

Functional Food and Nutraceutical Focus Group

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A steering committee of representatives from Alberta Agriculture, Food & Rural Development (AAFRD), Alberta Crop Industry Development Fund Ltd. (ACIDF) and Alberta Research Council (ARC) was formed to organize a focus meeting on the FF/N sector of the crop industry. The goal of the focus group was to identify specific opportunities, and to select areas for potential investment most likely to benefit Alberta's industry.

The focus group design represented value chains in the sector, with a western Canadian scope.

The focus group was held May 1 2003 in Leduc. Participants ranged from producers through researchers to consumers, and from business experts to health and nutrition industry representatives.

Both the focus group and the subject area were quite large. To verify the findings, this report has been validated among the participants and has been reviewed by selected individuals across the industry.

The focus group was challenged with three questions; two related to prioritized opportunities for Alberta and a third related to a vision of an FF/N network within the province. The *Summary of Priorities* below contains the combined results of the two opportunities questions, and separate commentary on the network question.

Definitions

Functional Food: Food/beverage consumed as part of the usual diet, has physiological benefits beyond basic nutrition and/or reduced risk of chronic disease.

Nutraceutical: Isolated active ingredient in a medicinal form such as pill or powder and/or reduced the risk of chronic disease..

Summary of Priorities and Principals

A number of principals and value statements came from the discussions and notes:

1. The greatest opportunities likely exist for active ingredients obtained and derived from existing and developed crops, as opposed to developing novel crops for limited uses.
2. At this time, the Development of novel strains of existing crops should be discouraged where the novel strain is a potential threat to the marketing of the existing crop or has not gained consumer acceptance. (i.e.: development of GMO wheat is a potential threat to export markets of all wheats)

3. Development of functional foods to support Alberta's initiatives in cancer and diabetes research would be preferred from a technology standpoint and from an expanded funding opportunity. Weight control and obesity alternatives were also identified as priorities.
4. Research should be directed from an active ingredient platform rather than being crop driven. Crops should be selected to produce the most cost effective, high quality active ingredient.
5. Some research should be directed towards identified market opportunities.

Priorities for development have been derived from the analysis in Appendix B, which looks at individual crops in relation to active ingredients. A prioritized list of crops and active ingredients to invest in follows:

Pulse Crops

1. Beta-glucan and fibres
2. Oligosaccharides
3. Sulforphane
4. Saponins
5. Lignins
6. Isoflavones

Cereals¹

1. Beta-glucan and dietary fibres
2. Dietary fructans
3. Peptides
4. Sulforphane
5. Lignins

Oilseeds

1. Beta-glucan and fibres
2. Sulforphane
3. Lignin
4. Conjugated Linoleic Acid (CLA) / Gamma Linolenic Acid (GLA)

Small Dark Fruits

1. Omega 3/6 fatty acids
2. CLA / GLA
3. Isoflavones

Priorities viewed from an active ingredient standpoint are:

1. Beta-glucans and dietary fibres
2. Dietary fructans

¹ Cereals in this recommendation include triticale, even though this crop received little discussion in the focus group. Please refer to the focus group report on the triticale industry (www.acidf.ca) which details active ingredients comparable to most other cereals. Further, triticale has great potential as a development platform for non-food and segregated production uses.

3. Sulforphane
4. CLA/GLA
5. Lignins
6. Omega 3/6 fatty acids

Priority should be given to funding the following actions:

1. Clinical verification of the efficacy of active ingredients
2. Developing communication between industry and research, and between health and agriculture specifically to pool resources and to narrow the field of study to areas of greatest potential success.
3. Development of technologies to deliver active ingredients to the market and to improve stability and quality of the products.

This report also recommends any network development for this sector at this time should take the form of the strategic development model discussed in question 3 on page 7. A primary goal of this network will be to bring health and consumer interests to the table and to set win/win priorities for the highest potential development. The industry at this time cannot afford to use a shotgun approach to development.

While not a part of the focus group mandate, discussion highlighted three strategic action items that are needed to develop this industry:

1. Processing and production facilities are prerequisite to adding value to agricultural products; otherwise research and development efforts will likely add value outside the province. Financial support is required.
2. Development, production and commercialization of functional foods are multi-dimensional and require a multi-disciplinary approach. We need to establish a strategic collaborative framework.
3. Alberta legislation appears to be behind other provinces in encouraging venture capital investment.

Focus Group Notes & Methodology

The meeting began with development of a standard definition of functional foods and nutraceuticals. Definitions varied somewhat around the group. Next the group was divided into small groups to address and answer each of the three questions. Answers to each question were presented to the large group before the next question was assigned. Participants were rotated in the groups for each question.

Focus Group Questions

- 1) Which active agents have the greatest potential markets, and are suited to being produced in Alberta?
- 2) Which bottlenecks are evident in the value chains of these products? (Prioritized if possible)

- 3) What outcomes would be expected from a functional foods/nutraceutical network that represents Alberta? What would that network look like?

Question 1 – Results

Which active agents have the greatest potential markets, and are suited to being produced in Alberta?

Discussions between the four breakout groups varied considerably. The compiled results of the discussion are shown in Appendix A: Component Selections For Alberta. This table uses health benefits as the primary criteria. Most promising active ingredients and related crops were listed. Finally the listing was ranked separately from the health practitioner viewpoint and from consumer interest.

An analysis of this collected information shows the greatest potential for research and development to lie with pulses, major cereal crops, flax, canola and some small dark fruits. This analysis is shown in Appendix B and the Priority Summary above.

Question 2 – Results

Which bottlenecks are evident in the value chains of these products?

Discussion groups focused on one of cereals, oilseed, pulses and medical/research.

Industry Wide

Research Needs:

- Refocus on bioactive ingredients (soluble fibre, oligosaccharides², dietary fructans³)
- Cost/benefit analysis of extractions vs. synthetic production of bioactives.
- Lack of evidence for health / wellness benefits
- Develop varieties and agronomic practice that impacts bioactives after market potential established
- People with the skills to do the research and adequate funding
- Food formulation and stability of product

Regulatory Issues:

- Health claims legislation
- Labeling (including differences between Canada and US market)

Investment/Commercialization Issues:

² A carbohydrate that consists of a relatively small number of monosaccharides. A monosaccharide is defined as any of several carbohydrates, such as tetroses, pentoses, and hexoses, that cannot be broken down to simpler sugars by hydrolysis.

³ Dietary fructan refers to any carbohydrate in which one or more fructosyl-fructose linkages occur. These include short chain (oligo-), long chain (inulin) β -2, 1-fructans, and long chain bacterial levans (β -2, 6-fructans)

- Research funds not coordinated between Agriculture and Health sectors (recommend a funding consortium approach)
- Harmonizing product specifications and standards with major trading partners
- Too few receptor companies
- Interprovincial differences in economic and taxation environment.
- Highly fragmented industry, largely small/medium enterprises.

Infrastructure Issues:

- Extraction facilities and technology above bench scale (non-solvent extraction)
- Costs and capacity to do clinical trials
- Government provide tax incentives to attract investment
- Government establish legislation for Agric-venture capital fund

Competitive Intelligence Issues:

- Convergence to Wellness and integration between agriculture and medicine.
- Intellectual property policy
 - o Complicated process in multi-disciplinary industry
 - o Ownership tied to multi-nationals in specific crop sectors to increase chance of going to market
- Partnering between small/medium enterprises (SMEs) and between SMEs and multi-nationals should be encouraged.

Market Structure Issues:

- Understanding the market place
- Difficulty in getting value back to farm gate⁴

Medical and Research

Research Needs:

- Knowledge of application and efficacy of bioactives in medicinal plants.
- Developing quality parameters for bioactives and crops producing them. (Common quality standards)

Investment/Commercialization Issues:

- Minimal interest from investors

Infrastructure Issues:

- Limited processing capacity to bring products to market

⁴ This is not difficult; it is impossible. The only conditions where value greater than the shipping differential will flow back to the farm gate is where the product grown is limited to a confined geographic area. For example, no company, no matter how well intended will pay more for barley at Edmonton than the price plus shipping of comparable quality from the nearest alternate market.

However having excellent quality, cost competitive barley may attract a company that is or wants into the market

- Lack of critical mass of feedstock

Cereals

Market Structure Issues:

- Insoluble dietary fibre- is the market saturated?
- Limited need for additional money investment into beta-glucan research from oats and barley at present.
- Canadian Wheat Board (CWB)

Oilseeds

Research Needs:

- Knowledge of application and efficacy of bioactives in medicinal plants.
- Developing quality parameters for bioactives and crops producing them. (Common quality standards)
- Food formulation
- Stability (flax, hemp)
- Niche products
- Move flax into functional foods
- Canola, specifically traits from non-GMO varieties
 - o Enhancing specific components using traditional breeding methods

Investment/Commercialization Issues:

- Minimal interest from investors

Infrastructure Issues:

- Limited processing capacity to bring products to market
- Lack of critical mass of feedstock

Pulses

Research Needs:

- Develop partnership to identify bioactives, conduct clinical studies, and attract industry partners.
 - o AAFC, AAFRD, OCCI, ARC (in progress with Pulse Canada)

Competitive Intelligence Issues:

- Identify competition and markets
- Continue component identification
- Are there competitive advantages to processing here?
- Identify markets for byproducts

Market Structure Issues:

- Market for byproducts

- Location of end use market
- Non-GMO is all that is acceptable at this time

Question 3 – Results

What outcomes would be expected from a functional foods/nutraceutical network that represents Alberta? What would that network look like?

The results for this section, taken en-masse, would describe an organization that would be all things to all people. This is as improbable as it is undesirable.

The list of points divides naturally into four basic organization types:

1. Strategic, developmental network,
2. Market development network
3. Political Lobby
4. Alliances between agriculture and health groups

The strategic development network should be responsible for identifying products with the greatest opportunity and the crops that can supply those products. **This group should have strong representation from the consumer and health sectors, with a primary goal of combining resources with the agricultural industry.** A strategic development function must include priority setting, research needs identification, and identification of barriers to industry development. This group could work closely with funding organizations and academia to develop investment plans to further the industry. The strongest role here is the identification of the “next step” to move ahead. One way to describe this function would be a “gated evaluation” approach. The network for this sector must have both agriculture and health participation.

A market development network can take two forms: an industry sector network or value chains. A network in this category should consider market streams from producer to consumer. It would have a role in information transfer, market intelligence (national and global), and a strong stake in product quality, efficacy and consumer image and consumer awareness. The market groups, with specific product focus, would be the most likely to attract processors, investment and venture capital. A market development network will need to be directly involved with labelling issues in Canada to move products forward.

The development of political lobby organizations is outside the interest and mandate of this focus group.

Appendix A: Component Selections For Alberta

Ranking of Ingredient by Health and Consumer Viewpoint

Health Benefit	Rank by health	Rank by consumer	Active Ingredient	Crop
Enhancing Performance			What do we know folks???	
Heart health	High		Phytosterols, phytostanols isoflavones, omega 3/6, betaglucan, (soluble fibre) pentosans dietary fructans saponins oleic / linoleic	Red clover, trees, pulses pulses, small dark fruit, red clover flax, hemp, canola, small dark fruit barley, oat, wheat, rye, rhubarb, mustard rye chicory, jerusalem artichoke pulses, medicinal plants, quinoa canola, safflower, sunflower
Cancer	High	High 9*	Phenolics Tocopherols Phytostanols Sulforphane Insoluble fibre Dietary fructans	Red clover, trees, pulses, small dark fruit, Barley, oats, sea buckthorn, canola Cruciferous Cereals, pulses Cereals, chicory, Jerusalem artichoke
Diabetes	High	High 4*	Peptides Beta glucans Soluble fibre Dietary fructans Lignans Sulforphane CO-Q10 Various, (polysaccharides)	Wheat, oats, barley, rye rhubarb Pulses, fenugreek, chicory, mushrooms Cereals, Jerusalem artichoke Flax, rye, pulses Cruciferous Canola Medicinal plants
Obesity	High	High 16*	DAG (diacylglycerol) CLA Steviosides Dietary fructans	Canola Stevia Cereals, chicory, Jerusalem artichoke

Health Benefit	Rank by health	Rank by consumer	Active Ingredient	Crop
Brain Function/nervous system			Omega 3/6 CLA GLA Various saponins	Oilseeds, borage Safflower, canola sunflower, flax, small dark berries, ginseng, st john's wort, faba bean, club moss Essential oils from herbal / medicinals, cereals, chicory, Jerusalem artichoke
Immune system		High	Phenolics Oligosaccharides Polysaccharides Phytosterols arabinogalactans	Small colored fruit and veggies Chicory, Jerusalem artichoke, pulses, sugar beets Echinecea, mushrooms Red clover Wheat , tamarack
Bone & Joints		High 5*	CLA, GLA Flavonoids Minerals from organic source Dietary fructans	Safflower, small dark berries, sunflower, flax, borage, hemp Cereals, chicory, Jerusalem artichoke
Digestive		High 2*	Oligosaccharides Prebiotics Dietary fructans	Pulses Pulses, cereals (starch based) Cereals, chicory, Jerusalem artichoke
Eye health		High 2*	Carotenoid Lutein ALA (Alpha Linolenic Acid)	Carrots Marigold, calendula, small dark berries Canola, flax, mustards, green leafy vegetables
Hormone			Lignans CLA ALA	Flax, rye, pulses Red clover Solin flax, safflower, sunflower Canola, flax

* Number of people within focus group of 26 who considered this a top priority

Notes:

1. Hormones included some anti-aging compounds, menopause treatment compounds and similar products.
2. Performance enhancers included athletic enhancers, sexual performance enhancers, and a number of related products.

Appendix B: Component Selections For Alberta

Ranking of Crop By Selected Ingredient

Crop	Active Ingredient	Health Benefit
Pulses	Isoflavoids	Hormone – cancer and osteoporosis
	sapins	Heart, Cancer, brain Function/Nervous system
	betaglucan, (soluble fibre)	Heart, Cancer, Diabetes, Immune system, Digestive
	Phytosterols, phytostanols	Heart, Obesity
	Insoluble fibre	Cancer
	Phenolics	Cancer, Immune system
	Oligosaccharide	Diabetes, Immune system, Digestive
	Lignans	Diabetes, Hormone, Bone & Joint, immune system
	Soluble fibre	Heart, Cancer, Obesity, Digestive
	Sulforphane	Cancer, Diabetes
	Prebiotics	Digestive
	Cereals Barley, Oats, Wheat, Rye	Soluble fibre
Insoluble fibre		Cancer
Peptides		Diabetes
betaglucan, (soluble fibre)		Heart, Cancer, Diabetes, Immune system, Digestive
Dietary fructans		Digestive, Heart, Cancer, Diabetes, Bone & Joints, Obesity
Tocotrienols / Tocopherols		Heart, Immune system, Health, Cancer, Hormone
Wheat	Arabinogalactans	Immune system
Oats, Barley	Phytosterols, Phytostanols	Heart, Immune system
Rye	pentosans	Heart
	Sulforphane	Cancer, Diabetes
	Lignans	Diabetes, Hormone, Bone & Joints
Oilseeds Flax, Canola, safflower, sunflower, hemp	oleic / linoleic	Heart
	CLA, GLA	Heart, Brain Function/nervous system, Bone & Joints
	omega 3/6	Heart, Diabetes, Obesity, Brain Function/nervous system, Hormone
Flax	Soluble fibre	Heart, Cancer, Obesity, Digestive
	Sulforphane	Cancer, Diabetes
	Beta glucans (Soluble fibre)	Diabetes
	Lignans	Diabetes, Immune system, Bone & Joints
Flax, Canola	ALA	Eye health, Hormone
Canola	Phytosterols, Phytostanols DAG	Heart, Obesity
	Tocopherols CO-Q10	Heart, Cancer Diabetes
Safflower, sunflowers. Flax	GLA	Hormone
Safflower, sunflowers. Flax, Canola	CLA	Heart, Brain Function/nervous system, Bone & Joints Obesity
Small Dark Fruits	Isoflavones	Heart, Cancer

Crop	Active Ingredient	Health Benefit
	omega 3/6	Heart, Diabetes, Obesity, Brain Function/nervous system, Hormone
	CLA, GLA	Heart, Brain Function/nervous system, Bone & Joints
	Lutein	Heart, Eye health
	Phenolics	Cancer, immune system
	Isoflavoids	Hormone
Rhubarb	betaglucan, (soluble fibre)	Heart, Cancer, Diabetes, Immune system, Digestive
	Dietary fructans	Heart, Cancer, Obesity, Digestive, immune system, Diabetes, bone & joints
	Lycopene	Heart, eye health
	Soluble fibre	Heart, Cancer, Obesity, Digestive
	Oligosaccharides	Digestive
Fenugreek	betaglucan, (soluble fibre)	Heart, Cancer, Diabetes, Immune system, Digestive
	Soluble fibre	Heart, Cancer, Obesity, Digestive
	Oligosaccharides	Diabetes,
	Low sugar alcohol's	Obesity

Appendix C: Participants and Reviewers

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