

Why Fibre is the Critical Link in the Hemp Family

CIHC believes that hemp is the critical link in the entire hemp industry. Management believes that over the long run the plant's fibre will become the most relevant, and the most valuable of its three outputs: Seed, Chemicals and Fibre. The key reason: Just as iron ore is a primary product, and steel is a secondary product, seed and CBD outputs are strictly primary - while only the fibre is secondary.

As primary commodities, hemp's seed and CBD outputs react swiftly to the reality of the world's quick changing market dynamics driven by inevitable and often unpredictable pricing fluctuations. However, CIHC believes that fibre will respond to changing market needs, as a secondary "feedstock" product for many years because of the huge gap between the existing supply and demand in the marketplace.

As the supply of quality-controlled, large volumes of hemp fibre increases, more commercial end-users will learn of hemp's benefits and choose to pursue hemp for their needs. These large potential users will learn that the potential benefits of choosing hemp fibres will include:

- Greater profitability across the Value Chain
- Sustainability
- Marketing: environmental friendliness
- Lower overall cost of finished products compared to other natural fibres
- Lighter weight and greater strength
- Increased durability

Management believes the greater the supply of quality-controlled fibre for the marketplace, the more demand will increase -and in turn, cause supply to increase. This is because:

- Current large-scale users do not specify hemp because the volumes needed for the training, marketing and large-scale logistics required for a new product, can't be cost justified today
- Using hemp fibre in MANY existing product applications saves considerable cost, and in many cases has specific important benefits such as lighter weight or improved durability
- Once commercial end-users understand that there is an increasing supply of availability, they will be encouraged to pursue the possibility of lower costs and better products.
- Growing demand will cause growing supply – not lower prices.

Of course, this does not mean that fibre prices will never go down. It is just that CIHC believes that a supply/ demand equilibrium won't happen for at least the next 20 years. The fibre market will grow substantially over that time – bringing scale opportunities and financial success to the innovators. Whether from the perspective of a farmer, a large-scale decorticator, or a major end user of fibre, the hemp plant's fibre will end up being the long-term, dependable and most profitable output of the hemp industry. For a long time.

When the price of seed or CBD retreats, the fibre will always be there to stabilize the opportunity for the farmer. Even before the price of CBD falls in the future, many farmers will be attracted to the unique opportunity growing hemp for fibre can deliver to them today by growing hemp, collecting the flowers for CBD and then processing the stalk.

BACKGROUND DOCUMENT

THE HEMP PLANT * overview *

Hemp is derived from specific varieties of the cannabis sativa family which contain less than .03% THC, a psychoactive ingredient. Hemp caters to 3 of the 4 available market segment opportunities:

- 1) Marijuana THC > .03% - Recreational/ Medicinal
- 2) Seed/ Oil THC < .03% - Nutritional
- 3) CBD THC < .03% - Medicinal and therapeutic
- 4) Fibre THC < .03% - Industrial Applications and Textiles

ABOUT MARIJUANA * overview *

Starting in 2015, legal Canadian “cannabis” companies - focused on medical marijuana - began to emerge. They were all focused on the growth and large-scale opportunity they already knew had existed in the illegal, underground black market. These indoor growing and distribution businesses understood that there were many buyers “out there” who had been around for a long-time. This meant there was a significant market platform on which to build scale. In the meantime, this market has grown quickly. However, the reality is that aggregating and making supply more transparent has already reduced prices by about 15%. Simply put, the early entrants made a fortune on their investments because they recognized there was a proven history of large-scale demand.

Over the last 25 years many countries have chosen to re-legalize hemp’s psychoactive cousin, marijuana: That is, any cannabis varietal containing more than .03% of the cannabis plant’s psychoactive element, THC. Some countries have made “pot” legal for medicinal purposes and many have already made it legal also for recreational purposes. The countries having legalized THC cannabis to date are:

Argentina	Australia	Canada
Costa Rica	Czech Republic	Ecuador
Israel	Jamaica	Mexico
Netherland	Peru	Portugal
South Africa	South Korea	Uruguay

Although the federal government in the USA has not yet made THC products legal, to date 35 States have legalized marijuana to be sold, for either medical or recreational use. It is expected that due to the proven large tax revenue opportunity in “pot”, the USA will very soon join this list.

ABOUT HEMP FIBRE / STALK * overview *

Hemp is a natural fibre, “similar” to cotton, wood, jute, kenaf, bamboo and other grasses. Compared to other natural fibres, hemp’s benefits are its low cost, considerable strength and durability, as well as its lighter weight. Hemp and a few other grasses are high in cellulose, the natural form of rayon – traditionally synthesized from wood fibre. Cellulose adds structure and strength to objects: It was what keeps plants standing up. Cellulose can be isolated and added to other products to make them stronger.

Some grasses, like bamboo, need to be processed chemically for the fibre to be utilized. However, this negatively impacts the environmental association of the resultant products. Bast is an ideal natural fibre already proven to be an ideal, cost-effective feedstock for thermoplastic production, across Europe and Asia. ***In 2018, these geographic markets generated over \$US 1.1 billion in hemp fibre revenue.***

Two kinds of fibers are derived from the hemp plant's stalk: The exterior "bast" fibers, and the inner (core) "hurd" fibers. Bast fibers are strong and similar in length to softwood fibers. They are very low in lignin, the natural glue that binds plant fibres together, making them more rigid, stuck together and difficult to separate. Hurd is more similar to hardwood "chips", higher in lignin than bast.

Fibre processing is a relatively new industry in North America but it is in fact an established, thriving business, already proven in Europe and Asia. It will very likely quickly generate valuable new financial opportunities across North America – just as marijuana did in 2016 – another "proven" market.

Besides the varieties, the big difference in growing hemp for fibre as opposed to seed or CBD is how the crop is planted: there are up to 5 times the number of plants / acre when growing for fibre. The intention is to crowd the plants, minimizing branches and having as much as possible of the sun's life-force go into the stalk. The stalk in these plants grow up to 14 feet and thereby generate more stalk volume. The dense, fast growing hemp plants lock out weeds, avoiding the need for herbicides.

Hemp fibre as a commercial feedstock currently has two basic, well-understood problems:

- A lack of consistent, large-scale supply to ensure availability
- A lack of consistent quality bast fibre

The need in the market is to provide a scalable supply of quality-controlled hemp fibre. This will give large-volume commercial end-users the confidence to specify hemp as a reliable feedstock.. Availability and quality are the biggest issues in hemp fibre. The market recognizes the fundamental benefits of hemp and is willing to pay for these benefits: It simply wants to know it will be there when they need it.

GLOBAL HEMP PRODUCTION * an overview of the hemp family *

1) SEED - In 1998, **Canada** re-legalized the growth and sale of industrial hemp – cannabis varieties which have less than .03% content of its psychoactive component, THC. The world has quickly accelerated its acceptance, and in 2019 hemp is legal to be grown in:

Belgium	China	Denmark
Finland	France	Germany
Great Britain	Hungary	India
Italy	Israel	Japan
Netherlands	Poland	Romania
Russia	Spain	USA

Hemp seed is well known, as is the oil which is pressed from the seed. It is a highly nutritious food product and delivers the highest concentration of a vegetable-based protein for human consumption. It is also tasty and delivers a perfect balance of Omega 3 and 6 vitamins.

Hemp seed (non-organic) will generate about **\$380 / acre** net to the farmer. Hemp oil is made from the seed. Both products are very well received by the market with very versatile applications in both consumer and industrial markets. Organic seed will generate about **\$900 / acre net, but it is very difficult to get the organic nitrogen fertilizer – manure - in large quantities, for large acreages.**

Seed is a commodity and the price is based on the balance between supply and demand. If there is too much in the market, relative to the demand, the price will fall. If the demand then rises, and overwhelms the supply, prices will rise.

Canada became a major hemp seed grower by 2017, harvesting over 125,000 acres. The largest customer was South Korea. Meanwhile, China, intent on reducing its cotton industry started doubling its hemp crop each year since 2015 - when it grew 250,000 acres. In 2018 they increased planting by 250,000 acres for seed, as well as 250,000 for fibre. China made a deal with South Korea and global prices fell 22%. One can expect that as China continues their move away from cotton and plants more hemp for seed, prices will continue to be eroded globally. Economics: supply and demand.

2) CBD – emerged as the next big cannabis frontier around 2017. The market was already thriving in Europe and Asia, delivering huge profits for the early adapters. The news spread quickly of the “huge” financial returns being generated and very quickly outdoor hemp CBD farming quickly began to appear. CIHC management is aware of five of such operations around the world which alone represent over 125,000 acres - and have heard about MANY others being planned. Everybody wants to benefit from the super-sized margins CURRENTLY being generated by CBD. However, in June 2018 when Robert Ziner, CIHC’s founder and CEO was at the European Hemp Conference, the big discussion there was that due to the very fast-growing supply of hemp being grown for CBD it was expected that CBD prices would retract up to **65%** by 2023, and most likely **90%** by 2028.

The other potentially disruptive consideration is the introduction to the market(s) of synthetic CBD which is already being produced: Nobody goes into a store and asks for Willow Bark Extract when they have a headache; they ask for aspirin – the synthetic version.

CBD has been receiving a lot of media coverage: Marijuana has been legalized around the world, and its chemistry is being researched and proven to be important, and valuable. Already, over **113 different cannabinoids** have been isolated.

With loosening government hemp regulations regarding hemp everywhere, there is currently a great opportunity for farmers to harvest hemp’s leaves and flowers for CBD extraction, and earn very high prices. In 2018, growing plants to extract the CBD from the flowers and leaves of appropriate varieties, harvested properly, was returning net to farmers over **\$2,500/ acre.**

In a presentation given at the European Industrial Hemp Association in Germany last year, the following important information was provided:

- a) The market for CBD is expected to grow to 4 times the size of the THC market by 2023.
- b) Growing hemp for CBD has already exploded globally.
- c) The price of CBD “extract” in the market will be at least **65% lower by 2023** – due to oversupply.
- d) The large market and significant research conducted, has already generated synthesized CBDs.

3) FIBRE - Hemp fibre has been used for textile and building product applications for over ten thousand years. It was the source of the rope used in all Viking ships, as well as all their sails. Until the early 20th century when hemp was made illegal across North America, over 95% of the paper produced was made of hemp. As a textile, hemp goes back thousands of years. It was always known to be strong, durable, comfortable, with an extra-ordinary benefit of being naturally anti-bacterial. It is also environmentally friendly. CIHC projects that growing hemp for fibre will pay farmers a NET return in the range of \$800 to \$1,8000 per acre.

Hemp fibre is extremely versatile. Construction applications offer a broad spectrum of opportunities for hemp, with some applications transforming fibre into a product stronger than concrete. Other large-scale existing applications include the production of bio-pellets, made from hemp and a low concentration of a compounding polymer. These bio-pellets are sold to thermoplastic producers and compounded at their premises to produce bio-composite products, which allows them to use their preferred polymers.

There are many other innovative proven products. This includes replacing the glass fibers in fiberglass batt insulation with bast fibres. Bast is lighter in weight, healthier to live with and considerably lower cost. Another is the utilization of hurd to provide the best alternative to clay for kitty litter: It is lighter in weight, cost competitive, and healthier for both you and your cat because it contains no crystalline silica which can cause irreversible lung disease. Significantly, unlike clay, hemp disposal does not create environmental problems.

Hemp fibre is “the last frontier” of the hemp plant. Processing the stalk into fibre to be used in a wide variety of consumer and industrial products has been practiced globally for almost 3,000 years. Although the industry is already well-established in other geographic areas where it had never been made illegal, it has experienced very slow growth in Canada since 1998 – primarily because of:

- High equipment capex
- Low scale production limits the supply chain’s efficiencies
- Low margins restrict investment in process engineering and automated quality control
- The high labour component associated with the low volume, slow production capabilities of conventional hemp processing.

In fact, to address these realities the larger existing companies in Europe have been building their new conventional processing facilities outside of Germany, Holland and France – the original European hemp processing zone – to Romania, the Czech Republic, all areas of relatively low labour cost: They avoid the capex by finding some margin in lower labour costs. In this regard, North American producers will have no choice but to develop and implement advanced manufacturing capabilities to help them lower their labour input costs.

GROWING FOR SEED CROP

- 1) **HARVESTING:** takes place at **16 weeks** when the seed has matured. This process requires the utilization of a combine harvester. This sophisticated, large and very expensive piece of equipment effectively tears the pods of seeds off the stalk, often resulting in fibre ripped from stalk getting wrapped around moving parts of the harvester – causing problems, and even fires. The stalk is left lying on the ground, fanned out in a steady row where it fell when released by the harvester. This method results in damage to a significant portion of the bast fibres in each stalk and restricts the fibres application in high value and textile quality outputs. ***As a crop grown for seed, the average amount of stalk generated per acre is 1.25 tonnes.***
- 2) **PROCESSING:** Currently in Canada, **97%** of the processing of hemp stalk into fibre is being performed on crop being grown for seed. This is important for the following reasons:
 - Grown for seed, the plants are kept wide apart giving each plant the room to open its branches allowing more sunlight into the seed pods. This encourages their growth and increases the seed output. This also tends to restrict the height of the stalk and encourages more branches - with more pods - to be formed.
 - Seed is usually harvested using a combine, which creates operational issues: The fibre is so strong that if stalk wraps around the moving parts of the combine harvester, the fibre will not break. Rather, it will end up damaging the combine itself, and in some cases set it on fire.
 - Harvesting seed through a combine is an aggressive mechanical process which often damages, and thus degrades the value of the resultant fibres.

GROWING FOR CBD

- 1) **HARVESTING:** Takes place at around **13 weeks** when the flower and its CBD are at their prime, (**3 weeks before the seed matures**) and before the lignin in the plant starts to take the plant into seed maturation. The harvesting of CBD requires a careful process designed to salvage much of the hemp plant's crystalline CBD, before it is shaken off the flower into the field. Currently, swathers are used to cut the stalks at the ground level allowing them to fall over onto the field – where they are manually handled. The process needs to be relatively slow, and gentle. New equipment is being developed globally at this time, to enhance the productivity – including the development of autonomous vehicles operated by sensors. ***As a crop grown for CBD, the average amount of stalk generated per acre is estimated at a minimum of 1.25 tonnes.***
- 2) **PROCESSING:** The huge global growth in the hemp-based cannabinoid (CBD) market over the last 2 years has resulted in a growing demand and opportunity for growing hemp outdoors. Globally, this has resulted in tens of thousands of acres being directed to hemp for CBD crops. There are large crops being pursued everywhere – and in large numbers. As a commodity, the price of CBD is expected to erode as the supply grows. Another risk to long-term pricing is the market's willingness to accept synthetic CBD pharmaceuticals, which are already available today. The point is, people go to the drugstore and usually ask for “aspirin”, not willow bark extract – the natural source of ASA (acetylsalicylic acid)!

GROWING FOR FIBRE:

1) HARVESTING – fibre crop takes place at around 13 weeks, at the same time as the flower and CBD mature. That is, 3 weeks before the seed matures. Harvesting the stalks 3 weeks before the seed matures generates:

- a) Provides a greater quantity and better quality of more valuable fibre
- b) Reduces the time pressure on farmers to harvest all their crops, in case of an early frost

It is much easier harvesting for fibre as it does not use a combine harvester, unlike seed – which does. Combines damage the stalk when they separate the seed, often causing individual fibres to be ripped away off the stalk which then wrap around moving parts of the harvester – causing mechanical problems, and even igniting fires. Instead, a swather is used to cut the stalks at the ground level which results in them falling to the field where they are left to begin a natural biological degradation process (“retting”) which separates the external bast from the inner, core hurd. **As a crop grown for fibre, the statistical amount of stalk generated per acre is 3.6 to 12 tonnes.**

There is a greater volume of quality fibre produced because the fibre varieties generate a greater percentage of high-value bast fibres, due to the larger diameter and length of the stalk produced as well as the fact that there are 4 times the number of plants per acre, when hemp is grown for fibre only. This approach increases the decorticator’s revenue as well because it generates better quality fibres which sell into higher-priced textile markets.

2) PROCESSING – fibre crop: Takes place when the fibre matures around 13 weeks, around the same time as the CBD matures. That is, 3 weeks earlier than seed. These 3 weeks are very important in northern growing areas, where the summer brings longer days of sunshine making the plant grow faster and taller, but in these areas the growing season is shorter and winter can come early and unexpectedly: 3 weeks additional time makes a considerable difference in reducing harvest risk and allowing farmers more time to harvest their other crops.

The average amount of stalk generated from crop grown for seed is **1.25 tonnes / acre**. However, when grown for fibre, CIHC is projecting **5 tonnes** per acre. This takes into account that there is more stalk volume per plant due to the increased diameter and length of the stalk, as well as having more 4 times as many plants per acre. This added volume plays a considerable role in the overall economics of both hemp farming as well as decortication production. Hemp grown for fibre alone is expected to generate NET revenues to farmers between **\$800 and \$1800** per acre - the highest, large-volume crop revenue opportunity in the Prairies.

DUAL CROPS

Seed and Fibre: Traditionally, most dual cropping was for seed and fibre: It is still done this way today in Europe and Asia. The idea is to get revenue from both crops. The problem is that the fibre produced is of secondary quality, over-matured because it is harvested only after the seed has matured – at least 3 weeks after it matured. The fibre is degraded and has a lower market value.

The combined economics of a Seed / Fibre crop are still lower than for growing premium-quality fibre (only) varieties, to be harvested at 13 weeks. Dual crop harvesting costs are obviously higher than a single crop, especially when a combine is involved – as it is with Seed / Fibre crop.

Seed and CBD: The considerations and economics are the same as dual cropping for a Seed / Fibre

- conflicting maturity dates
- seed necessitates a combine to be used for harvesting
- the difficulty of running a combine
 - to collect the seed without destroying most of the flower and losing most of the CBD.

CBD and Fibre crop: This is the most practical combination of dual crop farming

- Same maturation for fibre and CBD
 - both crops have the same maturation time, 13 weeks
 - before lignin formation which causes brittleness of fibre and reduces its strength
 - no combine required to harvest
 - highest market opportunity of all dual crops with a reduced risk profile
 - full-utilization of plant
 - risk of CBD prices falling is mitigated by the growth and stability of the fibre industry
 - no combine is required
 - the focus is on gentle handling of the CBD-filled flowers during harvest
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INTRODUCTION TO HEMP AND ENVIRONMENTAL PLASTIC POLLUTION

Hemp is a plant, grown across the globe, which has internal fibres which offer a valuable opportunity to reduce the volume and the impact of thermoplastic production. Thermoplastics use heated oil-based polymers and use various methods to shape them – including extrusion, injection moulding and compression moulding. These “plastic composite products” range from single-use retail bags up to complex compounds for specialty applications. Once they are formed and dry, they are almost permanent – and will take hundreds of years to naturally breakdown. As a natural fibre, hemp can be used in a broad range of thermoplastic applications to add strength, reduce weight, displace polymers – and reduce cost. The opportunity is to replace as much volume of the polymers as possible with the hemp fibres – to reduce weight and cost and increase durability and environmental benefit. Hemp seed oil can also provide a natural polymer, creating cost effective bio-degradable plastic products – where appropriate. This is expected to be a huge opportunity for the hemp fibre industry.