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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
Section II

HEMP AGRONOMY
Seeding

- **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

PHOTO: WWW.DEERE.CA
**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**

<table>
<thead>
<tr>
<th>Variety</th>
<th>Average TSW (g)</th>
<th>Site Years</th>
<th>Minimum TSW (g)</th>
<th>Maximum TSW (g)</th>
<th>Seeding Rate* (lbs/acre)</th>
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<td>7</td>
<td>15.7</td>
<td>19</td>
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<td>Canda</td>
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<td>CanMa</td>
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<td>Jutta</td>
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<td>4</td>
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<td>24.8</td>
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</table>

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

**SOURCE:** PARKLAND CROP DIVERSIFICATION FOUNDATION (PCDF) ANNUAL REPORT (2012).
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

- Increasing Daylength
  - = GREATER vegetative growth

- Decreasing Daylength
  - TRIGGERS 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$_2$O$_5$: 40 lbs/acre
    - K$_2$O: 60 lbs/acre
    - S: 15 lbs/acre

**SOIL TEST REPORT**

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

**SUBMITTED FOR:** [Redacted]
**SUBMITTED BY:** [Redacted]

**REF #**: [Redacted]
**BOX #**: 1314
**LAB #**: NW69693

---

**Date Sampled**: 09/17/2019  
**Date Received**: 09/18/2019  
**Date Reported**: 09/23/2019

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<td>YIELD GOAL</td>
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<td>Potassium</td>
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<td>Chloride</td>
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<td>Sulfur</td>
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<td>Manganese</td>
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<td>Copper</td>
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<td>Magnesium</td>
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<td>Calcium</td>
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**SUGGESTED GUIDELINES**

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<td></td>
<td>Fe</td>
<td>Band (Starter)*</td>
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---

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>
<thead>
<tr>
<th>Nutrient</th>
<th>Total Plant (kg/ha)</th>
<th>Grain (kg/ha)</th>
<th>Hemp Uptake</th>
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<tbody>
<tr>
<td></td>
<td>Hemp</td>
<td>Canola</td>
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<td>200</td>
<td>120</td>
<td>40</td>
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<td>47</td>
<td>50</td>
<td>19</td>
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<td>K</td>
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<td>75</td>
<td>10</td>
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<td>S</td>
<td>14</td>
<td>20</td>
<td>3</td>
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</table>

Sources: Canadian Fertilizer Institute, Manitoba Agriculture
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
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.
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).
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

SOURCE: Canadian Hemp Trade Alliance.
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)

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<th>Income</th>
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<th>$/Ac</th>
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- Total Fertilizer: $106.03

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<td>0.20 L</td>
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- Total Herbicides: $9.90

- Equipment Operating: 30
- Drying: 6
- Labour: 28
- Hail Insurance: 19

- Total Expenses: $257
- Contribution Margin: $268

SOURCE: BC Ministry of Agriculture & Manitoba Agriculture
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
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

Bast fibre

Hurd fibre

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

- Hemp Sense
  - Gilbert Plains, MB

- HEMPCO
  - The Seed of Possibilities
  - Vancouver, BC
Resources

Parkland Industrial Hemp Growers

Hemp Genetics International

Plant Genetics for the Natural World

Canadian Hemp Trade Alliance

Alliance Commerciale Canadienne du Chanvre

ACCC
Thank you!

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Manitoba Agriculture
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