

BC Ministry of Agriculture Webinar



Hemp Production & Markets 101

Fall 2019



Contents

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II. How to Grow Hemp

- Seeding
- Fertility
- Pest Control
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V. Marketing & Profitability

- Costs of Production
- Economies of Scale
- End-use Purposes of Hemp
- Major Industry Players & Buyers



Wide-row planted hemp

What is Industrial Hemp?

- The *Industrial Hemp Regulations* identify:
 - Cannabis (*Cannabis* spp.) plants and plant parts, of any variety, that contains <0.3% tetrahydrocannabinol (THC) in the leaves and flowering heads.
- Also included are:
 - Plant part derivatives
 - These do not include the flowering parts or the leaves



Practical Definition

- Dioecious annual plant
 - Male and female plants
- Requires 85-125 days to reach maturity
- Slow to germinate, slow growth for ~4-6 weeks, then explosive growth habit after
- Can reach up to 12 feet (3m) in height, depending on type, variety and day length
- Does not like wet, waterlogged soils

History of Industrial Hemp in Canada

- Grown worldwide, imported into Canada in 1606

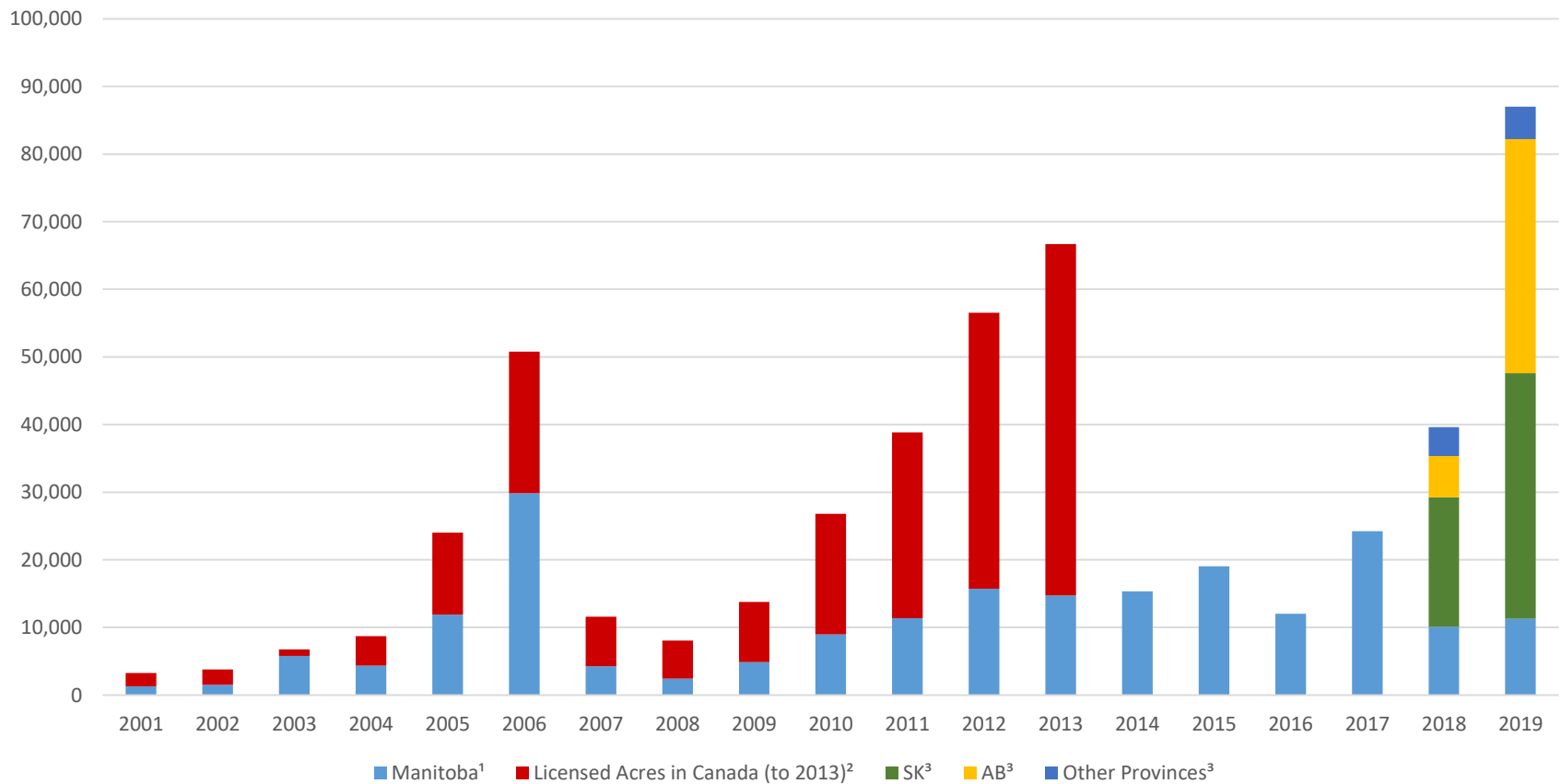


- Cultivation banned in 1938 (Opium and Narcotics Control Act)
- Legalized production and controlled cultivation in 1998 and regulated by Health Canada
- Loosening of some restrictions under the Cannabis Act in 2018
 - Cultivation for use in cannabidiol (CBD) production now allowed

History of Industrial Hemp on the Prairies

- Manitoba led Canada once legal production resumed
- Eastern European-derived cultivars first grown
 - Varietal breeding now done in Manitoba
- Challenge to separate hemp from marijuana issues
- USA market access was a challenge, improving after 2002
- SK, AB and QC have been the other major producers

Distribution of Hemp Acres in Canada



¹ [Manitoba Management Plus Program](#)

² Health Canada

³ StatsCanada Table: 32-10-0359-01

Section II

HEMP AGRONOMY

Seeding



PHOTO: WWW.DEERE.CA

- Must plant Certified seed
- Air drill most common
- Fibre production or “dual purpose”
 - target plant density of 250 – 300 plants/m² (23 – 28 plants/ft²)
 - 40 to 50 lbs/acre
- Grain production
 - target plant density of 100 – 125 plants/m² (10 – 12 plants/ft²).
 - 18 to 23 lbs/acre

Thousand Seed Weight (TSW)

- Hemp seed can vary significantly in size
- Common grain type, Finola, is much smaller than X59, another grain type
- Seedling mortality can range from 10 to as high as 70%, depending on handling and environmental conditions

<http://www.agric.gov.ab.ca/app19/calc/crop/otherseedcalculator.jsp>

Table 1. 2012 Industrial Hemp Grain Variety Trial 1000 Kernel Weight for 2011-2012 Variety Trials

Variety	Average TSW (g)	Site Years	Minimum TSW (g)	Maximum TSW (g)	Seeding Rate* (lbs/acre)
Alyssa	18.1	7	15.7	19	26.1
Anka	16.2	7	13.5	17.5	23.4
Canda	19.5	8	14.8	21.5	28.2
CanMa	16.3	2	15.5	17	23.5
CFX-1	16.9	8	14.1	18.5	24.4
CFX-2	15.9	8	14.6	17	23
CRS-1	17.3	8	15.6	19	25
Debbie	18	3	16.4	19.5	26
Delores	18.2	7	14.5	20	26.3
Finola	13.1	8	11	14.6	18.9
Joey	18.3	5	15.3	19.6	26.4
Jutta	18.4	3	17.4	19.8	26.6
Petera	20	1	20	20	28.9
Silesia	15.5	4	14.2	17	22.4
USO14	17	4	15	18	24.5
X59	17.2	4	13.5	21	24.8

Assumptions: 10 seeds/ft², 95% germination, 30% mortality, used average TSW per variety.

Seeding (cont'd)

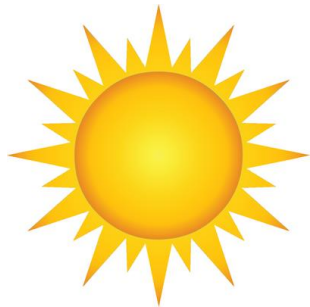
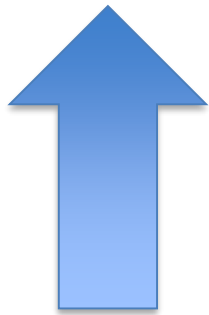
Seeding Depth

- Shallow seeding, 0.5 to 1 inch
 - Increased depths can result in poorer stands
- Target soil temperatures of 8 to 10°C or higher
- Good soil moisture will facilitate uniform and fast emergence
 - Need good seed-to-soil contact
- Plant stands and establishment have been lost due to deep seeding coupled with cold, wet soils.

Seeding Date

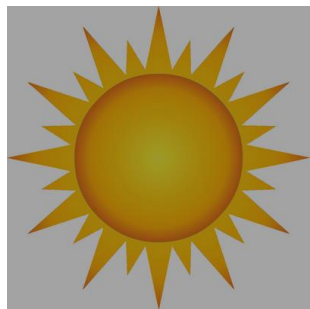
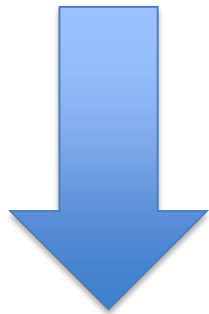
- Generally planted in late May to early June
- More critical to achieve optimum seeding conditions
 - Warm soils are key
- Reasonably tolerant to light spring frosts

Photoperiodic Response



= **GREATER** vegetative growth

Increasing Daylength



TRIGGERS

Decreasing Daylength



Flowering & Maturation

Fertility

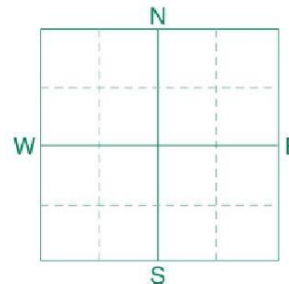
- Small seeds are sensitive to seed-placed N
 - Broadcast or side-band N, S may be necessary
- Soil testing is recommended
 - If no test available, treat similar to a spring wheat crop
 - N: 80 – 120 lbs/acre
 - P_2O_5 : 40 lbs/acre
 - K_2O : 60 lbs/acre
 - S: 15 lbs/acre



Soil Analysis by Agvise Laboratories
(http://www.agvise.com)
Northwood: (701) 587-6010
Benson: (320) 843-4109

SOIL TEST REPORT

FIELD ID [REDACTED]
SAMPLE ID [REDACTED]
FIELD NAME [REDACTED]
COUNTY [REDACTED]
TWP [REDACTED] RANGE [REDACTED]
SECTION [REDACTED] QTR [REDACTED] ACRES **160**
PREV. CROP **Canola-bu**



SUBMITTED FOR:

SUBMITTED BY:

REF # [REDACTED] BOX # **1314**
LAB # **NW69693**

Date Sampled **09/17/2019**

Date Received **09/18/2019**

Date Reported **9/23/2019**

Nutrient In The Soil		Interpretation				1st Crop Choice			2nd Crop Choice			3rd Crop Choice			
Nitrate	0-6" 6-24"	9 lb/ac 15 lb/ac	*****	Low	Med	High	Hemp Seed			Oats			Wheat-Spring		
	YIELD GOAL						YIELD GOAL			YIELD GOAL					
	700 Lbs						140 BU			70 BU					
	SUGGESTED GUIDELINES						SUGGESTED GUIDELINES			SUGGESTED GUIDELINES					
Phosphorus	Olsen	11 ppm	*****	Low	Med	High	Broadcast			Band/Maint.			Band/Maint.		
	Potassium	631 ppm					LB/ACRE	APPLICATION	LB/ACRE	APPLICATION	LB/ACRE	APPLICATION			
Chloride	0-6" 6-24"	76 lb/ac 360 +lb/ac	*****	Low	Med	High	N	116		N	116		N	165	
	Sulfur						P ₂ O ₅	41	Broadcast	P ₂ O ₅	35	Band *	P ₂ O ₅	44	Band *
Boron			*****	Low	Med	High	K ₂ O	0		K ₂ O	10	Band (Starter)*	K ₂ O	10	Band (Starter)*
	Zinc	0.86 ppm					Cl			Cl			Cl		
Iron			*****	Low	Med	High	S	0		S	0		S	0	
	Manganese						B			B			B		
Copper		2.63 ppm	*****	Low	Med	High	Zn	0		Zn	0		Zn	0	
	Magnesium						Fe			Fe			Fe		
Calcium			*****	Low	Med	High	Mn			Mn			Mn		
	Sodium						Cu	0		Cu	0		Cu	0	
Org.Matter		5.8 %	*****	Low	Med	High	Mg			Mg			Mg		
	Carbonate(CCE)						Lime			Lime			Lime		
Sol. Salts	0-6" 6-24"	0.75 mmho/cm 1.25 mmho/cm	*****	Low	Med	High	Soil pH		Buffer pH	Cation Exchange Capacity		% Base Saturation (Typical Range)			
									% Ca	% Mg	% K	% Na	% H		
			*****	Low	Med	High	0-6" 7.5 6-24" 8.2								

Crop 1: Many crops may respond to a starter application of P & K even on high soil tests. AGVISE Broadcast guidelines will build P & K test levels to the high range over several years.

Crop 2: * Caution: Seed Placed Fertilizer Can Cause Injury * Many crops may respond to a starter application of P & K even on high soil tests. Crop Removal: P2O5 = 35 K2O = 27 AGVISE Band/Maintenance guidelines will build P & K test levels to the medium range over many years and then maintain them.

Crop 3: * Caution: Seed Placed Fertilizer Can Cause Injury * Many crops may respond to a starter application of P & K even on high soil tests. Crop Removal: P2O5 = 44 K2O = 26 AGVISE Band/Maintenance guidelines will build P & K test levels to the medium range over many years and then maintain them.

Nutrient Uptake & Removal

- Most nutrients are contained within the fibre
- Highest % P held in seed
- Removal of nutrients ↓ with ↑ in retting time on-field

Table 2: Nutrient Uptake and Removal of Field Crops (kg/ha)

	Total Plant (kg/ha)		Grain (kg/ha)		Hemp Uptake
Nutrient	Hemp	Canola	Hemp	Canola	Kgs/acre/day
N	200	120	40	65	6.7
P	47	50	19	35	1.56
K	211	75	10	17	6
S	14	20	3	12	

SOURCES: CANADIAN FERTILIZER INSTITUTE, MANITOBA AGRICULTURE



Nitrogen deficiency, (N) early stage



Nitrogen deficiency, (N) progression



Nitrogen deficiency, (N) late stage



Nitrogen abundance (N), early stage



Nitrogen abundance (N), late stage



Phosphorus deficiency (P), early stage



Phosphorus deficiency (P), progression



Phosphorus deficiency (P), late stage



Potassium deficiency (K), early stage



Potassium deficiency (K), progression



Potassium deficiency (K), late stage



Magnesium deficiency (Mg), early stage



Magnesium deficiency (Mg), progression



Sulfur deficiency (S), early stage



Sulfur deficiency (S), progression



Sulfur deficiency (S), late stage



Zinc deficiency (Zn), early stage



Zinc deficiency (Zn), progression



Zinc deficiency (Zn), late stage



Manganese deficiency (Mn), early stage



Manganese deficiency (Mn), progression



Manganese deficiency (Mn), late stage



Iron deficiency (Fe), early stage



Iron deficiency (Fe), progression



Iron deficiency (Fe), late stage

Pest Control - Weeds

- No herbicides except Assure II (*quizalofop*) are registered for use in-crop hemp
 - Assure II is a Group 1 product for grassy weed control
- Cultural and mechanical methods of weed control are crucial to success
 - Beginning with a clean field
 - Pre-seed tillage/burnoff (eg. Glyphosate)
 - Appropriate seeding rates



VOLUNTEER
WHEAT



WILD BUCKWHEAT and SEEDS



BARLEY SEEDS





Hemp is susceptible to residual herbicides

Atrazine (Group 5) injury symptoms

PHOTO COURTESY OF JENNIFER McCOMBE, FRESH HEMP FOODS.

Pest Control - Insects

No insecticides are registered for use in hemp.

Many pest species do feed on hemp, but none at economic levels so far.

- Grasshoppers
- Corn borer
- Lygus bugs
- Stinkbugs
- Bertha armyworm
- Cutworms
- Blister beetles
- Birds
- Deer

PHOTOS COURTESY OF CHTA.



BROWN MARMORATED STINKBUGS ON SEED HEAD



EUROPEAN CORN BORER STEM DAMAGE

Pest Control - Diseases



Sclerotinia and botrytis are the most common diseases

- Sclerotinia infects under warm, humid conditions for periods >10 days
- Damage most severe with early infection (right)

PHOTO COURTESY OF CHTA.

Grain Harvest

- Begin harvest when 70-80% of seeds are ripe, and about 10 to 20% moisture content
 - Waiting too long will reduce yield from shatter losses
- Male plants will be dead at this time, only female plants remain



HEMP PLANT READY FOR HARVEST

PHOTO COURTESY OF CHTA.

Grain Harvest (cont'd)

- Delaying harvest too long allows plant time to dry down
 - Dry plants have more mature, tougher fibres
 - More prone to wrapping on axles, bearings, rollers and chains
- Hemp is best suited to straight-harvest, but swathing can be done
- Grain is dry at <10% moisture content

Fibre Management

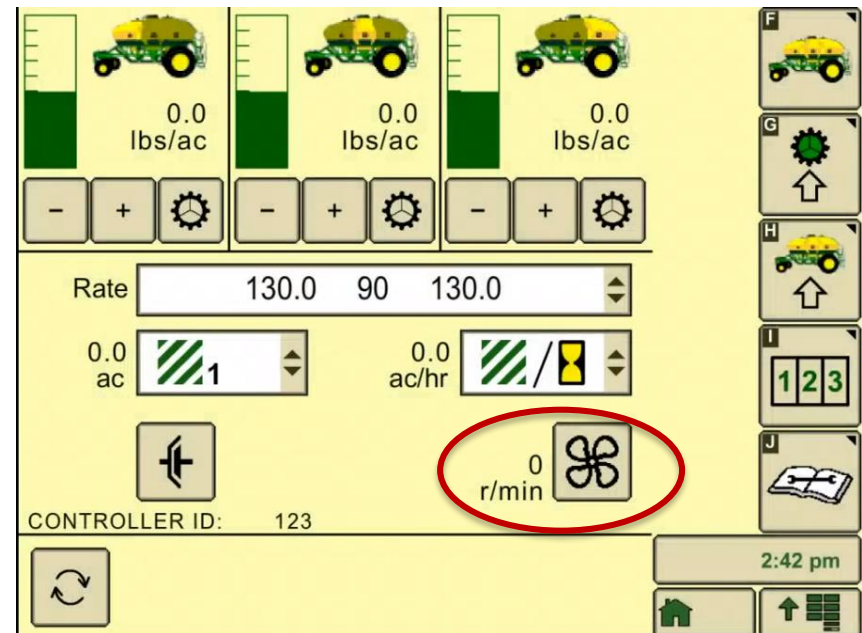
- Fibre-destined hemp should be cut prior to seed set
 - Delays will increase lignification of stem, and reduce bast fibre yield from stalks
- Fibre residue from grain crops can be:
 - Baled
 - Stubble is rolled or worked in with a high-speed disc immediately after harvest
 - Flat stubble can be burnt

SECTION III

SPECIAL MACHINERY CONSIDERATIONS

Seeding Technology

- Hemp is a sensitive seed, and seed coats can be easily damaged
- Reduce fan speed as much as possible, and use appropriately sized seed rollers
- Air disc drills or air seeders both work well; limited acres are planted (~15" spacing)



EXAMPLE SETUP SCREEN FROM JOHN DEERE
AIR CART MONITOR

Header Technology



PHOTO COURTESY OF CHTA.

Combine Technology

Initial Harvest Settings

Cylinder/Rotor – 450 – 600rpm

Concave - 30 – 50 mm

Wind - 1070 rpm

Sieve - 3mm

Chaffer - 10mm

- Inspect areas around final drives, rotor & feederhouse bearings, and straw chopper bearings regularly for wrapped material



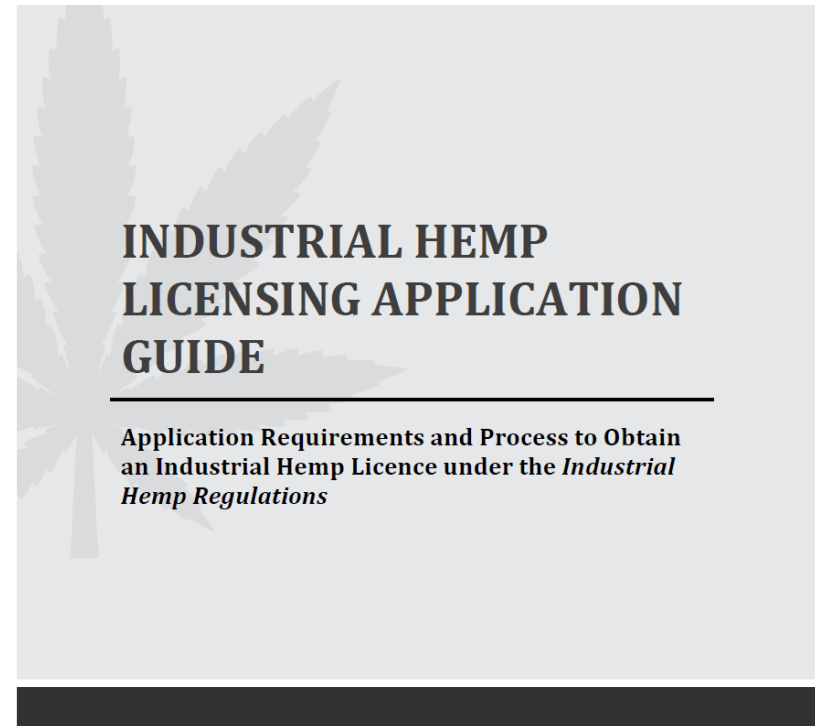
Newer, rotary-style combine in hemp

SECTION IV

LICENSING & LEGALITY

Licensing Guide

- Published Oct. 16, 2018
- Outlines all requirements necessary to producing hemp
- Producing hemp for pharmaceutical products requires a separate *Cannabis* license



Requirements of Licensing

- Apply for, and receive license ahead of production
- Declare ownership of, or landowner's consent on land intended for hemp production
- Declare GPS co-ordinates for production area
- Grow a hemp variety from Health Canada's List of Approved Cultivars
 - 52 varieties, all with THC content $<0.3\%$

Changes in Licensing

- Licenses now valid for 5 years
- Can sell other plant parts than just seed and fibre*
- Removal of 3rd-party THC testing requirement
- No criminal record check required**
- No minimum distance from schools or other public areas

* May require additional *Cannabis* license

** To grow hemp for seed and/or fibre

SECTION V

MARKETING & PROFITABILITY

Costs of Production

- Yields are variable
 - New growers can expect 500 to 600 lbs/acre
 - More experienced growers can achieve 700 to 900 lbs/acre
- Seed cost is normally ~ \$2.30/lb for packaged, certified, approved seed
- Fertilizer costs account for lbs product per acre, not lbs nutrient
 - Largest input cost per acre
- Pesticide products are limited
- Value does not include crop yield insurance (not yet available on hemp in BC)

HEMPSEED PRODUCTION ESTIMATED CONTRIBUTION MARGIN FOR 1 ACRE * IN THE PEACE RIVER REGION OF BRITISH COLUMBIA					
BUDGET					
Income	Yield			Price	Total
	700	Lbs.		0.75	\$ 525
Expenses					
Seed	Variety	Rate		\$/Lb	
	Katani	25	Lbs.	\$ 2.30	58
Fertilizer	Product	Rate		\$/lb	\$/Ac
	46-0-0	217	Lbs.	0.23	\$ 49.22
	11-52-0	77	Lbs.	0.34	26.20
	0-0-60	100	Lbs.	0.20	20.41
	21-0-0-24	50	Lbs.	0.20	10.21
Total Fertilizer				\$ 106.03	106
Herbicides	Product	Rate		\$/Ac	
	Glyphosate	0.67	L	10	\$ 6.70
	Assure II	0.20	L	16	3.20
Total Herbicides				\$ 9.90	10
Equipment Operating					30
Drying					6
Labour					28
Hail Insurance					19
Total Expenses					\$ 257
Contribution Margin					\$ 268

Economies of Scale

- Crop is challenging to produce
- Successful growers are repeat growers
- Start with 40 to 80 acres, and build from there
- Should already have modern equipment capable of use on multiple crops – investment only for hemp will not be profitable in the short-term

Markets

- Conventionally-produced hemp
 - Generally grown under contract, rarely spec production
 - About half of prairie market
- Organically-produced hemp
 - Grown under closed-loop contract
 - Premium prices (often double conventional price)

Grain Markets

- USA is the principle export market
- Seed can be:
 - crushed for oil
 - press cake dried for protein powder
 - dehulled for food products
 - sold as birdseed



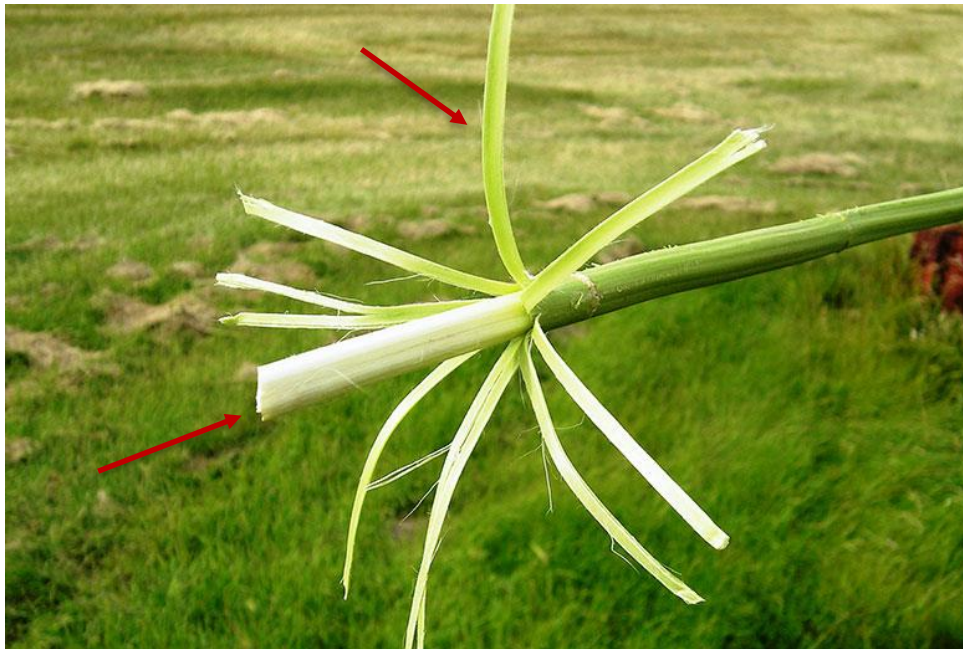
MANITOBA HARVEST & HEMP OIL CANADA PLANT AT STE. AGATHE, MB

Fibre Markets

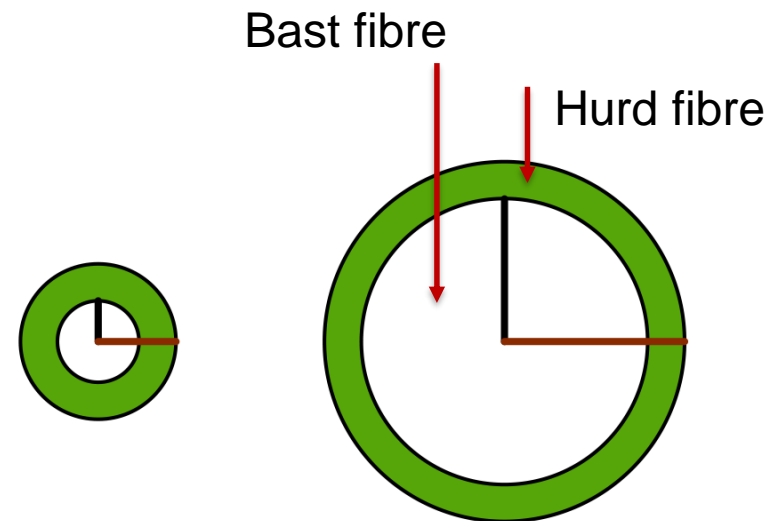
- Limited opportunity in Canada so far – only 2 processors
 - Fibres end up in bioplastics, building materials, insulation, animal bedding, paper products
- Hemp fibres (hurd and bast) require natural breakdown prior to industrial processing, known as 'retting'



Decortication



Comparison of Bast to Hurd Ratio



stems of hemp seeded at
high density of 300 seeds/m²

2.2:1

stems of hemp seeded at
low density of 100 seeds/m²

0.7:1

Hemp Buyers

FRESH
HEMP
FOODS

Ste. Agathe, MB



Gilbert Plains, MB



HEMPCO
The Seed of Possibilities

Vancouver, BC

Resources



Thank you!

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