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FIBER & GRAIN HEMP - HARVEST -

BY

BRYAN PARR

AGRONOMIST – LEGACY HEMP, LLC



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DOCUMENTATION

- GROWER LICENSE
- CERTIFICATE OF ANALYSIS
 - STATE TEST RESULTS
- FIT FOR COMMERCE CERTIFICATE (APPROVAL LETTER)

- ORGANIC
 - ORGANIC CERTIFICATE
 - NON-GMO/NON-TREATED STATEMENT



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INDUSTRIAL HEMP - FIBER HARVEST -



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TYPES OF FIBER

BAST

- LONG FIBERS
- OUTSIDE LAYERS OF THE STALK
- 20-30% OF THE STALK
 - PRIMARY BAST FIBERS (70-90%)
 - LONG LENGTH, HIGH CELLULOSE, LOW LIGNIN
 - HIGHEST QUALITY
 - TRUE FIBER-TYPE VARIETIES
 - SECONDARY BAST FIBERS (10-30%)
 - SHORTER LENGTH, HIGHER LIGNIN
 - DUAL PURPOSE VARIETIES

HURD

- SHORT FIBERS
- CORE/CENTER PART OF THE STEM
- 70-80% OF THE STALK
- HIGH LIGNIN CONTENT (20-30%)
 - WOODY CHARACTERISTICS

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HARVEST (FIBER)

- HARVEST TIMING:
 - MOWING:
 - **FIRST 10-20% OF POLLINATION (JULY/AUGUST)**
 - **PRIOR TO SEED SET**
 - LEAVE 4-6 INCHES OF STUBBLE TO REDUCE ASH CONTENT
 - DISC MOWERS (WITHOUT CONDITIONER), STRAIGHT SICKLE MOWERS
 - SHARPEN KNIVES REGULARLY
 - RAKING:
 - RAKE WHEN STALKS TURN FROM GREEN TO PALE YELLOW
 - INVERTERS OR ROTARY RAKE
 - 1-3 TURNS MAY BE REQUIRED



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FIELD RETTING

- FORM OF “CONTROLLED” ROTTING
- DEGRADATION OF PECTINS AND OTHER GLUE-LIKE SUBSTANCES
 - MODERATED BY MICROBIAL PROCESSES
 - NEED SOME MOISTURE
- RETTING PERIOD: 2-5 WEEKS (DEPENDS ON ENVIRONMENT)
 - WIDE SWATHS ARE BEST
 - CUT DURING PERIODS OF DRY WEATHER



<http://www.hemptrade.ca/eguide/fibre-production/storing-baled-hemp-fibre>

Retted Hemp Straw

Watch on YouTube: <https://youtu.be/o2X5w8poa18?t=608>

HARVEST (FIBER)

- WINDROWS SHOULD BE AS WIDE AS THE BALER PICKUP WIDTH
- PROTECT PTO SHAFT AND BEARINGS FROM FIBER WRAPPING
- BALING
 - BALE MOISTURE: <15%
 - LARGE SQUARE BALES ARE PREFERRED
- STORE UNDER COVER IF POSSIBLE



<http://www.hemptrade.ca/eguide/fibre-production/salvaging-hemp-fibre>

Baling

Watch on YouTube: <https://youtu.be/o2X5w8poa18?t=715>

QUALITY CONTROL (FIBER)

- MAINTAIN BALE MOISTURE <15% (10-12% PREFERRED)
- **LOW WEED CONTAMINATION**
 - ORGANIC MAY BE DIFFICULT
 - AVOID WEEDY PARTS OF FIELDS
 - POTENTIAL REJECTION
- **LOW ASH CONTENT**
 - REDUCE STONES AND SOIL CONTAMINATION
 - AVOID STACKING BALES ON GRAVEL, SAND OR TILLED AREAS

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FIBER YIELDS

- TRUE FIBER-TYPE: 4 - 6 TONS/ACRE
- DUAL PURPOSE: 0.5 – 2.0 TONS/ACRE
- **QUALITY SHOULD BE CONSIDERED A MAJOR COMPONENT**
 - DETERMINE WHAT THE PROCESSOR IS LOOKING TO PURCHASE



Watch on YouTube: <https://youtu.be/o2X5w8poa18?t=1130>

SUMMARY (FIBER)

- CUT HEMP DURING THE FIRST 10-20% OF POLLINATION (TRUE FIBER-TYPE)
- MAY NEED TO RAKE 1-3 TIMES DEPENDING ON UNIFORMITY OF RETTING
- BALE WHEN HEMP HAS FULLY RETTED AND MOISTURE IS <15%
- MINIMIZE ASH (SOIL) AND WEED CONTAMINATION
- **KNOW WHAT KIND OF FIBERS AND QUALITY PROCESSORS ARE LOOKING FOR**
 - TRUE FIBER-TYPE VS. DUAL PURPOSE
 - BAST VS. HURD

Watch on YouTube: <https://youtu.be/o2X5w8poa18?t=1272>

INDUSTRIAL HEMP - GRAIN HARVEST -



Watch on YouTube: <https://youtu.be/o2X5w8poa18?t=1452>

PRE-HARVEST EQUIPMENT CHECKLIST

- BE SURE TO CLEAN ALL EQUIPMENT PRIOR TO HARVEST (ESPECIALLY AFTER WHEAT)
- MAINTAIN SHIELDS AROUND BELTS, PULLEYS, CHAINS AND SPROCKETS
- CONSIDER SHIELDING EXPOSED BEARINGS AND SHAFTS (INCLUDING FINAL DRIVES)
 - REGULARLY CHECK SHAFTS AND BEARINGS FOR FIBER-WRAPPING
- RECOMMEND DISABLING STRAW CHOPPERS
- RECOMMEND NEW KNIVES AND GUARDS FOR CUTTER BAR
- KEEP ENGINE COMPARTMENT FREE OF DUST
- HARVEST CAN CAUSE STATIC ELECTRICITY
 - CONSIDER GROUNDING THE COMBINE – DRAG LOG CHAIN
- CARRY A COUPLE SHARP KNIVES
- BE SURE TO HAVE FIRE EXTINGUISHERS ON HAND



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ASSESSING MATURITY

- MATURATION BEGINS AT THE BOTTOM OF THE HEAD AND CONTINUES UPWARD
 - SEEDS ALSO RIPEN FROM THE INSIDE OF THE HEAD AND MOVE OUTWARD
- SEED CALYX/BRACTS WILL TURN BROWN AND SHRINK EXPOSING SEEDS
 - HARVEST WHEN PLANTS BEGIN TO SHATTER
- MATURE SEED:
 - TAN-BROWN APPEARANCE
 - 90-100 DAYS AFTER PLANTING



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ASSESSING MATURITY

- HARVEST TIME:
 - 70-80% OF SEEDS MATURE (100-120 DAYS)
 - SEPTEMBER/OCTOBER
 - **WITHIN 2-4 DAYS OF A KILLING FROST**
- SOME SEEDS WILL BE IMMATURE AT HARVEST
- **HARVEST MOISTURE: 12-18%**
- **STORAGE MOISTURE: 9%**



Watch on YouTube: <https://youtu.be/o2X5w8poa20?t=2006>

HARVEST

- **STRAIGHT CUTTING IS THE PREFERRED METHOD**
 - DRAPER HEADERS ARE PREFERRED
- SWATHING CAN BE SUCCESSFUL
- SINGLE ROTOR COMBINES WORK BEST
 - DUAL ROTORS MAY HAVE HIGHER POTENTIAL FOR FIBER WRAPPING
 - CONVENTIONAL STRAW-WALKERS WORK FINE
- **CONSIDER CLEANING EQUIPMENT AT THE END OF EACH DAY**
 - REDUCES SPOILAGE

Watch on YouTube: <https://youtu.be/o2X5w8poa21?t=2375>

STRAIGHT CUTTING

- **CUT GRAIN HEADS ONLY**
 - CONSIDER LEAVING 5-15% OF THE LOWER HEADS IN UNEVEN STANDS TO REDUCE FIBER INTAKE
- REDUCE GROUND SPEED (2-3 MPH)
 - BASED ON CROP CONDITION
- FILL HOPPER TO HALF FULL UNTIL SETTINGS CAN BE ADJUSTED TO CLEAN GRAIN BETTER



Straight Cutting

Watch on YouTube: <https://youtu.be/o2X5w8poa22?t=2608>

SWATHING

- SWATHING IS NOT RECOMMENDED
 - LARGE VOLUMES OF FIBER THROUGH THE COMBINE
 - INCREASED SEED LOSS
 - INCREASED MICROBIAL CONTAMINATION
- SUCCESS CAN BE ACHIEVED
 - SWATH PLANTS DURING DRY WEATHER
 - CUT HEIGHT: 8-12 INCHES
 - HARVEST WITHIN 24-72 HOURS
 - **AVOID OVER DRYING STALKS**



<http://www.hemprade.ca/eguide/fibre-production/fibre-harvesting-equipment>

Swathing

Watch on YouTube: <https://youtu.be/o2X5w8poa23?t=2835>

HARVEST SETTINGS

*** HEMP IS RELATIVELY EASY TO THRESH, SET COMBINES TO “**GENTLY THRESH**” THE SEEDS ***

- **CYLINDER/ROTOR SPEEDS:** 350-600 RPM (**SIMILAR TO CANOLA**)
 - SLOWER SPEEDS REDUCE SEED CRACKING
- **CONCAVE:** 1-2 INCHES (**SIMILAR TO CANOLA**)
 - WIDER SETTINGS REDUCE SEED CRACKING
- **FAN SPEED:** 650-1 100 RPM (**SIMILAR TO WHEAT**)
 - BEGIN WITH MODERATE SPEEDS AND ADJUST BASED ON CROP CONDITION AND FOREIGN MATERIAL
- **SIEVE/SHOE:** (**SIMILAR TO WHEAT**)
 - CHAFFER: 5/16 – 7/16 INCH
 - SHOE: 1/8 – 1/4 INCH



Watch on YouTube: <https://youtu.be/o2X5w8poa24?t=2944>

POST HARVEST

- **HANDLE GRAIN WITH CARE TO PREVENT CRACKING**
 - CONVEYORS ARE PREFERRED
 - RUN AUGERS FULL AND SLOW
 - REDUCE AMOUNT OF HANDLING
- **QUICK CLEANING IS RECOMMENDED PRIOR TO PUTTING GRAIN IN THE BIN**
 - FINAL CLEANING CAN BE PERFORMED AFTER GRAIN IS DRY
- COLLECT REPRESENTATIVE SAMPLES WHEN GRAIN IS DRY



Grain cleaning prior to storage

Watch on YouTube: <https://youtu.be/o2X5w8poa25?t=3141>

GRAIN DRYING

- SPOILAGE CAN BEGIN WITHIN **4-6 HOURS** AFTER COMBINING
 - **Do NOT LEAVE GRAIN SIT OVERNIGHT WITHOUT AIR**
- GRAIN SHOULD BE DRIED IN AERATION BINS IMMEDIATELY AFTER HARVEST
 - HEAT MAY BE APPLIED IF LESS THAN 120°F
- GRAIN MAY NEED TO BE ROTATED TO REDUCE “HOT SPOTS”
 - DEPENDS ON SIZE OF BIN AND VOLUME OF GRAIN INSIDE
 - CONSIDER FILLING BINS HALF FULL UNTIL GRAIN IS DRY
- MONITOR GRAIN REGULARLY
 - TEMPERATURE, MOISTURE, SMELL
- **DRY MOISTURE: 9%**



Watch on YouTube: <https://youtu.be/o2X5w8poa26?t=3423>

GRADING/SPECIFICATION

Microbial Specification Standards	
Standard Plate Count	<100,000 cfu/g ¹
Total Coliforms	<1000 cfu/g
E. coli	Negative
Salmonella	Negative
Yeast & Mold (combined)	<1000 cfu/g
THC	<10 ppm ²
Free Fatty Acid	<2%
Peroxide	<2meq/kg ³
Gluten	<20 ppm

Reminder: Quality is the most important aspect of this crop.

1 - cfu/g - colony forming unit per gram or the measure of viable bacterial or fungal cells.

2 - ppm - parts per million

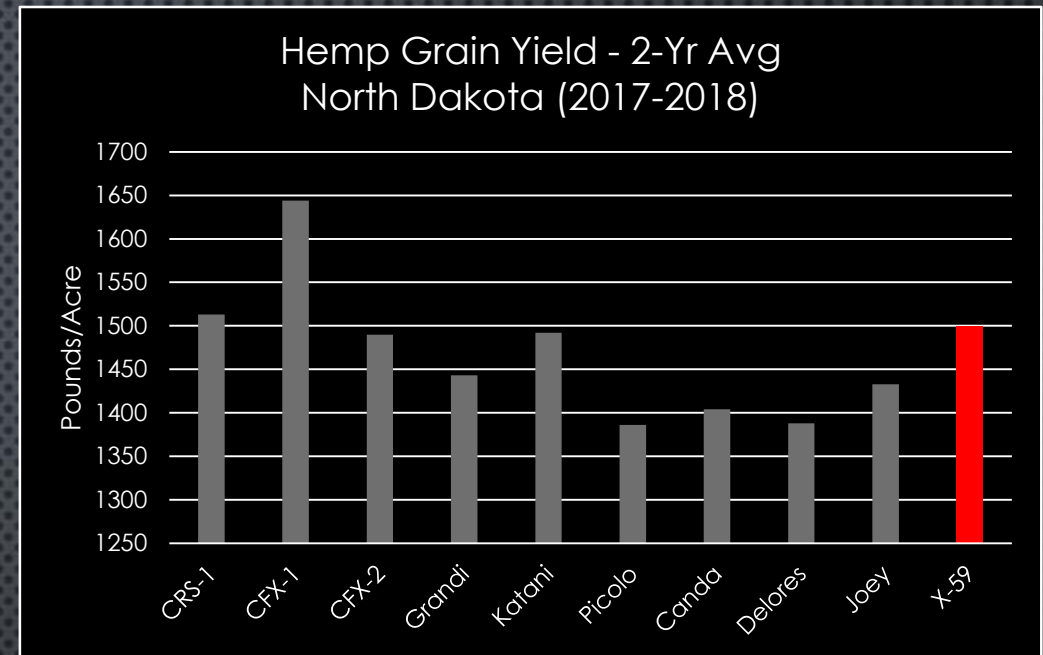
3 - meq/kg - milliequivalents per kilogram

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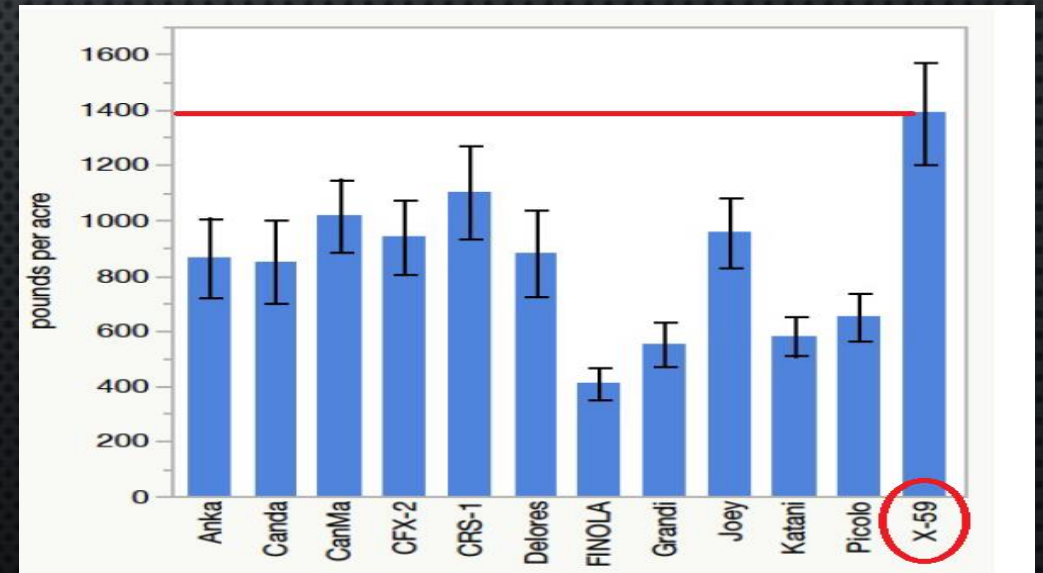
GRAIN YIELD

- **YIELD**

- **RANGE:** 600-2000 POUNDS/ACRE
- **AVERAGE:**
 - CONVENTIONAL: 1200-1400 POUNDS/ACRE
 - ORGANIC: 600-800 POUNDS/ACRE



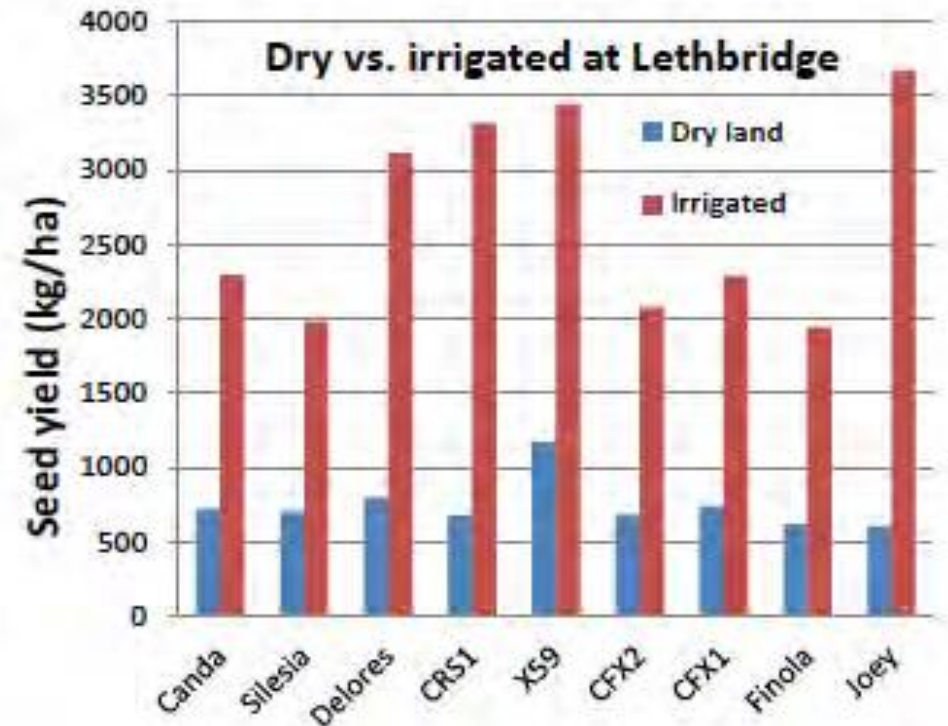
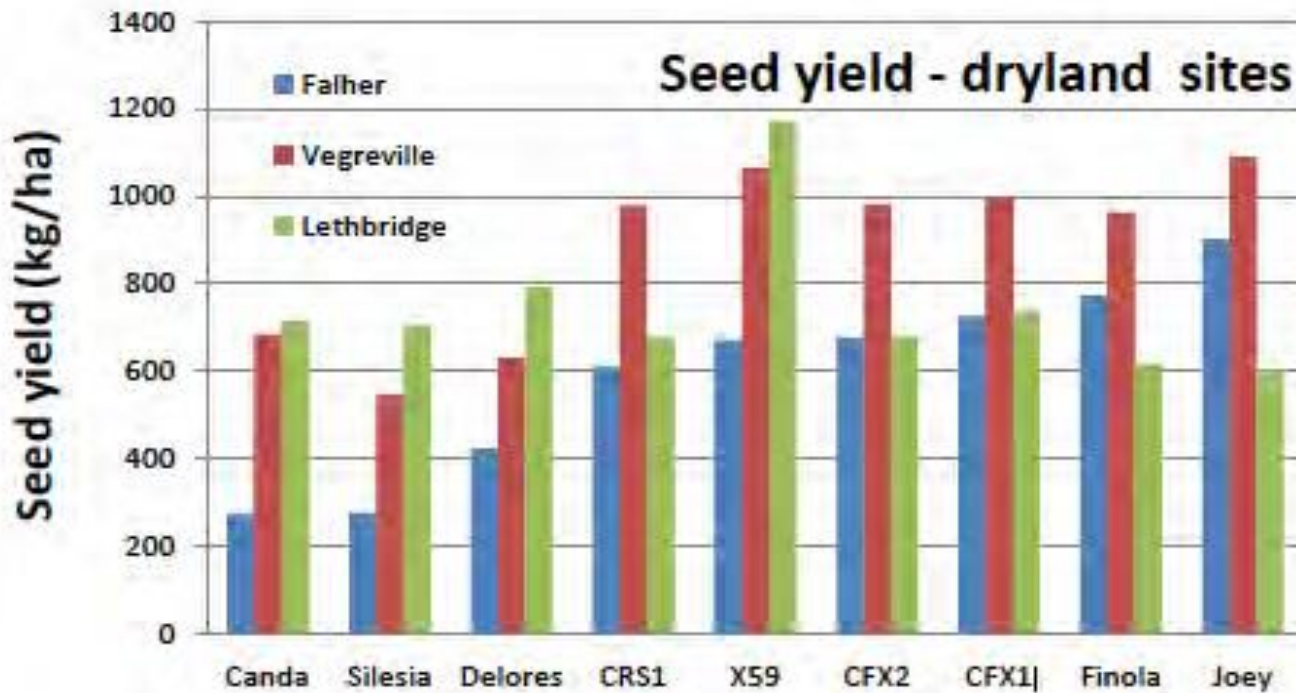
Industrial Hemp Variety Performance in North Dakota – NDSU



University of Minnesota Industrial Hemp Variety Trial - 2017

Watch on YouTube: <https://youtu.be/o2X5w8poa28?t=3644>
 Dryland Yield

Dryland vs Irrigated



[http://www1.agric.gov.ab.ca/\\$department/deptdocs.nsf/all/crop15539/\\$file/HempHarvestStorage.pdf?OpenElement](http://www1.agric.gov.ab.ca/$department/deptdocs.nsf/all/crop15539/$file/HempHarvestStorage.pdf?OpenElement)

X59

- ~ 580 lbs/ac (Falher)
- ~ 960 lbs/ac (Vegreville)
- ~ 1050 lbs/ac (Lethbridge)

X59

- ~ 1050 lbs/ac (**Dryland**)
- ~ 3000 lbs/ac (**Irrigated**)

Watch on YouTube: <https://youtu.be/o2X5w8poa29?t=3722>

FIBER HARVEST (DUAL PURPOSE)

- **AVERAGE YIELD:** 0.5-2.0 TONS/ACRE
- **HARVEST TIME:**
 - MOWING: 1-3 DAYS AFTER COMBINING
 - BALE: 14-30 DAYS AFTER MOWING (WHEN DRY)
 - **MOW AND BALE IN SPRING (PREFERRED)**
- **MOISTURE:** <15%
- **EQUIPMENT**
 - **MOWER:** DISK MOWER (WATCH FOR WRAPPING), SICKLE MOWER (PREFERRED), SWATHER
 - **BALER:** LARGE SQUARE BALER (PREFERRED), ROUND BALER



<https://www.nuntisunya.com/en/hemp-stem-faq-uses-benefits/>

Watch on YouTube: <https://youtu.be/o2X5w8poa30?t=3871>

SUMMARY (GRAIN)

- MONITOR EQUIPMENT REGULARLY
- HARVEST WHEN SIGNS OF SHATTERING IS APPARENT
 - 12-18% MOISTURE
- COMBINE SETTINGS SHOULD “GENTLY THRESH” THE SEEDS
- HARVEST GRAIN HEADS ONLY TO REDUCE FIBER WRAPPING
- CONSIDER CLEANING GRAIN AFTER COMBINING
- **MOVE GRAIN TO AERATION BINS IMMEDIATELY AFTER HARVEST FOR DRYING**
 - DRY MOISTURE: 9%



Watch on YouTube: <https://youtu.be/o2X5w8poa31?t=3993>

RESOURCES

- **CANADIAN HEMP TRADE ALLIANCE** (ONLINE)
- ALBERTA AGRICULTURE AND FORESTRY – INDUSTRIAL HEMP (ONLINE)
- GROWING INDUSTRIAL HEMP IN ONTARIO (ONLINE)
- INDUSTRIAL HEMP PRODUCTION AND MANAGEMENT – MANITOBA (ONLINE)
- HEMP PRODUCTION IN SASKATCHEWAN (ONLINE)
- HEMP DISEASES AND PESTS: MANAGEMENT AND BIOLOGICAL CONTROL (BOOK)
- THE CULTIVATION OF HEMP: BOTANY, VARIETIES, CULTIVATIONS AND HARVESTING (BOOK)
- MARIJUANA BOTANY: THE PROPAGATION AND BREEDING OF DISTINCTIVE CANNABIS (BOOK)



Watch on YouTube: <https://youtu.be/o2X5w8poa32?t=4027>

QUESTIONS?

AGRONOMIST – LEGACY HEMP, LLC

BRYAN PARR

