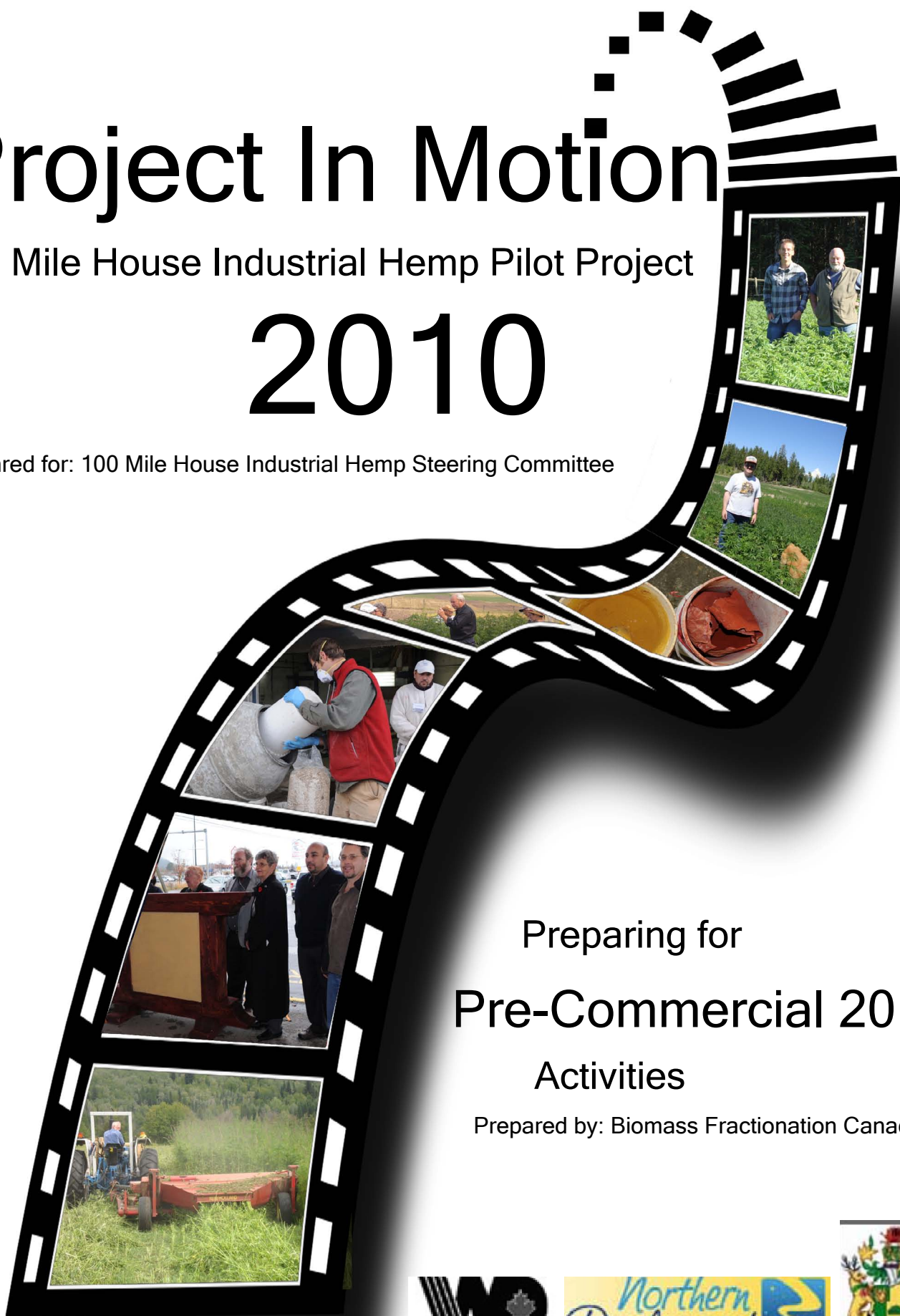


# Project In Motion

100 Mile House Industrial Hemp Pilot Project

# 2010

Prepared for: 100 Mile House Industrial Hemp Steering Committee



Preparing for  
**Pre-Commercial 2011**  
Activities

Prepared by: Biomass Fractionation Canada





# Executive Summary

The 2010 - 100 Mile House Industrial Hemp Pilot Project has reached the pre-commercial phase.

The project has access to an extensive industrial hemp fibre-network that we are able to tap into for business information that circulates within a small, but active international group. By having access to this valuable information and upon careful evaluation, we are able to direct the business development focus of the project accordingly.

The project continues to attract local (BC) investor interest. This has resulted in several meetings with diversified interest groups which have taken place in 100 Mile House and the Lower Mainland.

Throughout the course of this project we saw a strong interest for Canadian industrial hemp products expressed by the Chinese industry. We have not only noticed this through our investor business meetings in BC, but also through conversations with European network participants. We have noticed how the Chinese procurement of natural fibres in Europe impacts the European raw material supply chain. This has resulted in European processors starting to explore opportunities to procure semi-processed industrial hemp fibre products from Canada. Some even take it a step further and are interested to explore opportunities to establish processing facility(ies) in Canada to provide both the existing European market and the upcoming North American market. They are searching for strategic alliances with Canadian industrial hemp fibre producer groups.

It is recommended that we prepare to direct our project development efforts to a micro-level market entrée point, thereby focusing on providing processed industrial hemp straw products, hurd and fibre, to the BC and US Pacific Northwest green building industry. Developing a pilot scale, transportable on-farm industrial hemp straw processing system, would enable the producer group to move forward to commercial scale production and stimulate the development of the industrial hemp green building market. Without pilot plant processing capabilities the 100 Mile House Industrial Hemp Pilot Project will not maintain the momentum it has gained during 2009 and 2010. In order for the B.C. green building industry to accept industrial hemp products, it has to have access to BC grown and processed industrial hemp building products. The cost for the development of a pilot plant is in the \$500,000.00 range.

To attract macro-level investment opportunities, it is essential that the momentum that has been created is maintained while entering the pre-commercial phase.

It is recommended that concurrent with starting at the micro-level marketing entrée point, a work plan is developed to enable the producer group to explore potential collaboration opportunities with a European processor. Through a strategic alliance with a European industrial hemp fibre processor the 100 Mile House industrial hemp project will have access to valuable technology and market assessment information. Without this information the project will not be able to develop a bio-composites based business plan.

The 100 Mile House Industrial Hemp Pilot Project has succeeded in identifying: a) suitable pilot scale processing technology for the micro- level market entrée and b) a European industrial hemp processor interested in exploring a potential strategic alliance with the 100 Mile House Industrial hemp project.

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# Introduction

The objective of this report is to provide the 100 Mile House Hemp Steering Committee with the most recent industrial hemp fibre critical business information. Thereby, specifically focusing on pre-commercial activities that will deliver an industrial hemp fiber processing industry to the District of 100 Mile House. Information in this report is 100 Mile House specific, development of a British Columbia industrial hemp value chain, operating out of 100 Mile House. The 2009 and 2010 activities have resulted in The 100 Mile House Industrial Pilot Project progressing towards the pre-commercial phase. The information contained in this report is intended to help guide the 100 Mile Industrial Hemp steering committee while entering the pre-commercial phase. The report is industrial hemp product end-use market focused.

A 2010 month by month project activity overview can be found in the 2010 *work report document*.

# Background

The following information is intended as background information, to facilitate better understanding of industrial hemp technical terms plus historical industry development.

Long fibre – **textile** versus Short fibre – **industrial**

**Up to WWII**

Industrial hemp used to be harvested and processed by hand. This system allowed for full length stems to be handled and processed without shortening or damaging the bast fibres. The long fibres were shipped to the textile industry for further processing. The harvesting, processing and decortication, of industrial hemp was similar worldwide until WWII. Harvesting and processing of industrial hemp was comparable to that of harvesting and processing of linen flax.



Sheaves of hand harvested linen flax straw

Until WW11 industrial hemp fibre straw was hand harvested in a similar way.

## After WWII

### Mechanization

In Europe and North America, through government legislation, no industrial hemp production took place until the 90's and was under strict government rules. During this time, all farm-work in Europe and North America had become completely mechanized for the crops that were grown, except for industrial hemp. For example during this time period the linen flax industry, which is closely linked to the industrial hemp industry in North Western Europe, converted their harvesting and decortication system from intensive hand labour to completely mechanized harvesting and decortication.

### Technology Developments

When the industrial hemp crop was re-introduced to Canadian and European farmers during the 90's there was no technology available to harvest full length 12 ft. tall industrial hemp stalks. The design of the linen flax harvesting technology is based on harvesting a crop that is 4 ft. or shorter. Linen flax harvesting systems are not compatible with industrial hemp harvesting requirements. Since hand labour was not a viable option anymore for modern day industrial hemp farmers, the industrial hemp farmers developed a harvesting systems based on existing/available equipment, most often– forage harvesting systems. During this mechanization development process the ability of harvesting long industrial hemp fibres was lost. Current technologies shorten/bend the long bast fibres during the harvesting, this results in this industrial hemp fibre losing its linen fibre characteristics and is therefore being used for short fibre industrial end-use applications instead.



Modern day linen flax straw harvesting. (The stalk is not cut, but pulled)

## Price Range for Decorticated Fibre

Textile Industry	Linen quality fibre	1,600 Euro/ \$2160 CAD per metric tonne
Bio-Composites Industry	High end industrial quality fibre	660 Euro/ \$900 CAD per metric tonne
Pulp and Paper Industry	Low to medium industrial quality fibre	450 Euro/ \$600 CAD per metric tonne

### Single purpose versus dual purpose

Canadian Prairie grown industrial hemp is a dual-purpose crop, harvested for hemp grain with existing on-farm grain harvesting equipment. Hemp grain sales creates the revenue stream while the residual hemp straw requires removal input cost. Since the straw does not break down very easy and when left in the field it would interfere with next year's seeding operation, and fibres would tangle up in equipment. The crop is harvested when the hemp grain has entered the optimum yield stage. At this point during fall, the hemp fibre has lost its prime quality and quite often weather conditions do not allow for the straw to be become dry so it can be baled.

The 100 Mile House Industrial Hemp Pilot Project is focused on growing single-purpose industrial hemp fibre straw, bio-mass production only. This straw can be harvested on the ranch with already available hay harvesting equipment. The straw is harvested while the bast fibres have reached their optimum quality, preferably with controlled retting included.

### Quality of Fibre

Besides applying the correct processing (decortication) technic, the quality of the harvested industrial hemp fibre straw will determine marketability/price of processed product. Therefore, it can be expected that dual purpose industrial hemp straw is more likely limited to lower and medium quality end-markets, while single purpose straw, which has undergone controlled retting, can enter into the high quality end-markets.

In 2011, we can expect further research will be conducted to establish the quality perimeters of Canadian grown single purpose and dual purpose industrial hemp straw.

### Shift in demand

#### Europe

The bast fibre industry, linen flax and industrial hemp, are closely related and influence each other, therefore a shifting market demand and/or change in price in linen flax, as is currently the case will influence the industrial hemp market.



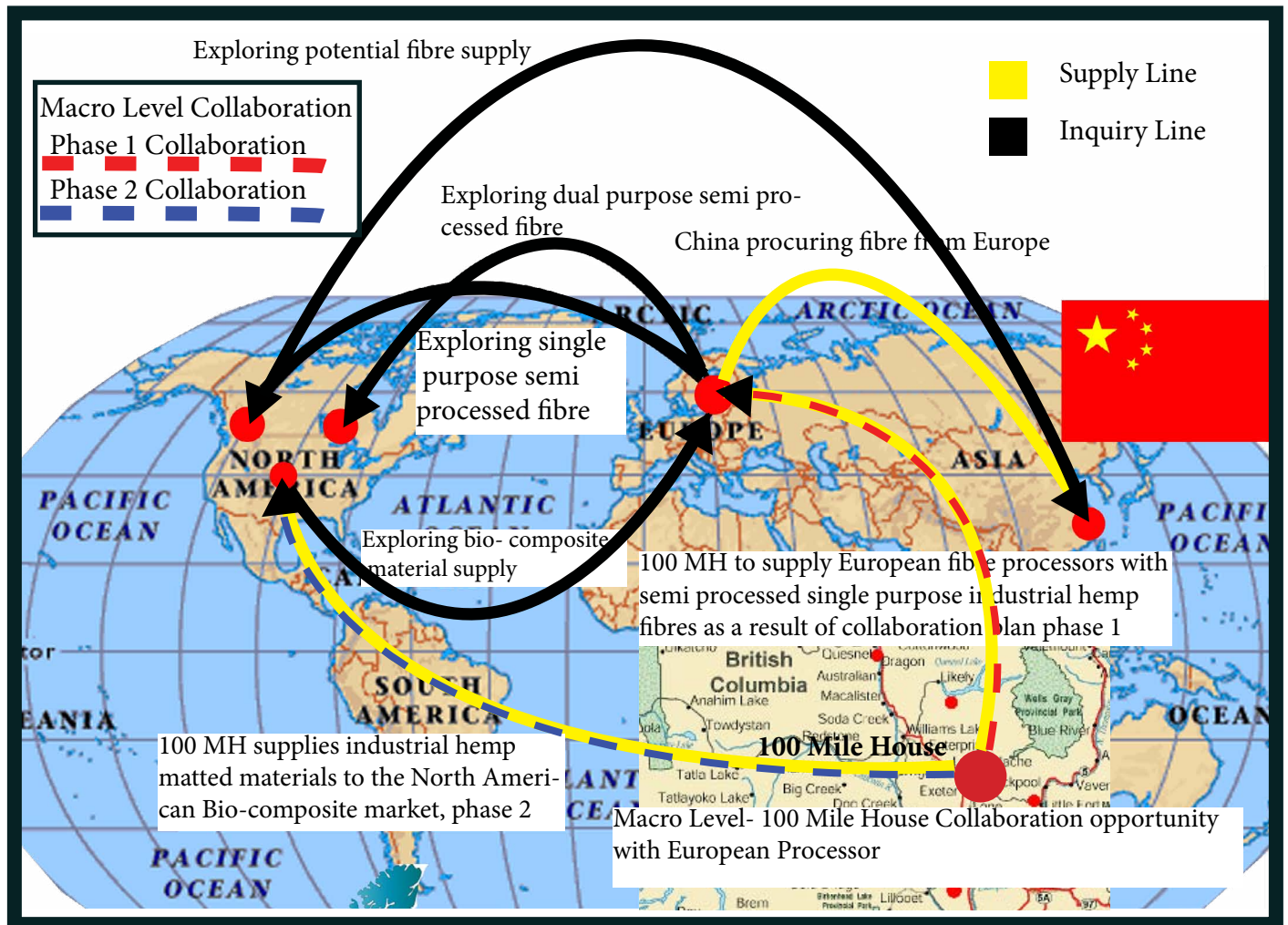
During the second half of 2010, we have noticed an increased demand by the Chinese textile industry for linen fibre. This resulted in linen flax fibre prices climbing back up to 1,600 Euro per metric tonne. The North Western European linen flax industry depends for 90% of their market on the Chinese textile industry. Due to a prolonged low demand by the Chinese textile industry the price for linen flax fibre in Europe had fallen to 1,000 Euro per metric tonne, which is 400 Euro below break-even point. As a result of the decreased demand the total acres seeded to linen flax in North Western Europe dropped to an all-time 40 year low. The European linen flax industry is accessing funding for research to develop alternative markets for their products, including the bio-composites market to become less dependent on the Chinese market.

This most recent turmoil in the European bast fibre market coincides with an increased demand by the domestic bio-composites market for bast fibre products.

In 2010, some regions of Europe experienced below average yields of industrial hemp fibre straw. Combine this with an increased demand for bast fibre products + uncertainty about future EU subsidy support for the bast fibre industry. Due to globally increased grain prices, competition for limited available land for industrial hemp production has increased. At the same time that this adds pressure on the supply side for industrial hemp fibre processors, the bio-composites end-users are demanding an improved guaranteed supply.

We can expect European processors becoming seriously interested in accessing semi-processed industrial hemp straw from Canada.

### Industrial hemp Fibre Demand as it effects the 100 Mile House Project



## **Investor relationship building**

Over the course of the project the 100 Mile House Industrial Hemp Pilot Project has attracted the attention of investment groups. Several meetings have taken place whereby investor groups expressed interest in becoming part of an industrial hemp fibre value chain, with products being exported to Asia, mainly China.

Western Regional Management Team Ltd.(WRMT), a subsidiary of First Nations Agricultural Association, which is located in Kamloops, plays a leading role as a facilitator to establish and maintain investor related communication between the District of 100 Mile House town council, Hemp Steering Committee and potential investors.

As a result of these efforts MOU's have been signed and on-going discussions take place through WRMT's role as facilitator.

## **Fibre processing technology**

Besides the investor business relationship building capacity WRMT also plays an important role in facilitating the potential technology transfer of existing decortication technologies. This makes it become more available to the 100 Mile House Industrial Hemp Project.

The WRMT's manager has expressed strong interest in the concept of on-farm processing of industrial hemp straw to enable the development of a 100 Mile House industrial hemp value chain. Managed by the producer group thereby providing an opportunity for B.C. grown industrial hemp to be processed at or near the crop production location with end-products entering the B.C.-green building market.

In 2010 an industrial hemp processing technology MOU has been negotiated by WRMT.

## **China developments**

Especially, but not exclusively, in China due to a strong industrial development we notice a drive towards less labour intensive fibre processing methods, due to increased labour cost. There is a worldwide shift away from hand fibre processing towards mechanized fibre processing technology. In China we've noticed an increased environmental concern about the release of toxins during the water retting process of bast fibers, including industrial hemp, in streams and rivers. As a result of increased environmental concerns in China, fibre processing plants have been closed down. Due to the industrial market expansion, the Chinese will source raw materials from the global market, including Canada.

## **Energy market**

Worldwide, we notice an interest by the composites industry towards using natural fibres instead of synthetic fibres in industrial applications.. This interest is driven by price advantage of natural fibres over synthetic fibres. Synthetic fibre prices are directly correlated with the oil prices.

For PR purpose the industry advertises their commitment to a cleaner environment by switching over to green products, however this does not translate into a premium paid to the natural fibre industry.

# Market Update

## Industrial hemp products Market update

The 2010 industrial hemp marketing efforts of the 100 Mile House industrial hemp project have been focused on the following regions

- International markets –off shore markets
- North American markets
- Regional/provincial markets,

### Off-shore markets

As result of these efforts the 100 Mile House Hemp Steering Committee and town council met with Lower Mainland based investor groups who are interested to explore joint venture business opportunities in a BC- industrial hemp value chain. The investors primary objective is aimed at marketing B.C. grown and processed industrial hemp into the Asian markets.

China

Textile

- We've noticed a repeated interest in B.C. grown and processed industrial hemp fibre for the textile industry.

Polypropylene

- We have received a request for potential delivery of hemp hurd fractionations destined to the plastic industry, as filler.

Pulp and Paper

- The pulp and paper industry investment groups have expressed interest.

North America

Green building

- This upcoming industry offers an excellent marketing opportunity for a wide range of industrial hemp hurd products and industrial hemp fibre for insulation, as blown-in type in attics or bat-insulation in walls.

Bio-composites

- Growing interest and demand by the North American composites industry is directed towards European industrial hemp fibre processors and international fibre brokers. These end-users are interested in accessing high quality industrial hemp fibre matted products. We've noticed that especially North American bio-composites industries with European affiliation are starting to drive the demand for a reliable supply of consistent quality natural fibre products. We believe that the products during the short term will be supplied by European processors using European grown industrial hemp straw.

Long term this product will be supplied from Canada using British Columbia grown industrial hemp straw processed in 100 Mile House by a European-BC joint venture group.

Regional/provincial

Green building

- As a direct result of the 2.5 day, 100 Mile House Green Building Symposium we have noticed an increase in the number of B.C.- based contractors starting to use industrial hemp building products. 2011 B.C. orders for industrial hemp products are currently being filled by Emerson Hemp Distribution Company.

# Market Assessments

## Off-shore Asia

### Filler-product

China is the main driving force behind interest in BC grown and processed industrial hemp fibre products. B.C.'s location, especially the Prince George – Prince Rupert corridor is becoming a major transportation channel for Chinese products. Coming into North America by container through the Prince Rupert terminal or by plane into the Prince George cargo airport. This flow of containers and planes coming into Northern BC offers an excellent back-haul opportunity for B.C. processed industrial hemp products destined for the Chinese market.

As a result of our discussions with investment parties we believe that the marketing entrée point for the Chinese market is expected to be at a volume level far exceeding, even the most optimistic predictions of the potential production and processing capacity not only for B.C., but for all of Western Canada combined.

At this moment the Chinese market is looking for imported filler-type products to reduce their chemical in-put cost of manufactured industrial and consumer products. The expected price level for these filler products is far below our Canadian Cost of Production.

Due to these low prices offered by the Chinese market it is not recommended that serious efforts are being undertaken in B.C. or Western Canada to fill this filler product market demand at current price levels

### Textile market

A repeated demand by investment parties for textile quality long industrial hemp fibre products has resulted in the 100 Mile House Industrial Hemp Pilot Project collaborators evaluating this demand.

In conclusion, we are able to offer this crop production and processing option to interested parties. The start-up of this potential project will be dependent on a strong financial commitment by a marketing party to cover a substantial share, if not all of the cost to conduct a full scale feasibility project of growing and processing of industrial hemp focused on marketing linen quality fibre product.

We do not recommend the 100 Mile House Industrial Hemp Pilot Project to pursue independently the linen quality industrial hemp project unless a strategic partner finances the project.

### Pulp and Paper

We have also been approached to discuss the feasibility of establishing an industrial hemp value chain to provide the raw materials for a pulping project. Discussions have stalled.

## Off-shore Europe

In North Western Europe there is a close historical relationship between the linen flax industry and the industrial hemp industry. Due to increased demand by the Chinese textile industry for flax fibres, we see this increased demand and higher product prices echoing through the European industrial hemp fibre market. Due to below average harvest yields in some places in Europe, we see a potential shortage of raw materials developing for an industry that has opportunities to expand its markets into a highly demanding industry.

### Raw Material Supply Risk Management Strategy

The end-users demand for guaranteed supply, forces processors to widen their raw material supply base.

We can make the following prediction:

In the near future, European industrial hemp fibre processors will become interested in accessing the Canadian industrial hemp production capacity. Thereby, through possible joint ventures create strategic alliances with suitable Canadian partners. To start processing Canadian grown industrial hemp in Canada, with fibre products being exported to Europe for further processing. At the same time we will experience that the North American bio-composites market will open up to industrial hemp fibre matted products. Canadian based processing of industrial hemp fibre into matted products, including hemp insulation, will start to take place after the successful start-up of a Euro-Canadian decortication joint venture project.

### Quality

In Canada, we have to determine if the readily available dual-purpose industrial hemp straw on the Canadian Prairies meets the quality standards required for matting products. This has not been established. What we hear through our network is that controlled retting of single purpose grown industrial hemp straw will meet the quality standards required for high-end markets including the bio-composites market.

The entrée level for a future Canadian based processing joint venture would be in the 2,000 acres and up range for single purpose + controlled retting. This creates opportunities for the sustainable development of an industrial hemp fibre value chain.

### Fibre Export

Shipping Canadian grown and semi-processed industrial hemp fibre by container to Europe, where the fibre will be further cleaned and processed into matted products, is economically feasible under the current market conditions. The industrial hemp fibre will have to be compressed into bale form. The hemp hurd will have to be marketed in North America into the small animal bedding market and green building markets. Due to low density of hemp hurds, when shipped over more than 500 km distance to end-market, it is advisable that the hemp hurds be compressed.

## Collaboration

In order to capture the opportunity to export industrial hemp fibre into the European market a strong collaboration in the form of a business joint venture is required. A strategic alliance between the 100 Mile House Industrial Hemp Pilot Project and the European industrial hemp fibre processor is required in order to successfully produce and process (decorticate) industrial hemp straw on/near BC ranches and transport the fibre to Europe for further processing.

## Controlled Retting

Single purpose Industrial hemp produced under pivot irrigation can also be exposed to controlled retting through irrigation after the crop has been cut. From conversations with fibre brokers and processors we understand that single purpose grown and controlled retted industrial hemp fibre will be required in order to fill a high-end quality market. European industrial hemp processors are more familiar with processing single purpose grown and retted hemp fibre straw as compared to dual purpose grown industrial hemp.

# Producer Support

## Producer Group Development

The initial steps towards creating a cohesive group of dedicated industrial hemp producers were taken in 2009 and resulted in the January 2010 founding of the producer group, during a meeting in 100 Mile House.

### Project Extension

In 2009 the Cariboo region experienced wide spread crop failures due to adverse weather conditions. The 2009 industrial hemp crop experienced a crop failure. The projects budget allocated for industrial hemp straw procurement and processing was left unused.

After March 31 2010, the District of 100 Mile House was successful in negotiating a project extension. May 31st 2011 the district office was informed by the funders that the request for a project extension was approved.

### 2010 Seeding

Early in Spring 2010, the 100 Mile House industrial hemp producer group, after conducting several teleconference meetings reached a consensus to continue their on-farm research project. Independent from the outcome of the potential extension, as requested by the District of 100 Mile House. The producer group members applied for industrial hemp licenses at Health Canada. Industrial hemp seed was ordered, the logistical aspect of receiving and temporary storing was managed by one of the producer group members who applied for and received from Health Canada an industrial hemp distributor licence.

### Producer Group Expansion

Two producers who participated in 2009 were not able to make land available for the 2010 on-farm research project, they asked to be included in future producer group exchange of information. Two new producers joined the group, thereby expanding the 100 Mile House Industrial hemp production corridor north towards Quesnel and Vanderhoof.

In 2010, the producers were able to seed their industrial hemp on-farm research sites without outside assistance. The crop production knowledge gained in 2009 was implemented. The producers had followed the recommendations of fall land preparation as is outlined in the 2009 report.

Frequent on-farm research site visits by the project manager and summer student, resulted in crop production knowledge transfer through one on one meetings with producers.

In July, a producer group meeting took place in Williams Lake, at this meeting details of the June approved extended 100 Mile House Industrial Hemp Pilot Project were discussed. The individual producers provided an update of their on-farm research projects and shared with other producers their experiences. It also offered an opportunity for the project manager to further discuss industrial hemp processing (decortication) technologies and marketing opportunities for the processed products.

### Summer Student

At this meeting the summer student was introduced to the producer group and an outline of the summer student's activities were presented.

## Technology Knowledge Transfer

As a result of this meeting, one of the producers showed strong interest and requested further information about the industrial hemp processing model, that is based on the Emerson Hemp Distribution company model.

## Irrigation

While the initial on-farm research updates about crop developments came back very positive, all locations except one reported good to excellent germination. During the discussions, the importance of early crop development was addressed in order for the crop to reach full bio-mass potential later on at harvesting time. Producers had the extremely poor growing conditions of the 2009 season still fresh in memory. A consensus amongst the producers was starting to develop that irrigation might have to be included in future crop production recommendations, as a management tool to protect the relatively high crop-input cost requirements. In the same discussion it was agreed upon that investing in irrigation equipment just for industrial hemp production could not be justified, based on expected revenue. It was agreed upon, that crop-production locations with an existing irrigation system in place should become part of future on-farm research.

## Additional Benefits

The knowledge gained by the project participants, through on-farm research extends beyond the industrial hemp crop production. It will benefit applied by ranchers benefitting a wide range of crops/forages. Example; building up soil fertility through seeding a green manure cover crop, intensive crop scouting, using different types of soil tillage equipment, introducing different crop production systems.

The on-farm research project forms an important platform from which the producer group development takes place.

## Coach

An important objective of the producer group development is to create coaches, these are producer members that are able and interested to support, develop and share their industrial hemp production experiences in the initial phase with fellow producers and later on connect with new producers. Local ranchers sharing their experiences with interested and new producers is a corner stone to the successful development of the industrial hemp fibre value chain.

## Group Profile

The current producer group can be best described as leaders and innovators in the community. The average age is above 55 years old and all are interested to engage with the younger generation. They represent on average about 5% of the ranching population. Their role as coaches will be to enable the knowledge transfer to a much larger group of ranchers, the 95% group, that will engage in production of industrial hemp but are not able to or interested to participate in the knowledge transfer process.

The level of development/commitment of the producer group will determine the markets that can be approached

The off-shore Asia market, demands a volume flow of industrial hemp products which is beyond reach for any new producer group in BC or Canada. For the foreseeable future, next five years.



The off-shore European market is within reach for the 100 Mile House Industrial Hemp producer group.

When the following conditions can be met:

- 1) The producer group is interested and capable to explore strategic alliance partnership with the European industrial hemp processor.
- 2) Producer group extends on-farm research project to include irrigation.
- 3) Producer group starts collaboration process with European processor. Shipping B.C. grown industrial hemp straw by sea-going container to processor for evaluation.
- 4) Producer Group develops skills to manage controlled retting by means of irrigation.

Projected Collaboration Outcome

- 1) Production knowledge transfer
- 2) Processing technology knowledge transfer
- 3) Business opportunity to start fibre processing facility, matting facility in 100 Mile House

Industrial Hemp Technology Transfer

As part of the 2010 producer-group development activities, the project manager provided basic industrial hemp harvesting and processing know-how.

Harvesting targeted for:

Industrial Market Short fibre - < 6 inches

Regional market

Throughout the 100 Mile House industrial hemp production corridor ranchers have or have access to excellent hay harvesting equipment. During the 2010 industrial hemp harvest, the producers were successful in harvesting industrial hemp straw, cutting was done with on-farm available rotary hay-bines, or sickle hay-bines. Baling was done with square balers and/or round balers. The existing haying equipment is sufficient for ranchers to be able to provide industrial hemp straw that can be processed into fibre and hurd to be marketed into the regional market.

## European market

Through collaboration with a European processor, it is recommended that the cutting process of industrial hemp be evaluated. A possible recommendation might be that a specially designed hemp cutter be used. This cutter does not only mow the standing crop but in the same process will cut the hemp stalk to a 2 ft. length. Baling can be done with existing technology.

Textile application – long fibre 2.5 ft.

The production, harvesting and processing technologies of industrial hemp for linen quality long fibres is not compatible to that of industrial hemp for non-textile application.

The 100 Mile House Industrial Hemp Pilot Project collaborators have evaluated the textile market opportunities and are able to deliver a work plan and perform the execution of such a plan for interested parties.

We have to warn for the high up-front investment costs required to purchase highly sophisticated harvesting and processing equipment in order to run a project that would result in accurate data information that can be used for developing a business plan. Unless an industrial party provides the funding required to run such a program it is not recommended to explore industrial hemp textile linen production opportunities.

## **Decortication (fibre processing)**

### Regional market

Emerson Hemp Distribution Company (EHDC), a 100 Mile House Industrial Hemp Pilot Project collaborator, has developed a made in Canada, transportable decortication line that is producing commercial quantities of industrial hemp fibre and hurd. In 2010 this processing line has been shown while in operation to the visiting Western Regional Management Team Ltd (WRMT) manager. As result of this visit, WRMT is considering facilitating a possible technology transfer based on the EHDC model.

EHDC is the main (sole) marketer in North America of industrial hemp hurd into the bedding and green building market.

As part of the producer group development process the EHDC processing and marketing model has been presented and discussed with members of the producer group.

There are strong similarities between the EHDC business model and the hay harvesting + hay marketing business models that we find on some of the 100 Mile House District and surrounding area hay ranches.

Within the producer group there is capacity to assemble, operate and maintain an EHDC decortication processing system. Also the marketing of processed industrial hemp products is well within reach of the current hay marketing ranchers.

### Off-shore markets- Asia

The hourly processing capacity of the existing version of the EHDC is not sufficient to market the required volume of products to Asia.

## Off-shore markets- Europe

Any decortivating processing activities for this market should be done through extensive collaboration with a suitable European industrial hemp fibre processor.

### Stream Lining Technology

The initial phase of such a collaboration process would start with the evaluation of how decortication of B.C. grown single purpose irrigated industrial hemp could be done in B.C. using EHDC processing technology. Preliminary discussions are in progress to understand the needs and requirements to match the B.C. transportable decortication system with the collaborating European processing system.

### Investment in 100 Mile House

The European processor is interested to collaborate with a well organized producer group. The positive outcome of such a collaboration would result in the processor directly investing in or establishing a joint venture operation with suitable partner(s). Thereby focusing on developing a processing operation in 100 Mile House where hemp hurds would be packaged into store-shelf ready animal bedding products and fibre would be processed into industrial hemp insulation and bio-composites products.

## Maintaining Momentum

### Information Network

Another important component of the producer support program is to provide up-to-date and accurate information covering a wide range of industrial hemp related topics.

### Off-shore markets + North American market

The 100 Mile House Industrial Hemp project is extremely well connected with the global industrial hemp network. We have to keep in mind that the industrial hemp industry is very fragmented, highly competitive and tight lipped. Depending on the internet for critical business information is not a good option. For anyone interested to enter this “world” it takes years of intensive work to build trusted relationships with national and international processing, marketing, technology businesses, research centres and universities.

For future development of the 100 Mile House industrial hemp project it's crucial that the connections to the network are maintained or even better, are extended. For the development of a strong business plan, it is recommended that the 100 Mile House industrial hemp project maintains access to the international industrial hemp fibre network.

Within the 100 Mile House producer group there is no current or (immediate) future capacity to maintain or further develop this network connection.

### Regional market

It is strongly recommended, that upon official completion of the 2010 100 Mile House Industrial Hemp Pilot Project the producer group put in efforts to establish an information service aimed at maintaining contact with all interested green building products parties in BC and the US Pacific Northwest. Through this channel they can provide frequently requested product information to the green building industry and can also direct requests for product to the producer group.

# Agronomic Research

On Farm Crop Research Sites



Vanderhoof 2010

Beavervally 2009/2010

Quesnel 2010

Hausmann Road 2009

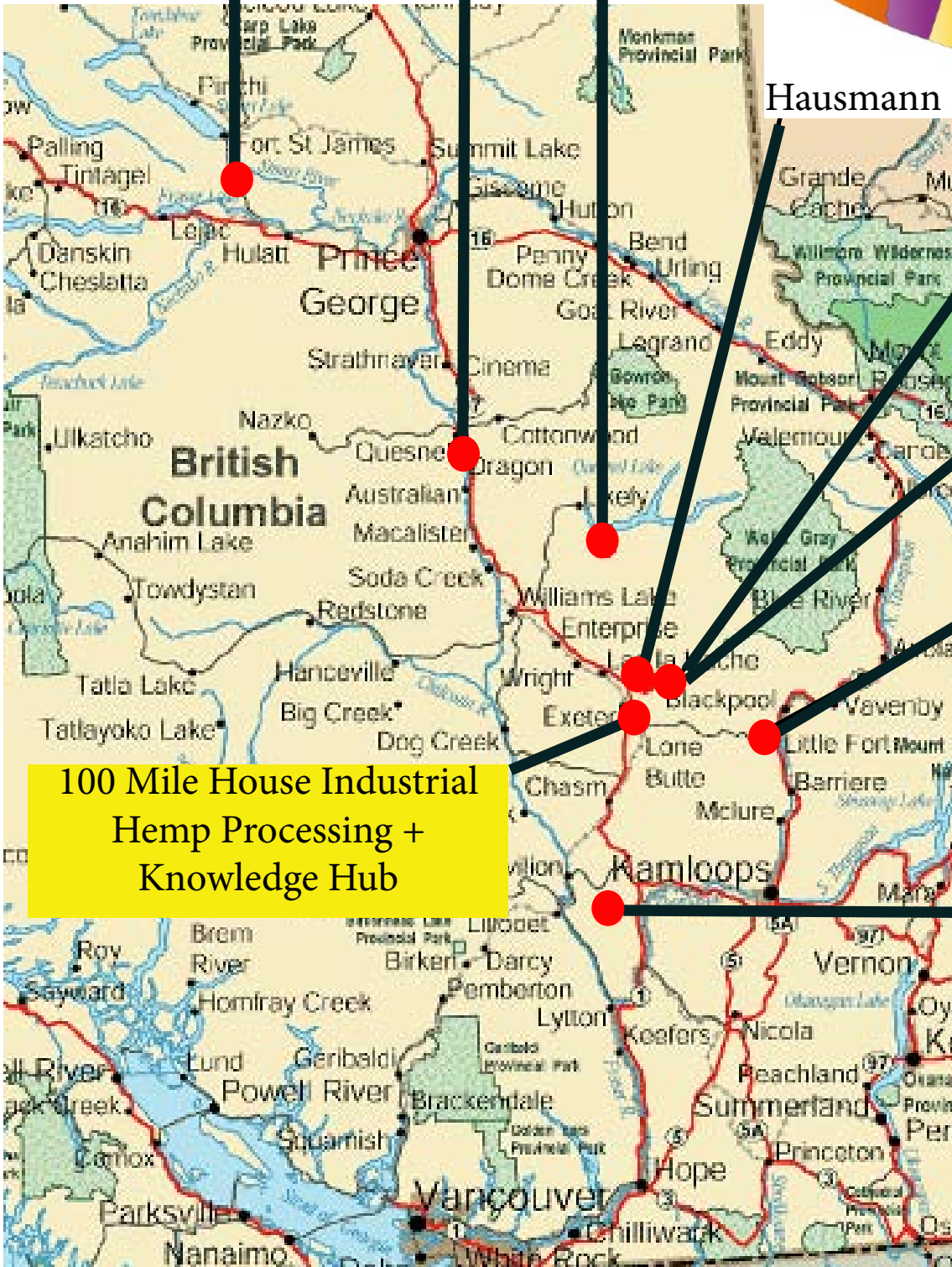
Canim Lake 2009

103 Mile Lake 2009

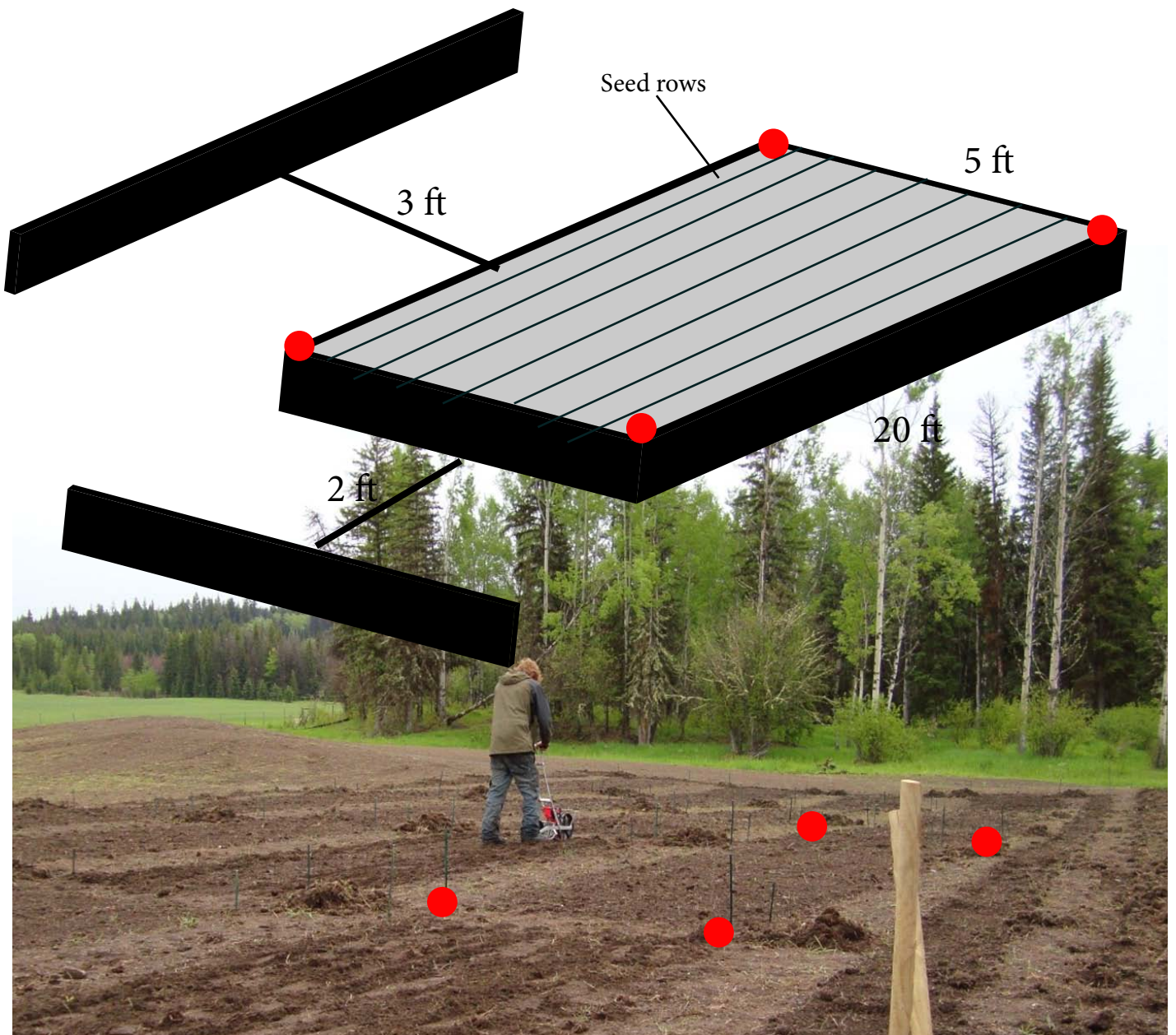
Horse Lake  
(Varietal Test Plots)  
2009/1010

100 Mile House Industrial  
Hemp Processing +  
Knowledge Hub

Ashcroft 2011



## Varietal test plots



Seeding of test plots in progress

### Program Management

It is expected that the Canadian Hemp Trade Alliance will take over the responsibilities and management of the 2011 Canadian wide industrial hemp varietal test plots.

### Location: Horselake

#### Site Selection

The site that was made available to the project was representative for the surrounding area, elevation 3,500 ft. In the past the site had been used for winter feeding. Due to close proximity to a yard site, irrigation under dry conditions was possible. The site was accessible even under wet conditions + could facilitate the expected visitors for the field day.

## Varieties

Anka, Jutta, Alyssa, Delores & Carmen

## Preparation

The site had been roto- tilled in Fall . Prior to seeding the seed bed was fertilized with conventional fertilizer and prepared. The seed bed was moist and firm.

## Seeding

Preparing the seed bed for the test plots took place shortly after the official announcement by the 100 Mile House District Office that the proposal for crop year 2010 had been accepted by the funding agencies.

Nearby, the on-farm research project had been seeded at May 15. The test plots were seeded on June 09-10. At seeding time the moisture conditions were excellent. Seeding rate was based on 25lbs/acre. Fertilizer: N -150lbs./acre

P - 50lbs. /acre



Seeding Protocol: seeding from outside toward the centre



Last seeded row

## Test Plot Management

Due to the history of the site, winter feeding area for cattle, the weed population was heavy. The summer student managed to control the weeds. Therefore the test plots did not have to compete with a weed infestation.



Horse Lake varietal test plot after weeding 2010

## Growing Conditions

Seeding conditions were ideal, followed by quick emergence of the plots. In late June the test plots were exposed to frost, neighbouring potatoes were damaged but no physical damage was done to the hemp plants. In July the crop suffered from drought, irrigation took place once. In August the crop was still developing bio-mass. It was decided to let the test plots further develop and see how much bio-mass they would yield, knowing well that due to late seeding the yield potential had been compromised.

## Harvest

Originally the summer student was to establish the bio-mass yield, but due to late seeding and the July drought it was decided to let the test plots grow. In September, the test plots benefited from excellent growing conditions and increased their bio-mass. In consultation with the test plot owner it was decided to harvest the test plots and bring the hemp stalk under roof for drying. During the period of drying they would frequently be turned over to prevent rotting. During the growing season we noticed a wide variation in bio-mass development within the same varieties. This variation in crop development was related to soil conditions as we had noticed in the 2009 varietal test plot. We also noticed this wide range of crop development variations on the nearby on farm research site. Due to favourable soil conditions, plots 2, 5, 6, 9 and 10 produced the highest bio-mass as compared to the other plots independent of variety.

### Bio-mass yield of dry stalks without leaves:

Plot 2	Jutta	3.4 kg	7.48 lbs.	3291 lbs./acre
Plot 5	Alyssa	6.2 kg	13.64 lbs.	6002 lbs./acre
Plot 6	Anka	4.4 kg	9.68 lbs.	4259 lbs./acre
Plot 10	Alyssa	5.2 kg	11.44 lbs.	5034 lbs./acre
Plot 9	Jutta	4.2 kg	9.2 lbs.	4065 lbs./acre

Break-even yield established with 2009 report cost of production template

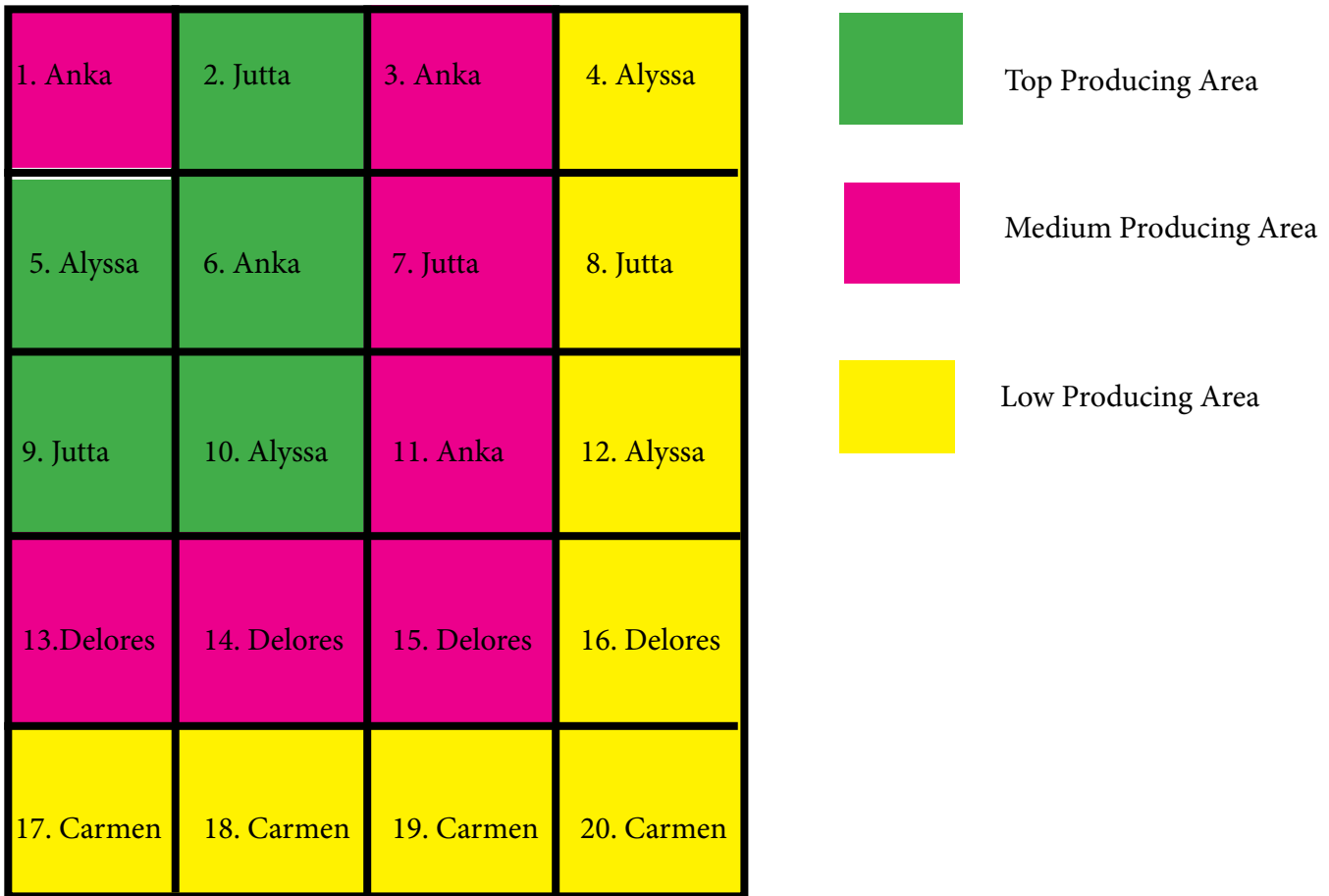
Operating Costs	3029 lb
Operating and Fixed Costs	4506 lb
<b>Total Costs</b>	<b>4866 lb</b>

Cost of Production 2009 template shows break even yield required: 4866 lbs.

Conclusion: Plot 5 and 10 (both Alyssa varieties) exceeded the cost of production break even point  
During the 2010 crop production year no Alyssa seed for the on farm research sites was available due to seed production shortage in Manitoba.



## Varietal Test Plot Layout



### Observations:

1. Test plot site was representative for the surrounding area, we have noticed in 2009 and in 2010 that within a short distance between plots seeded with the same variety there are substantial differences in bio-mass production. It is our conclusion that this is related to soil type.

2. Test plot areas 9, 10, part of 11 & part of 14 produced the most bio-mass, independent from choice of variety.

3. Test plot areas 4, 8, 12, 16, 17, 18, 19 & 20 produced consistently less bio-mass, independent from choice of variety.

Overall the test plots performed considerably better as compared to 2009

### Recommendations:

1. The 100 Mile House Industrial Hemp Pilot Project establish contact with the Canadian Hemp Trade Alliance and prepares for 2011 participation in the Canadian wide varietal test plot. Entering min. two sites 1) with irrigation 2) without irrigation.
2. Hire summer student.
3. June Field Day- Prior to holiday season to attract more people.

## On-farm research

### Background information

In 2010, the seed provider struggled with seed quality issues, improper/no labeling. During the growing season Health Canada, SeCan and the CFIA got involved. One of the issues was that the Anka seed was contaminated with wild mustard seed. As a result, one producer group member was forced to harvest his Anka seeded field prematurely to prevent wild mustard seed from maturing and contaminate his hay producing ranch. In other fields the wild mustard infestation resulted in lower bio-mass yields. As far as we know the irregularities are an isolated case and not industry wide. Due to limited supply of industrial hemp seed last year the producer group was not able to access the fibre varieties that they had planned for.

In producer group meetings this issue was discussed and it was proposed that in future a seed procure plan has to be implemented to prevent last minute seed order cancellations by seed providers.

### Locations:

#### **Horse Lake** – seed distribution location

Farming practice: conventional

Seed bed: Fall tilled

Seeding: seed drill (on-farm)

Varieties: Anka & Carmen

Seeding date: May 15

Excellent early crop development, followed by variation in bio-mass development due to soil influence

Anka was harvested in pre-maturely due to wild mustard infestation.

Harvested with New Holland rotary haybine and New Holland (small) square baler. No technical problems with cutting and/or baling of crop. No yield established due to premature harvest.

Carmen left standing in the field to mature for hemp grain. No grain yield established.



Horse Lake on farm research site, July 2010. Notice wide variation in industrial hemp crop development due to variation in soil conditions



Wild mustard infestation of Anka variety

### Beaver Valley

Farming practice: organic with conventional fertility test plot

Seed bed: Fall seeded rye, spring discing of green manure

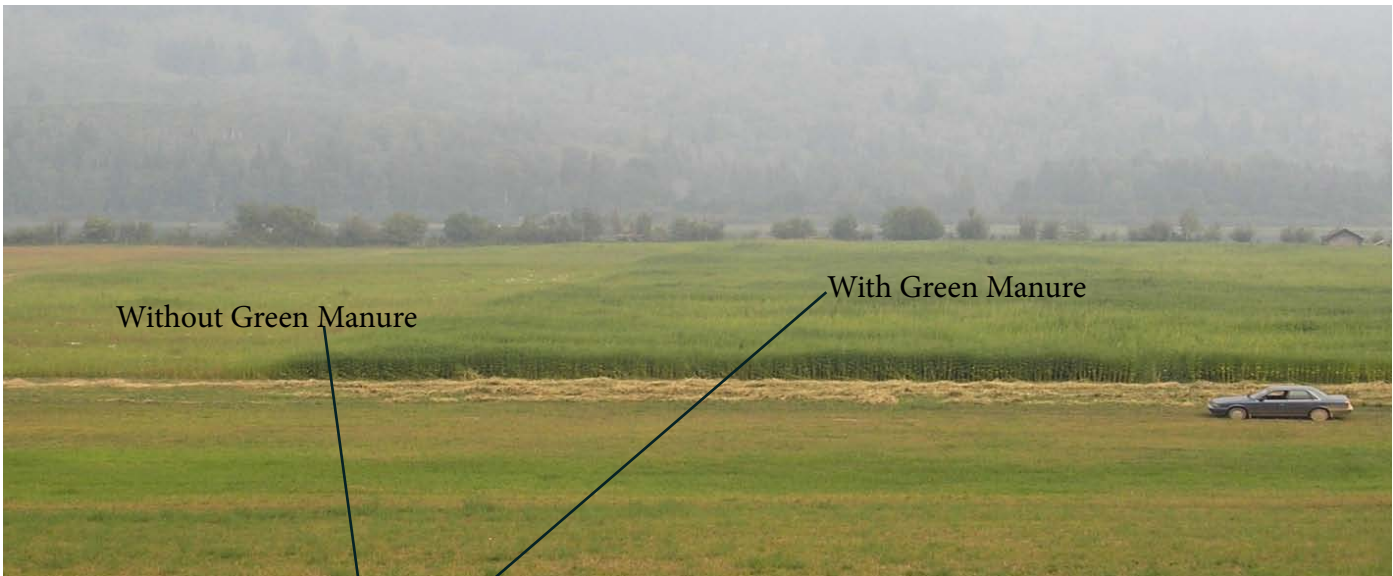
Seeding: seed drill (on-farm)

Varieties: Anka & Carmen

Seeding date: May 19

Good crop development, lower plant density on sandy areas.

Noticeable influence on crop development between green manure incorporated section and non-green manure section.



Notice the green manure affect on crop development

### Observations

Organic versus conventional fertilizer test plot, due to technical problems no organic fertilizer could be applied. Both Anka and Carmen harvested with 9 ft. New Holland (conventional) haybine. 8 ft. green crop was cut without problem. Weather issues prevented the crop from drying. No yield established.



Beaver Valley crop reaching an average height of 7.5 ft

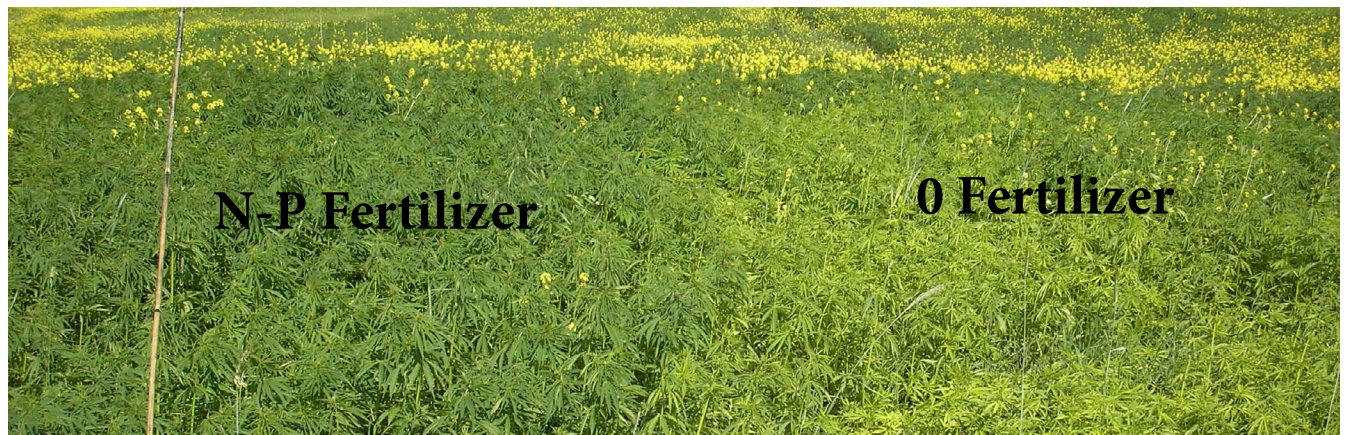
Not fertilized



Anka

Fertilized

Carmen



**N-P Fertilizer**

**0 Fertilizer**

Colour difference due to fertilizer

## Quesnel

Farming practice: conventional

Seedbed: Fall tilled

Seeding date: May 17

Seeding: seed drill (on-farm)

Varieties: Anka & Carmen

Harvested with a rotary haybine and round baled without technical problems.

### Observations

Due to very dry conditions after seeding, some of the deeper seeded seeds ended up in moist soil and emerged where as the other seeds not so deeply seeded, ended up germinating later. This resulted in very uneven crop development, throughout the remainder of the crop season. On 08 July, we noticed seeds germinating, plants 3 inches tall and plants 27 inches tall within a short walking distance of the field. In late August after heavy rains we noticed a very late crop bio-mass taking place in those areas of the field that early on in season had established a crop canopy. Irregular crop development prevented us from establishing a reliable bio-mass yield.



July 8, wide variation in crop development due to lack of seed bed moisture during seeding



October -ready to bale

## Vanderhoof

Farming practice: conventional + organic

Seed bed: spring tillage (custom discing)

Seeding date: May 23

Seeding: air-seeder (custom)

Seed Varieties: Anka & Carmen

Harvesting: No harvesting took place

Observations

Sufficient moisture for excellent germination for a spring tilled field. The organic field, organic by default (no nutrient input) although emerged good, never gained measurable bio-mass during the growing season due to severe drought conditions. The plants suffered throughout the growing season until the second half of August when moisture conditions improved somewhat.



Soil compaction issues due to tire tracks.  
Result: reduced plant emergence, July 3rd



Well developed plant, July 3rd



August 7th, Crop development stalled due to severe drought conditions

Conclusions

Varietal performance

On-farm research sites

The Anka variety showed better bio-mass production performance on all on-farm research sites as compared to the Carmen variety. We were not able to measure the bio-mass weight differences between the two varieties due to a premature harvesting, an incomplete late harvest and no measurement could take place due to irregular crop production patterns in the field.

Varietal test plots

Alyssa variety outperformed all other varieties.

Recommendation for 2011

Producers should select Carmen and Alyssa varieties for their on-farm research sites.

# University of Manitoba - Partnership

Collaboration 100 Mile House industrial hemp project and The Alternative Village , University of Manitoba, Bio-Systems Engineering.

Background:

The conclusion of the 2009 meetings with BC based contractors:

- 1)A growing interest in the use of “green building materials” both at the home buyer and contractor level.
- 2)Both Industrial hemp products: hemp hurd and hemp fibre are of interest
- 3)No off-shore industrial hemp product are imported and used as green building materials
- 4)Locally produced and processed “Green Building” products are preferred over imported products

Product liability is the major hurdle preventing contractors from using industrial hemp hurd or fibre.

In order to overcome this hurdle the industrial hemp hurd and fibre have to undergo engineering research conducted by an industry recognized facility/person.

During the 2009 project, contact was established between the District of 100 Mile House and the University of Manitoba Bio-Systems Engineering Associate Professor Kris Dick, P.Eng. and U of M graduate student Jeremy Pinkos. The “Alternative Village” at the University of Manitoba is a site where non-conventional or pre-commercial construction projects take place under leadership of a professional building engineer.

It is at the Alternative Village site that prior to, during and after the construction of a structure or structural component extensive research is being conducted and documented for industry partners. The range of research conducted ranges from structural behaviour of full scale specimens to lab-based testing. This type of engineering research is required in order for industrial hemp products to become accepted by the building industry. The nature of university-based research implies that these data will be published and available to a wide readership.



U of M Bio-Systems Engineering Lab

In 2009, Prof. Kris Dick was searching for industry collaborators for a comparison study of different building products. This project is managed by Jeremy Pinkos and supervised by Prof. Kris Dick.

One of the structures planned for this comparison study was going to be a “hemp house” combining industrial hemp hurd with specially formulated binder material, mainly consisting of locally available industrial by-products.

During the consultation process a plan was developed that consisted of three phases:

1)The 100 Mile House project would make a financial contribution to support the actual work of developing different binder mixes and blending these with hemp hurds.

#### Results

These engineered tests will create the data required to develop an engineered binder material. This engineered binder blended together with hemp hurd would become the infill- wall material of the proposed hemp house.

2)Prof. Kris Dick and student Jeremy Pinkos would become available to attend and deliver presentations + be work shop instructors at the November 2010 100 Mile House Green Building Symposium.

3)Prof. Kris Dick and Jeremy Pinkos would offer their expertise and available research data in the construction of a transportable 100 Mile Industrial Hemp house.

Emerson Hemp Distribution Company is the provider of the industrial hemp hurd that is being used at by the U of M Bio-Systems Engineering team,

An agreement was signed by the U of M faculty and the District of 100 Mile House.

#### Symposium impact

As a direct result of Prof. Kris Dick’s + Jeremy Pinkos presentations at the 100 Mile House Industrial Hemp symposium, including the work shop sessions, the Alternative Village has established an industry link to the B.C. industrial hemp green building products community.

BC contractors have benefitted/are benefitting from the industrial hemp engineering capacity that was brought into BC as part of the 100 Mile House Industrial hemp project.

We can measure the results of the symposium by the increased orders for industrial hemp hurd and fiber EHCD is receiving from BC.

We’ve noticed an increased number of BC contractors interested in receiving industrial hemp building information.



From a marketing perspective the BC local/provincial green building market can potentially be provided with industrial hemp product produced and processed at the Micro level entrée. Currently this market is looked after with products that have been provided by the 100 Mile House industrial hemp Pilot Project processor collaborator, Emerson Hemp Distribution Company.

Technology transfer of this EHDC designed processing (decortication) line to 100 Mile House is a possibility to be explored.

Recommendations:

- 1-Prepare for a second 100 Mile House Industrial Hemp Green Building Symposium
- 2-Extend collaboration with U of M's Bioystems Engineering faculty
- 3-Explore collaboration opportunity between U of M Bio-Systems Engineering faculty, to be identified with a B.C based engineering research party
- 4- Established a District of 100 Mile House based industrial hemp industry information service

# Industrial Hemp House Demonstration Building

## Industrial hemp house demonstration

This component of the project could not be completed in time to meet the 100 Mile House Industrial Hemp project deadline.

## History

During the course of the 2009 100 Mile House Industrial Hemp project we identified the product liability issue as faced by contractors to be the main hurdle that had to be overcome in order for market to accept industrial hemp building products.

In the 2010 project proposal we addressed this issue through allocating funding for establishing a collaboration project between the engineering industry and the BC construction industry.

We identified the University of Manitoba 's Department of Bio-Systems Engineering as the preferred partner to collaborate with. An agreement was reached and a contract consisting of three independent phases was signed.

The last phase, consisted of building a transportable industrial hemp house for demonstration purposes where by the 100 Mile House industrial hemp project would oversee the construction of the demo-building by a, to be identified, BC based construction company. The construction company would receive engineering services from U of M's Department of Biosystems Engineering.

The allocated budget for the industrial hemp house demonstration component of the 100 Mile House Industrial Hemp Project was limited to procurement of construction materials only.

The first opportunity for exploratory meetings between U of M's Department of Biosystems Engineering representatives and potential BC contractors took place at the 100 Mile House Industrial hemp green building conference Nov 4-6. It was during this meeting that a BC construction company was identified as the industry collaborator.

Due to a medical leave of absence of one of the collaborators, the follow-up telephone meetings to discuss and plan the technical details were delayed and after re-starting had to be kept at a slower pace than before.

Preparing for the engineering part, designing an industrial hemp construction panel, was more time consuming as originally scheduled.

Although the dead line was missed, the U of M's Department of Biosystems Engineering and the BC contractor have decided to continue to collaborate on designing building of and engineered industrial hemp construction panel.

All parties have committed their support to make the results of this collaboration project available to the District of 100 Mile House.

The situation can be best described as:

Within the context of our time lines and that when mixing industry, government funding time frames, grant submissions and academic schedules there is a probability of non-intentional delay.

# Green Building Conference

## Green building symposium

### Objective

The objective of organizing the November 4-6 100 Mile House Industrial Hemp Green Building Conference was to introduce participants to speakers and presenters that represent the links of an industrial hemp value chain.

### Approach

To focus on the local/provincial green building market that is starting to develop for industrial hemp hurd and fibre products.

### Value Chain

During the 2009 and 2010 course of the projects, companies or persons were identified and approached for their collaboration to present and share their knowledge. The objective of this process was to focus on the needs required to develop a successful District of 100 Mile House based industrial hemp value chain hub. We succeeded in attracting presenters that are active in the B.C. green building markets.

Producer link - BC Ranchers, First Nations

Processor link – Emerson Hemp Distribution Company

Engineering link – University of Manitoba, Bio-Systems Engineering faculty, Emmanuel Lavoie

End-users/market link – Jayeson Hendyrsan, Vittorio Gianini, Damon Zirnhelt,

### Knowledge Centre Development

The project has developed the District of 100 Mile House into an industrial hemp fibre knowledge centre. The 2.5 day event has proven the District of 100 Mile House was able to attract some of the most knowledgeable participants/presenters Canada has to offer, all with the ability to directly apply/focus on the B.C.-provincial industrial hemp products green building market .

The District of 100 Mile House through the Lodge Conference centre offered excellent settings for presentations including the complete kitchen services that enable the guests to be treated to an excellent menu prepared with 100% locally grown products. Technical support was available to assist presenters with overcoming technical problems. As result we did not experience any interruptions during the many presentations.





Producer group meeting in 100 Mile House- Nov 4



From left to right: Damon (provider of timber frame structure), Pam (representative of Canim Lake First Nation), Jack (project initiator), Kris (U of M Engineering), MLA Donna Barnett, Vittorio and Jayeson (hemcrete contractors)

# 100 Mile House Industrial Hemp Straw

## Overview

2009

Due to severe drought conditions throughout the region the project experienced crop failures except at one location.

At this location, the industrial hemp harvesting started with mowing but was not completed due to a missed opportunity by a rancher to proceed with timely baling in late summer. During follow-up consultation the next opportunity identified for baling, early spring, was missed. This resulted in no hemp straw being available for test-processing.

2010

At three of the four production locations, hemp straw was mowed and at two locations the industrial hemp straw was baled, the third locations experienced wet weather and as result was not able to bale. At this location a second attempt will be made in early spring 2011.

During the November 2010, 100 Mile House Industrial hemp green building conference discussions took place to have the harvested straw shipped to Manitoba to be processed by project collaborator, Emerson Hemp Distribution Company, whereby processed products would be shipped back to 100 Mile House to be used for the industrial hemp house construction.

Due to project delays, the industrial hemp house construction could not be completed in time to fall within the time frame of the project. As result the hemp straw was not processed.

# Summer Student

## Agronomic Research

Without employing a dedicated summer student the on-farm research program and the varietal test plot program can not be properly managed. Without these programs in place year after year, the industrial hemp value chain will not develop.

## On-farm research

The summer student's role of executing the on-farm research work-plan can not be taken over by individual ranchers. The work plan activities are scheduled to coincide with critical crop development stages and would interfere with the participating ranchers work schedule.

The on-farm research projects provide valuable information/data which benefits new and existing ranchers and results in them being able to make sound management decisions, as it relates to their ranch.

The industrial hemp value chain benefits from on-farm research when making industrial hemp crop production models. These models are important management tools when making industrial hemp processing business decisions.

Therefore a funding request for on-farm research has to include the cost associated with hiring a summer student. Keep in mind the travel + accommodation costs. The 100 Mile House industrial hemp production corridor stretches from as far south as Ashcroft to as far north as Vanderhoof.

## Varietal Test Plots

There are no designated test plot research facilities in the area that can be accessed. Test plot site selection is dependent on local ranchers making a site available, most often near a yard site to ensure for all-weather access.

For successful varietal test plot performance and management, it is required that the summer student is available for seed bed preparation and seeding around mid-May until harvest time – end of August.

Besides seed bed preparation and seeding which are completed in a relatively short period it's however the weed control management that is time consuming and the success has a big impact on the test plot performance.

Dedicated test plot management is required, this might include working during evenings and weekends.

## Open day

The open day is an important event to connect producers with potential new producers, it also offers an opportunity for the general public to become more familiar with the developing industrial hemp industry. It offers an excellent platform to conduct knowledge transfer.

Without the employment of a summer student the open day would not be feasible.

## Producer support

A summer student plays an important role in managing the on-farm research and variety test plot industrial hemp crop development data. This is a direct benefit for the producer group. Organizing producer group meetings prior to the busy haying season can be managed by the summer student.

## Recommendation

Depending on the educational background of the summer student, it is recommend to enroll the summer student in a test-plot management course, including test plot data processing.



Field inspection by summer student at Horse Lake on-farm research site

# Field Day



Field day 2010

The Horse Lake varietal test plot site and the neighboring on-farm research site were the focus points of the August 10 field day.

The focus is to draw an interested group of visitors with a diverse background, to see first hand the production of industrial hemp at close range.

This year the summer student organized the event, including preparing the invitations, informing the media of the event and preparing the test-plot site – weeding + marking of each plot.

A display of semi-processed industrial hemp hurd and fibre products including packaged animal bedding products were on display.

The field day offers an excellent opportunity to attract attention to the project by introducing new ideas. At this event we introduced the concept of the Industrial Hemp Fibre Processing Knowledge Centre of Canada.

As direct result of the 2009 & 2010 project activities, the District of 100 Mile House has attracted the attention not only in Canada but also internationally. It is important to realize that as result of the project efforts we have been able to attach the project to an informal industrial hemp fibre network through which we can access valuable business information. Without this network, it would be difficult to direct the project to success.



# Conclusions

The 100 Mile House Industrial Hemp Project is a community supported initiative, that in 2009 and 2010 gained momentum and attracted interest & support from the regional ranching community. During the 2010 activities, the project gained recognition and support from the provincial green building industry.

In order for this momentum to be maintained the following recommendations should be considered:

Enter the 2011 pre-commercial phase at a manageable level through small scale production and small scale processing (2 tonne/hr. capacity)- Grow with the market approach.

**Pilot plant construction** - on-farm processing at a micro-level

Develop industrial hemp straw (decortication) processing capacity- at pilot scale

Cost of developing a processing line requires a \$ 500,000.00 investment

Benefits:

- Provincial green building industry would gain access to B.C. grown and processed industrial hemp building products. Currently, no BC products are available, imported products would not meet the strict green building accreditation requirements
- Producer group development would reach commercial scale production level up from current on-farm research level. Attracts Investor interest
- At this investment level marketing of industrial hemp products can start at manageable levels.

**Collaboration - for macro level**

Explore collaboration opportunities with identified European industrial hemp processor

Benefits:

- Crop production and harvesting knowledge exchange between 100 MH and Europe
- Hi-tech processing technology knowledge exchange between 100 MH and Europe
- Potential joint venture processing opportunity for exporting BC grown semi-processed fibre to Europe (phase I)
- Potential business plan development for a 100 Mile House based industrial hemp matting line (phase II)

**2011 On-farm research + varietal test plot**

Develop funding plan for this research to continue

Benefits:

- Research data will increase producer group production knowledge on micro and macro level
- Test new industrial hemp fibre varieties – increase in bio-mass yield will result in higher revenue return to ranchers

**100 Mile House Industrial Hemp fibre knowledge centre**

Develop strategy plan for creating 100 Mile House Knowledge Centre

Benefits:

- Name recognition -100 Mile House based Industrial hemp knowledge centre will attract market interest and attract investor interest

## What is required to get the process going?

- 1) Stake holder meetings involving representatives of the industrial hemp value-chain links. Objective of this meeting is to establish a level of support and commitment for development of a pilot plant.
- 2) Identify project partners and establish + secure their commitment
- 3) Evaluate the strength of the case. Proceed yes/no.....if yes
- 4) Prepare for funding application

This process should start in early April so that ranchers decide to participate before seeding starts

Who should initiate this process : District of 100 Mile House

Who should manage this process: Western Regional Management Team

Role of the producer group: members commit to contract production for pilot plant and their role could be extended to managing/operating processing equipment.

Supporting role for engineering partner (U of M)

Supporting role for green building market representatives/contractors

## **Project Accomplishments**

- 1) Successful introduction of new crop into the B.C. ranching community
- 2) Participation with First Nations
- 3) Development of functioning producer group
- 4) Development of on-farm research sites
- 5) Development of Cost of Production model
- 6) Development of feasibility study
- 7) Transfer of industrial hemp crop production knowledge to ranchers
- 8) Connecting with wide range of markets, providing sample material
- 9) Facilitating industrial hemp industry business relationships
- 10) Industrial hemp processing technology know-how transfer
- 11) Value-chain development
- 12) Development of positive media relationship
- 13) Facilitated open-days, field days, conference and workshop

## **General Comment**

The development of a value chain is a time consuming process, which on average takes three years before being completed to a satisfactory level. For future funding applications, it is recommended that sufficient time is set aside in order to meet the required time to successfully complete the development of the value chain.

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## Hempcrete Research at the Alternative Village, University of Manitoba

Canada's legalization of the growing of industrial hemp in 1998 has provided new and exciting avenues to explore in terms of food and textile production. However, approximately 60-70% of the plant is comprised of a woody core in which this portion of the plant is used for horse bedding and the like due to its ability to absorb large amounts of moisture or is otherwise burned. Thanks to collaboration between the District of 100 Mile House, BC and researchers Professor Kris Dick, P.Eng. and his student Jeremy Pinkos at the University of Manitoba, a different use for the woody core of the industrial hemp plant is being explored.

Hempcrete is a building material that has been around for some time in Europe but is rather new in Canada. Though not load bearing, this material is used as infill insulation. Thanks to its vapour permeability, the walls "breathe" thereby creating a healthier indoor environment. Hempcrete consists of the shredded core of the hemp stalk and a binder. The binder mix may contain any number of ingredients such as hydrated lime, hydraulic lime, and Portland cement, just to name a few. Figure 1 shows a fresh batch of hempcrete just prior to being cast as test cylinders.

Seven different mix designs were evaluated in terms of their effect on the compressive strength of 127 hempcrete test cylinders. Figure 2 shows a hempcrete cylinder after being tested in compression. Load-deformation and strength were evaluated. Out of these seven binder mixes, one was chosen based on its effect on compressive strength as well as local availability of the ingredients, carbon footprint and embodied energy.

Currently, hempcrete wall panels are being constructed to create a test building at the University of Manitoba's Alternative Village. This building will be monitored for temperature and relative humidity through the walls as well as the energy consumption to keep the interior of the building at room temperature. The results will be compared with those of a benchmark building built to the standards set forth by Manitoba Hydro for its Powersmart residential buildings.

Mr. Pinkos and Professor Dick would like to thank the District of 100 Mile House, BC for their support of this research. The Industrial Hemp Green Building Conference brought producers, contractors and researchers together to advance the use of industrial hemp and has created other collaborations between our two provinces that will continue.

Prepared by:

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Figure 1: Freshly mixed batch of hempcrete



Figure 2: Tested hempcrete cylinder