
- Networking is important to build relationships – Protein Industries Canada's role as to act as "matchmaker";
- Access to fellow PIC members and their contact information is a benefit;



- Access to capital and market readiness were identified as the number one ecosystem challenges facing organizations; and



- Working to address the current infrastructure challenges was ranked as the number one area that PIC should focus on to support the industry.

PROTEIN INDUSTRIES CANADA

BUILDING ON OUR NATURAL ADVANTAGES

PROTEIN
INDUSTRIES
CANADA

SHIFTING **TRENDS**

THE CASE FOR PLANT PROTEIN

What is driving demand?

1. Increasing global population and a growing middle-class
2. Changing Western diets
3. Livestock, companion animal and aquaculture feed

The world will need to produce as much food in the next 45 years as in the previous 10,000

PROTEIN INDUSTRIES CANADA

WESTERN CANADA **PRODUCTION POWERHOUSE**

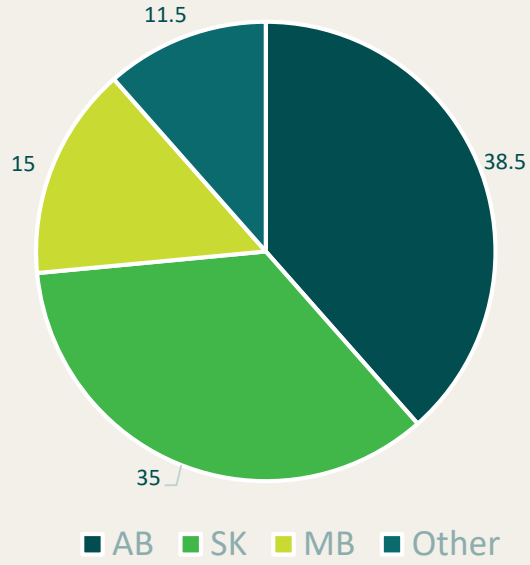
- 28 million hectares of arable land
- 60 million metric tonnes of production of crops
- 80% of which are high-protein crops
- 14 million metric tonnes of protein expected in 2019

PROTEIN
INDUSTRIES
CANADA

INDUSTRIAL HEMP **PRODUCTION**

- 77,800 acres Industrial Hemp grown in 2018
- In 2018, Canada exported nearly 5,400 MT of hempseed valued nearly $500 Million USD, over 70% export volume to US
- In 2017, Canada imported 726 MT of hempseed from US
- Major types of hemp grown in Canada are FINOLA, X-59 (hemp nut), Katani

2018 Production of Industrial Hemp, Percent Volume by Province



Health Canada data available from January 1, 2018 to February 4, 2019, Global Agricultural Information Network report CA19030 “Industrial Hemp Production Trade and Regulation” 2019

PROTEIN INDUSTRIES CANADA

OUR **NATURAL ADVANTAGES**

Production

Innovation

Research

International reputation

PROTEIN INDUSTRIES CANADA

PROTEIN INDUSTRIES CANADA

***Vision**: Canada is a global leader in plant protein*

***Mission**: Invest collaboratively to accelerate innovation and the competitiveness of the Canadian plant protein sector*

PROTEIN INDUSTRIES CANADA

OUR **OBJECTIVES**

- To increase value added production of plant protein based products and co-products;
  - Develop new technologies and processes
  - Grow processing close to production
  - Remove industry-wide barriers/resolve challenges
  - Increase capacity across the value chain
  - Create a strong, globally recognized, Canadian plant-protein value-chain

PROTEIN INDUSTRIES CANADA

WHAT WE **WILL DO**

Collaborate. Ideate. Build.

- Create connections between companies, customers & research
- Co-invest in technological priorities
- Address restraints to growth
- Build capacity in the sector
- Define Canada’s global brand attributes

PROTEIN INDUSTRIES CANADA

“The supercluster initiative is more than just investing money; it is about doing business differently — leveraging strengths to drive innovation, overcome barriers and explore new opportunities.” CEO Bill Greuel

PROTEIN INDUSTRIES CANADA

Protein Industries Canada has two main project streams:

1. Technology Priorities

2. Ecosystem Development

CO-INVESTING TO **BUILD THE SECTOR**

- $153 million to be co-invested between 2018 and 2023
- Majority is invested into technology priorities
- Priority areas/investment opportunities identified and led by industry
- Investment into both technology and ecosystem is necessary for the sustained success of the sector and as outlined in the Contribution Agreement

Year	Technology Priorities	Ecosystem Development
2019	90%	10%
2020	88%	12%
2021	86%	14%
2022	85%	15%

PROTEIN INDUSTRIES CANADA

Technology Priorities

PIC Will Invest in Projects Within One of Four Main Areas

CREATE GROW MAKE SELL

PROTEIN INDUSTRIES CANADA

Valuable Components of Hemp Seed:

1. Hemp Protein

2. Hemp Oil

3. Hemp Meal

4. Whole Hemp seed (Fibre)

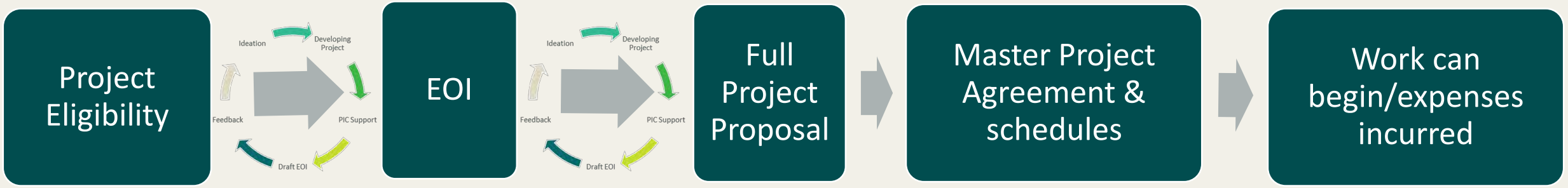
PROTEIN INDUSTRIES CANADA

KEY ACTIVITIES

- Execution of the Co-investment Program
- Support IP Value
- Identify Gaps and Barriers to Innovation
- Act as a catalyst to support innovation
- Support Ecosystem Activities
- Develop Long Term Science and Development plan

PROCESS OVERVIEW

Key Steps



Relative Number of Projects

PROTEIN INDUSTRIES CANADA

TECHNOLOGY PROJECTS

First round of Expressions of Interest (EOIs)

- Closed June 28, 2019
- 38 EOIs received; 16 advanced to full project proposal
- Value of Proposals = $307 million

Second round of Expressions of Interests

- Closed September 13, 2019
- 19 EOIs received; currently being evaluated
- Successful consortiums notified on Oct. 24
- Total Value of Projects received to date > $480 million

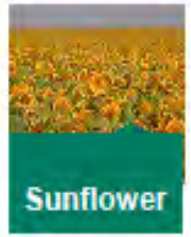
Third round?

- Priority will be addressing gaps – what is missing to reach our goals?

Botaneco creates a new, high value adjacent space to the commodity oilseed processing industry.

Oilseed Feedstocks


Canola


Sunflower


Safflower


Hemp

Feedstocks with unique attributes

Novel Process Technology

BOTANECO

Aqueous based novel processing platform

Unique Co-Products

oleosomes, protein concentrates & isolates

superior quality enabling access to new, high value markets

Global Markets


PERSONAL CARE


AQUACULTURE FEED

FOOD

producing new, higher value co-products from oilseed crops

PROTEIN INDUSTRIES CANADA

ECOSYSTEM **DEVELOPMENT**

Eight Priority Areas

Ecosystem priorities are activities that build capacity in the sector.

Investment in the ecosystem will ensure that the results of technology projects are fully realized.

For example, a new technology will have limited success without a market to sell its product or a regulatory environment that is too burdensome to get a product to commercialization.

PROTEIN INDUSTRIES CANADA

WORKING WITH **PROTEIN INDUSTRIES CANADA**

For-profit Canadian companies/Sector Groups

- Can be an SME or larger (at least one SME required)
- Submit and contribute to a project (with at least one other private sector member)
- Responsible for at minimum 50% of project costs

Academic/Research Institutions

- Can be a part of a project with companies; though financial contribution cannot be matched by PIC
- Can participate as a contract Research Organization
- Alignment with industry in skills and training

PROTEIN INDUSTRIES CANADA

WORKING WITH **PROTEIN INDUSTRIES CANADA**

Federal Government Research

- Can be contracted to complete research
- Cannot stack federal investment
- Cannot lead a project

Contract Research

- Not part of consortia
- Can be contracted to complete research

Producer/Commodity Groups

- Cannot lead a project or count as one of the “for-profit partners”
- Can financially contribute to a project

PROTEIN INDUSTRIES CANADA

SUCCESS

- New products, technologies and businesses
- Being a global leader in the supply of plant-protein ingredients, products and technology
- An ecosystem aligned with technology priorities to support a sustainable industry.

We are working to create long-term structural changes to the industry. Our work will not be done in four years

PROTEIN INDUSTRIES CANADA

Protein supercluster aims to transform food processing in Western Canada

The region can be a world powerhouse in value-added processing, says head of Protein Industries Canada

By Alexis Kienlen
FOLLOW
Reporter

Published: June 24, 2019
Crops

Protein Industries Canada has a plan to kickstart the growth of the plant-based protein sector in Western Canada over the next four years, says its CEO.

"From a processing perspective, this is a growing industry in Canada — we've got 7,000 food processors," Bill Greuel told attendees at the recent Bridge2Food Plant-Based Food Summit.

But the processing sector is just starting to take off in Western Canada, he said.

"We're just on the cusp of transitioning out of what we do today, which is for the most part, shipping our raw commodities to value-added processing for the food manufacturing sector," he said. "It's going to take a lot of investment. It's going to take some time, but I have no doubt that we will emerge as a leader in food processing and ingredient supplies."

The federal government is giving $153 million to Greuel's organization, a so-called 'supercluster.' The goal is to create a concentration of plant-processing industries akin to an ag version of Silicon Valley. With matching industry funds, Saskatoon-headquartered Protein Industries Canada expects to see $300 million invested in value-added plant-based protein processing and market development.

About 30 per cent of crops grown in Alberta, Saskatchewan and Manitoba are high-protein crops, said Greuel.

"At the end of the day, that's 14 million tonnes of plant-based protein," he said, noting Canada is one of five jurisdictions in the world that is a net exporter of food.

He pointed to canola, saying if there were varieties with more protein and less fibre, the crop sector could expand sales into aquaculture, pet food and swine production. Value-added processing of peas, lentils and chickpeas also offer rich possibilities — and would provide a

more lucrative market than exporting raw production. (The Prairies export 6.5 million tonnes of pulses annually.)

Western Canada's land base, knowledgeable producers and good productivity will allow it to grow at a range and scale that few other regions can match, said Greuel.

"The ability to scale up new crops over a short period of time — this is something that we can do in Western Canada that few other jurisdictions can do globally," he said.

There are also promising opportunities for crops such as flax, camelina and oats.

In addition to the ability to produce large volumes of high-quality crops, Western Canada has good infrastructure when it comes to research and development, and a good international reputation, he said.

"Canada is a trade-friendly nation," said Greuel. "We export 95 per cent of what we produce and that won't change if we're part of the value-added sector.

"Our role is to help position Canada as a global leader in plant-based food, feed and plant-based co-products. We want to contribute to Canada's economic growth. We want to act as a catalyst to support innovation and collaboration and we have a long-term goal to transform Canada's agriculture and food processing sectors from where we are today to what we can become."

Breeding new varieties with the right genetics for both protein content and quality will be key, he added.

"For instance, we'll be considering investments in decreasing fibre content, and increasing fibre concentration in canola. We'll be considering investment around increasing protein content in yellow peas and investments at the end of the value chain that make processing more efficient."

Western Canada has historically underinvested in processing technology but that may soon start to change.

Protein Industries Canada is currently in the midst of its first call for proposals — with $40 million in funding available. (Successful bidders will have to at least match any money they receive.) A second call for proposals will take place this fall.

"Technology priorities will be the majority of investments that we want to make," said Greuel. "This will be 80 to 85 per cent of the investments that we want to make."

His organization also wants to help small- and medium-size enterprises grow, he added.

“We want to make sure this is inclusive growth. We’re hoping to see how we ensure that First Nations are benefiting from the investments that we’re making.”

It will also be working with post-secondary institutions to make sure that the next level of graduates will be able to take advantage of opportunities in the plant-based protein sector. Protein Industries Canada will also advocate for regulatory changes that allow companies with innovative ideas to act on them quickly.

“We want a regulatory environment aligned with advancements in innovation,” said Greuel. “We’re really working to create a long-term sustainable change in the industry.”

But change won’t happen overnight, he emphasized.

“Our work will not be done in four years. I don’t think our work at Protein Industries Canada will be transformational in four years. We’re taking the first steps to grow this industry in Western Canada.”

PROTEIN INDUSTRIES CANADA FIVE-YEAR SUPERCLUSTER STRATEGY

PROTEIN
INDUSTRIES
CANADA

Our Vision *is to position Canada as a leading global source of sustainable, high-quality plant protein and plant-based co-products, while substantially contributing to Canada's economic growth and international trade.*

Our Mission *is to inspire innovation and support collaboration to transform Canada's agriculture and food processing sectors.*

THIS IS CANADA'S OPPORTUNITY

The global demand for food is growing, with a specific need for more protein. Canada is uniquely positioned to meet this need. We are a leader in agriculture research with technologically advanced farmers. Western Canada is home to more than 28 million hectares of arable land, with annual production of 60 million metric tonnes of crops that results in 12 million metric tonnes of protein. Canada is a trusted supplier of food and feed.

It is our time

By creating more value-added processing opportunities in Canada, we will generate new companies, products, processes and services. We will create jobs. We will generate opportunities for our small and medium enterprises to scale, integrate into global value chains, transition to high-value activities and become global market leaders. We will build a shared competitive advantage for Canada.

A BOLD VISION FOR CANADA'S AGRI-FOOD SECTOR

The Advisory Council on Economic Growth and Canada's Agri-Food Economic Strategy Table set bold growth targets for the agri-food sector. The Dominic Barton chaired Advisory Council challenged Canada "to double its global market share in agri-food products by 2027."[1] The Economic Strategy Table set goals including $140 B in domestic sales by 2025 (an increase from $110 B in 2017) and $85 B in exports by 2025 (an increase from $65 B in 2017).[2]

Protein Industries Canada (PIC) is well-positioned to support these ambitious goals.

PIC will work to grow small and medium-sized enterprises and leverage the market power of large anchor multinational firms by:

- Creating connections between companies, customers and our world-leading scientific capacity;
- Investing in technological priorities;
- Addressing constraints to growth;
- Creating a strong, globally-recognized, Canadian plant protein value-chain; and
- Improving Canada's global brand.

1. Unleashing the growth potential of key sectors, The ADVISORY COUNCIL ON ECONOMIC GROWTH February 6, 2017.
2. The Innovation and Competitive Imperative: Seizing Opportunities for Growth. Report of Canada's Economic Strategy Tables: Agri-Food.

THE GROWING GLOBAL DEMAND FOR PLANT-BASED PROTEIN

The global plant-based protein market is estimated at more than $8 B USD and is expected to reach $14.8 B USD by 2023 with an expected compound annual growth rate of 5.9 per cent.[3] Over the next five years, human consumption of plant-based protein is projected to nearly double.[4]

This growth trajectory is supported by an increasing global population, a growing middle class, changes in western diets and increased requirements for livestock and aquaculture feed and companion animal food. According to the Canada West Foundation, as this global demand for plant ingredients escalates, international firms have assessed the Canadian Prairies as the place best suited to meet this demand. Getting in on the ground floor will position Western Canada to dominate the global plant ingredient industry.[5]

Canada has an advantage in the fact that we produce unique, high-protein crops, specifically canola and pulses. Our sustained advantage comes when we have continued access to the global market with novel products that come from these crops.

This space, primed for economic growth, is characterized by technology driven start ups, SMEs ready to scale and large anchor companies that have access to capital and global markets.

Targeted investments through the Innovation Supercluster Initiative (ISI) will contribute to this growth and create a sustaining ecosystem that will help meet the ever-growing market demand for plant proteins.

THE WESTERN CANADIAN PLANT PROTEIN ADVANTAGE

With approximately 85 per cent of Canada's farmland, innovative producers, globally-recognized research infrastructure and a low carbon agricultural production system, the Canadian Prairies are uniquely positioned to capitalize on global growth in demand for plant protein.

Few places can reproduce this competitive advantage that has evolved over a century of agricultural production in Western Canada. Canada's agriculture system is backed by a unique set of crops that are sustainably produced by innovative farmers. This system is supported by a research and development community that links the entire value chain from genetic researchers and breeders through the producer to ingredient processors and food manufacturers. The entire system is responsive to consumer needs and trends, as they are communicated back to researchers at the start of the value chain, allowing for innovation to be scaled and commercialized quickly.

3. Mordor Intelligence, "Global Plant Protein Market," https://www.mordorintelligence. com/industry-reports/plant-protein-market, November 2017.
4. Mordor Intelligence, "Plant Protein Market (2017 - 2022) | Size | Share | Forecasts". Web excerpt.
5. Canada West Foundation, "Sprouted: the plant ingredient opportunity taking root on the Prairies", December 2017.

STRATEGIC INVESTMENTS IN TECHNOLOGY

PIC's value chain approach to innovation, leading to increased production and processing, new and expanded export markets, and scaling of agriculture business, will occur through investment across four main technology priorities:

CREATE:

Will focus on advanced breeding technologies and germplasm development. Investments will focus on improvements to protein content, quality and functionality with an aim to improve processing efficiency and the development of novel food ingredients.

GROW:

Concentrates efforts on primary production and sustainability objectives using technologies related to data and predictive analytics, artificial intelligence, automation and sensor technology to increase production efficiency, including nutrient and water use, as well as soil carbon sequestration and enhanced photosynthesis. These efforts will reduce cost, improve sustainability and increase understanding of the effects of production practices on protein quality and quantity.

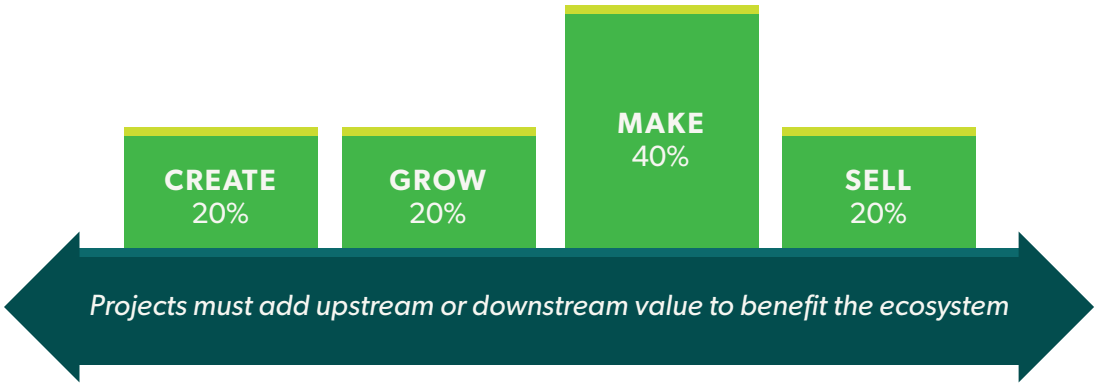
MAKE:

Is centred on improving processing by enhancing current processes or developing new technologies to increase efficiency, decrease energy consumption or to develop entirely new products from existing commodities. Improvements in this area will allow companies to scale, attract investment into the sector and help meet the need for product consistency in both supply and quality.

SELL:

Focuses on the development of new markets, in the human, livestock, aquaculture and pet food markets and serving those markets more effectively with improved logistics and traceability. This pillar builds on Canada's brand advantage as a food and ingredient supplier to be better position SMEs to take advantage of the increased demand for plant proteins. This includes pre-competitive research, prototyping and testing, improved trade relationships and trade literacy. Investments will connect small and medium-sized enterprises with multinational food and ingredient manufacturers and branded food companies through improved supply chains.

PIC's investment will be distributed in each of the four pillars that makeup the ecosystem.



OPPORTUNITIES FOR INVESTMENT

PIC will focus its investment in priority areas as identified by industry. These areas represent the most significant opportunities for growth and will have the greatest impact on the success of the ecosystem. These have been identified through industry consultation, the work of the Federal/Provincial/Territorial Agriculture Ministers' Table, and the Advisory Council Economic Growth and Agri-Food Economic Strategy Table Report.

Investments made in collaboration with the private sector will accelerate opportunities, while addressing areas of constraints. Together, this approach will grow the value added and food processing sector and establish Western Canada as a leader in the plant-protein sector. PIC will also help to build and strengthen the ecosystem, with the goal of ensuring that businesses have the supports and tools necessary to be successful, sustainable and to take advantage of opportunities. Examples of this include, improving IP literacy and assisting with access to capital and other support programs. PIC will invest into both Technology Priorities and Ecosystem Development.

Year	Technology Priorities	Ecosystem Development
2019	90%	10%
2020	88%	12%
2021	86%	14%
2022	85%	15%

The areas of investment can be classified within the broad categories of technology, global branding and recognition, infrastructure, access to labour, skills and talent, regulation, intellectual property management and access to capital.

Technological Opportunities

Agriculture and food processing are technology driven and innovative industries. Together, technology and innovation keep the sector globally competitive, allows the value chain to respond to shifting consumer demands and ensure industry remains adaptable to factors such as climate change. Innovation in technology is a major area of opportunity for the agriculture and food processing sectors, however, there is decreasing public sector investment in this area.[6] Increased and targeted investment will focus on advanced plant breeding technologies, data management and processing technology.

CREATE:

PIC will invest in advanced breeding technologies to overcome challenges related to speed of traditional breeding. Genomics and gene editing technologies will be employed to advance breeding objectives faster than could be achieved through traditional breeding methodology. In plant breeding, data and information derived from genomic screening and digital imagery will drive algorithms to predict field performance reducing the time from initial crosses to commercial production.

GROW:

Will focus efforts on data and predictive analytics to improve agronomic practices and to drive production decisions at the farm level which can have positive effects on yield as well as protein content, quality, consistency and overall production sustainability and Carbon emissions and sequestration.

MAKE:

Work in this area will ensure processors are more efficient, profitable and will help to reduce the environmental footprint of value added processing. Investment will address processing efficiency, including research into energy and input reduction, as well as support the development of new products and processes.

SELL:

Includes technology, such as employ block chain technology, to improve data capture and digitization to support supply chain efficiency and traceability.

Investing in our Global Brand and Recognition

Western Canada is home to more than 28 M hectares of farmland, that supports an average of 60 MMT of high-protein crops; an accomplishment not produced in any other jurisdiction. Add to this, Canada's current reputation as an environmentally sustainable source of agricultural commodities, with world-class innovative producers, and a strong competitive advantage begins to emerge.

However, the industry faces three main challenges in this area: reliability of supply, authenticating our global reputation and a lack of global recognition as a supplier of protein-rich food ingredients. Investment into these areas is necessary to improve Canada's global brand as a food and ingredient supplier.

6. AIC (2017), An Overview of the Canadian Agricultural Innovation System. Ottawa, ON: Agricultural Institute of Canada.

Canada's global brand as a reliable supplier is increasingly questioned due to issues with our rail and port infrastructure. PIC investments will lead to higher value, higher bulk density ingredients and food products, while opening alternative avenues of transportation; alleviating the dependency on rail infrastructure. PIC will also support the development of enhanced supply chain logistics to meet end use customer demands for reliability and traceability.

Canada, with the support of PIC, also has an opportunity to keep enhancing our brand around data trust and integrity. With the continued focus on field to plate, the ability to identify ingredients and their source with a transparent, traceable, reliable and trusted data tool is important in building our Canadian Brand. PIC will engage in partnerships to better understand expectations of customers and the proof points, metrics and data necessary to substantiate the claims.

The increasing demand for sustainability measures by both food manufactures and consumers, such as a full life cycle analysis of a product's carbon footprint, is a new factor influencing ingredient and food purchasing. PIC will work with industry to better understand how food companies are making ingredient purchasing decisions beyond the traditional criteria of volume, price, consistency and functionality. Targeted investments will explore purchase decisions related to sustainability, total carbon foot print, nutritional composition and food safety and develop a process and strong science to validate those claims.

Finally, PIC will work with industry leaders to tell the story of Western Canada's plant protein advantage – of novel crops that lead to novel products – to the global marketplace. Our goal is to ensure that domestic and international food and feed companies recognize our global advantage and that the entire value chain receives full benefit for our innovative and sustainable production and processing practices.

Infrastructure

The agriculture and food processing sectors have complex and substantial infrastructure needs. To secure the Prairies as an agriculture production and processing powerhouse, focused investment into infrastructure along the value chain – from the lab to end market – is necessary.

As a sector required to move high volumes of low-bulk density product to market, the agriculture and food processing sector is particularly attuned to transportation infrastructure challenges. While PIC is not investing in rail transportation, PIC will focus on the creation of new, higher value products that allow for additional modes of transportation in addition to rail – helping to improve reliability of western Canadian products

Beyond transportation challenges, infrastructure deficits exist in research capacity and data management.

RESEARCH CAPACITY:

Research needs for the agriculture sector in Western Canada are well serviced at the front end of the value chain, or the Grow pillar. A strong network of private and public plant breeders and facilities exist to meet most needs in this area. However, research infrastructure is lacking in the processing, product development and product testing areas. PIC will work with private sector partners, contract research facilities, post secondary research institutions, regional food industry development centres and regional colleges to catalogue the research infrastructure, identify critical gaps and then co-ordinate with funding partners to create a sustainable research and development community and infrastructure. Potential research infrastructure funding partners include producer organizations, federal and provincial government departments and agencies, private sector contract research institutions and philanthropic investors.

DATA MANAGEMENT:

We are currently witnessing a digital transformation of all industries across the global economy. The rate and pace of digital transformation is increasing, and the agriculture and food industries must adapt to survive and thrive in this transforming economy. This is critical to meet the increased demand for food, sustainable production goals and to attract much needed capital investment to the sector. PIC will help foster a foundational data platform for innovation across all four PIC pillars and for all members to meet the goals of the Supercluster.

The need for improved data infrastructure in the agri-food space was recently highlighted by Dominic Barton who urged the industry to "develop a data strategy for the agfood sector in Canada to securely collect agronomic and economic data from farmers and food processors, provide them with enhanced decision-making tools to enhance yield, crop quality, and competitiveness, foster system-wide transparency and traceability, and furnish researchers with data for their work–all through partnerships with analytical platform providers and scientists."[7]

Improved Data and IT Management can be employed across all four PIC strategic pillars;

- **Create:** Utilize bioinformatic data and digital plant imagery to improve the speed and accuracy of plant genetic improvement and creating tighter linkages between genotype and nutritional quality;
- **Grow:** Improve the intersection of sensor technology, satellite imagery, weather data and farm record management (both inputs and outputs) to improve production efficiency;
- **Make:** Through enhanced seed quality information (protein content and seed constituent characterization) to improve processing efficiency; and
- **Sell:** Employ industry chain of custody technology to improve both supply chain efficiency and traceability.

PIC will work with members in the Data and IT space and across all four strategic pillars to address principles related to data management for data creators, aggregators and user, work to address data governance issues and increase collaboration with existing data and new data that will be created within the ecosystem.

Increasing Access to Labour, Skills and Talent

The value added, food processing and feed sectors require a diverse and specialized labour force that spans plant breeders and geneticists to agronomists and production agriculture specialists. Food processing – creating new products and processes, requires an array of skills – from process engineers, plant operators, food scientist and product development specialists. In addition, the increased focus on digitization will require more programmers, AI specialists and data analysts than are currently working in the field.

The Agri-Food Strategy table characterized the problem, "primary agriculture, food processing companies and related input and service providers employ approximately 3.5 per cent of Canadians, yet the sector continues to report critical and ongoing labour shortages across all skill levels. The cause of this is complex, but top reasons cited by industry include a lack of skilled talent both in STEM and other high-skilled occupations (e.g., machine technicians), lack of awareness about career opportunities in the agri-food sector for general occupations (e.g., electricians, plumbers) and perceptions about working in the sector."[8]

7. Unleashing the growth potential of key sectors, The ADVISORY COUNCIL ON ECONOMIC GROWTH February 6, 2017.
8. The Innovation and Competitive Imperative: Seizing Opportunities for Growth. Report of Canada's Economic Strategy Tables: Agri-Food.

The challenge is that no single academic institution can provide the full capacity in programming required to match industry needs. Given the pace of intelligent technology disruption and the opportunities associated with these new technologies, the need for iterative collaboration between industry and academia is critically important. Western Canada can be a leader in industry and academia working together to design curriculum that considers industry demanded skills to produce highly skilled graduates.

In support of this, PIC is working with industry and academia to establish the Pan Prairie Academic and Training Working Group (PPAT-WG). This group will ensure that there are the necessary skills and training tools to meet the future demands of the sector. The PPAT-WG is composed of representatives from industry and academia from businesses, universities, colleges and polytechnics across the Prairie Provinces. In addition to industry and academic stakeholders, the PPAT-WG engages with the National Research Council (NRC), the National Sciences and Engineering Research Council (NSERC), the Social Science and Humanities Research Council (SSHRC), Mitacs and Technology Transfer Offices across the Prairies.

Specifically, the PPAT-WG will develop a labour force skills strategy, provide an online, searchable database of academia skills and training expertise across the Prairies, create programming for skills and talent development for students at all levels and act as a technology and training sandbox to provide work-integrated learning opportunities for students at all levels.

Addressing Regulatory Barriers to Innovation

Canadian commodities, ingredients and food products enjoy a strong domestic and international reputation for food safety, due in part to a science based regulatory framework, anchored by *The Safe Food for Canadians Act* and several other Acts and Regulations that strengthen our reputation.

However, the state of the regulatory environment in Canada and the impact of regulation is impacting companies' willingness to invest and their ability to innovate. Dominic Barton called for "modernizing regulations to streamline approvals and remove barriers to bringing new solutions to market."[9]

The Agri-Food Economic Strategy Table was more direct stating that, "Overly prescriptive and process-driven regulations are preventing companies from adopting innovative products and production systems, responding to shifting market opportunities and accessing the latest technologies used by competitors. Regulators need to work with industry…to identify opportunities to achieve our strict health and safety outcomes at the lowest cost to the economy."[10]

PIC has engaged in a series of industry consultations regarding the challenges our member face in the regulatory space. These span the value chain from Plants with Novel Trait Regulations, Novel Food Regulations, Novel Feed Regulations and Food Labelling requirements. Industry concerns include uncertainty with how regulatory decisions will be made and enforced, uncertainty about how new technologies will be regulated, the length of time required for regulatory approval and asymmetrical regulations with our major trading partners.

9. Unleashing the growth potential of key sectors, The ADVISORY COUNCIL ON ECONOMIC GROWTH February 6, 2017.
10. The Innovation and Competitive Imperative: Seizing Opportunities for Growth. Report of Canada's Economic Strategy Tables: Agri-Food.

This uncertainty impacts a company's willingness to invest in the agriculture and food processing sector. Plant breeding firms, for example, have greater certainty about the regulation of gene editing technology in other jurisdictions, such as the United States. Therefore, these companies are much more willing to invest in the U.S. compared to Canada. This is compounded when both SMEs and MNEs potential investment is considered. Canola and pulses are large and important crops in Western Canada, but relatively small globally. The uncertainty of Canada's regulatory space for novel traits further cements a business' decision to invest in larger crops, such as corn and soybean, in more certain regulatory environments such as the U.S.

From a food processing perspective, the asymmetrical regulatory requirement for plant protein labelling with the U.S. requires food companies to create and run separate packaging lines for both markets. This prevents investment in Canada, as the U.S. market is considerably larger and more profitable. This leads to Canadian developed food products, made with Canadian ingredients, being produced in the U.S. for the U.S. market.

PIC will work with industry to determine the most significant regulatory barriers to innovation, while maintaining food, feed and environmental safety. The Supercluster will work with federal and provincial regulatory agencies to create the scientific knowledge required to implement regulatory changes in support of innovation.

Increasing the Value of Intellectual Property

Canada is a country of inventors. We have strong scientific capacity that leads to the creation of new knowledge and technologies, however we lag other industrialized nations in our ability to realize the value of IP. There are many reasons for this identified in the recent Federal Government report, Building a Nation of Innovators, including weak IP literacy, the fact that only 10 per cent of SMEs hold IP and less than half of those have a formal IP strategy. This is despite our understanding of the value of IP in today's economy. "SMEs that hold formal IP are four times more likely to export and 64 per cent more likely to be high-growth firms. Businesses using IP in patent-intensive industries have about eight to 10 times more revenues than those not using IP. IP-intensive businesses pay 16 per cent higher wages, on average, than businesses with little or no IP. SMEs that hold formal IP are three times more likely to engage in product innovation than those without IP and two times more likely to engage in other types of innovation."[11]

Support in managing, and access to, IP is a benefit of Membership with PIC. PIC's approach to IP management is based on three guiding principles:

- Building trust among Supercluster members;
- Protecting the value of background IP; and
- Maximizing the value of foreground or arising IP.

Using these principles, PIC will work with industry to increase the value extracted from Supercluster co-funded research.

PIC will work with SMEs to improve their IP literacy with a focus on awareness, education and advice with an aim to create better knowledge and understanding of how IP can help companies compete in a global marketplace. PIC will provide services through a dedicated IP Manager and create opportunities for information exchange on industry best practices for IP management.

11. Building a Nation of Innovators, Innovation, Science and Economic Development. www.canada.ca/innovation.

To assist members in maximizing the value of IP, PIC will create an IP registry for all Foreground IP developed with investment from the Supercluster. In addition, at the start of each project, PIC will, through the role of the IP Manager, help consortia develop their IP rationale, anticipate the Foreground IP that will be developed and help identify Supercluster members that may benefit from a formal licencing of the Foreground IP.

PIC will help SMEs better protect their IP through improved IP literacy, creating connections between members and legal expertise and ensuring that project consortia define at the start of a project, both the IP ownership structure and plans for the licensing of IP to other members of the Supercluster. In addition, PIC will work with industry to explore a prior art library in the agriculture and food processing sector to help defend against patent challenges against member developed IP.

Access to Capital

In recent years, agriculture and food processing has been an area of emphasis for venture capital investors. Most notably, high profile projects such as the development of the Impossible Burger have garnered attention. It is encouraging to see the investment in the agriculture and food space, however, the Canadian reality is that less than three per cent of venture capital investment flows into the Prairie region, and only a fraction of that is targeted to the agriculture and food processing sector.

Western Canada has seen both start up and established companies looking to scale, move out of the Prairie region and establish operations closer to venture capital sources. This separation between the research community that generates new technology and those with the skills to develop and commercialize it, has slowed the pace of innovation and commercialization.

As PIC works with industry to develop new crop processing technologies and novel food ingredients, it only makes sense to commercialize and scale those processes in Western Canada, near the supply of raw material. This requires talent and capital. To achieve the convergence of technology, talent and capital, PIC will work in close concert with a series of Venture Capital firms that have a line of sight to the PIC research portfolio. The mutual exchange between the technology companies and the venture capital firms will help ensure that technology is commercialized faster. Venture Capital firms are best positioned to provide an environment for technology incubation and mentorship to PIC funded SMEs.

KEY PERFORMANCE INDICATORS

PIC is seeking to increase Canada's global economic strength in the creation, development and commercialization of plant proteins and co-products to help position firms to achieve scale, become integrated into global value chains, transition to greater production of high-value activities and become global market leaders.

PIC has identified seven top line metrics on which to measure success;

Opportunities for Growth	Outcome
Overcoming Technological Challenges	• The development of new plant-based food ingredient, feed, pet food, aquaculture and industrial products • Increase in the research and development investments in the private sector • The creation of 4,500 jobs over the next 10 years as a result of PIC investments and the development of new technologies
Improving our Global Brand and Recognition	• Increase the economic value of Canada's Agri-Food industry by $4.5 B over the next 10 years • Establishing Canada as a globally recognized centre for plant proteins and related co-products
Addressing the Infrastructure Deficit	• The creation of lasting research infrastructure for the value added processing sector • Enhanced industry collaboration in data management and data analysis leading to improved production and processing decisions
Increasing Access to Labour, Skills and Talent	• Increase in the number of students trained in fields related to the value added processing sector in Western Canada • Increase in the number of new graduates employed in the values added processing sector in Western Canada • Increase to the number of research and development employees and world-class scientists present in the cluster
Addressing Regulatory Barriers to Innovation	• A regulatory system that supports and encourages innovation across the value chain while ensuring food, feed and environmental safety
Increasing the Value from Intellectual Property	• Increase in the number of SME firms that hold IP • Increase in the number of firms with a formal IP strategy • Increase the number of license agreements for IP in the agriculture and good processing sector
Improving Access to Capital	• Increase the total percentage of venture capital funds invested in Western Canada • Increase in the total percentage of venture capital funds invested in the agriculture, value added and food processing space • Increase the number of new firms, spin-offs and their survival rate, as well as the number of local firms involved in the cluster

ONGOING STRATEGY EVALUATION

The Board of Directors and Management of Protein Industries Canada are committed to organizational and operational excellence, responsive to the needs of our members and industry, delivering on the objectives and expected results of the Innovation Supercluster Initiative and above all, growing the value-added processing sector in Canada.

The concept of the Supercluster, the Innovation Supercluster Initiative and the work that Protein Industries Canada is about to undertake is new to Canada. As this sector is rapidly growing and subject to changing market demands, new trends and the adoption of new technologies, this strategy will continue to evolve.

An indication of the success of the strategy, is PIC's sustainability beyond the initial five-year agreement. Therefore, in addition to the work necessary to operationalize and implement this strategy, PIC will explore strategic partnership and alternate revenue sources to ensure relevance and continued growth beyond 2022.

As such, Protein Industries Canada is committed to ongoing review, evaluation and adjustment of this five-year strategy and will update and amend as required.