

HEMP PRODUCTION GROWERS MEETING



WEDNESDAY JUNE 26TH, 5:30-9:00PM

TOLLAND COUNTY EXTENSION CENTER, GOLD BUILDING

5:30-6:00 Registration

6:00-6:30 Light dinner + networking

6:30-6:40 A quick update in CBD hemp research.

Gerald A. Berkowitz, Professor, UConn PSLA

6:40-7:00 Growing hemp in field: what we know about cultivation practices.

Shuresh Ghimire, Assistant Extension Educator, UConn Extension

7:00-7:30 Growing hemp in controlled environment.

Shelley Durocher-Nesta, Grower and Research Laboratory Aid, UConn PSLA

7:30-8:00 Seed sources, dioecy, feminized seed, and pollen drift: Things to consider.

Jessica Lubell-Brand, Associate Professor, UConn PSLA

8:00-8:10 Regulatory update.

Carole Briggs and Wayne Kasacek, CT Dept. of Ag

8:10-8:30 Pre-harvest sampling and testing.

Wayne Nelson, CT Dept. of Ag.

8:30-9:00 Networking and Mini-Trade show

UConn
COLLEGE OF AGRICULTURE,
HEALTH AND NATURAL
RESOURCES

EXTENSION & PLANT SCIENCE
AND LANDSCAPE ARCHITECTURE



A close-up photograph of vibrant green hemp leaves with serrated edges, filling the entire background of the slide. The lighting is bright, highlighting the texture and veins of the leaves.

GROWING HEMP IN FIELD: WHAT WE KNOW ABOUT CULTIVATION PRACTICES

**Shuresh Ghimire, Assistant Extension
Educator, UConn Extension**

Photo: Cornell Univ.

Before we start-

Hemp and Marijuana

Both are *Cannabis Sativa* L.

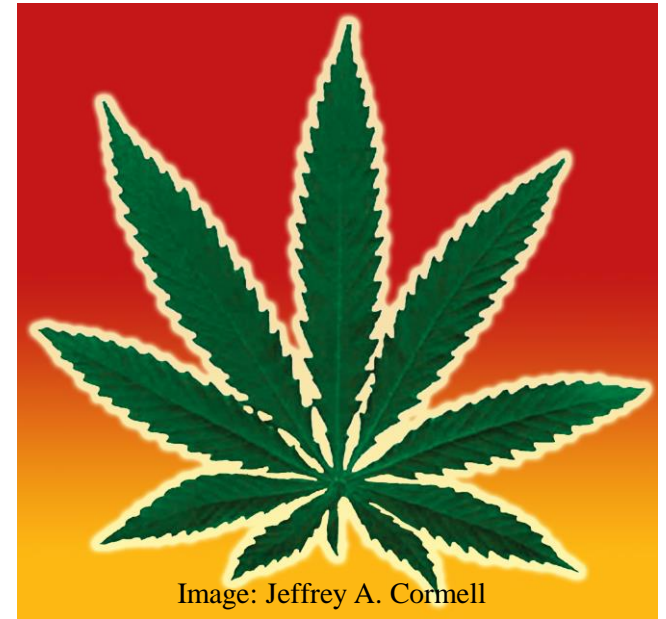


Image: Jeffrey A. Cornell

Delta-9 TetraHydroCannabinol (THC) – the psychoactive component of *Cannabis Sativa* L. is how the distinction is made.

Hemp $\leq 0.3\%$ THC

Marijuana $> 0.3\%$ THC

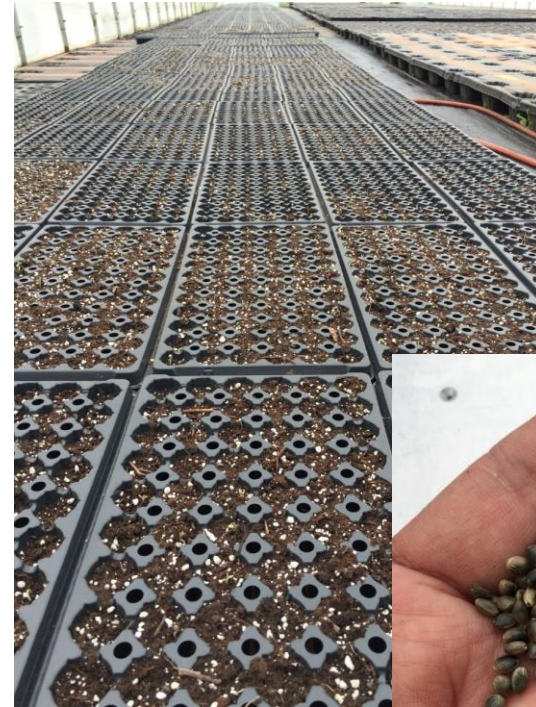
Grower's checklist

Connecticut Department of Agriculture
Hemp Grower/Processor Application and Licensing

Department of Agriculture Supporting documents for the application for a license, sample forms and information.

On-Line Application <https://www.elicense.ct.gov/Default.aspx>

Forms



- Licensing
- Land/soil, water, equipment, infrastructure
- Seeds vs clones
- Testing
- Harvesting, drying, processing
- Selling your crop

Botany

- Dioecious (separate male and female plants)
- Monoecious (male and female flowers in the same plant)
- Photoperiod sensitive (<14 hrs of sunlight- induces flowering)
- Male: taller, die after shedding pollen



Female flower (Sean Flynn/UConn Photo)



Male flower (Univ. of Vermont)

Site selection and planting

- Grows best in well-drained sandy loam soils, avoid compacted soils
- Plant after the danger of killing frost or soil temp 50 °F or above
- Seeding depth: $\frac{1}{2}$ to $\frac{3}{4}$ inch but not deeper than 1 inch
- Ideal temp for growing 60 – 80 °F
- Soil pH: 6.0 – 7.5



[Image: Cornell Hemp - Cornell University](#)

Site selection and planting

- Does not tolerate water logging
- Thrives full sun
- Long tap root if friable soil: up to 6 ft deep tap root



Virginia Dept. of Ag & Consumer Services



[Photo: Cornell Hemp - Cornell University](#)

Fertility requirements (lbs/a)

N: 125

Al ppm	<40	41-100	>100	Soil test K	K₂O
Soil test P	P₂O₅			<99 lbs/a	120
0-3 lbs/A	80	100	120	100-169	80
4-7 lbs/A	60	80	100	170-249	40
8-13 lbs/A	40	60	60	250-349	30
14-20 lbs/A	20	40	40	350 - 499	20
> 20	0	0	0	>500	0

Suggestion from UConn soil lab

Seeds/starts

- **CBD:**
 - Feminized seeds
 - CBD clones (female plants)
 - Male and female seed
- **Grain & fiber:** males and female or monoecious seeds
- **Regular seed (m&f):** less expensive, up to 50% males,
- **Feminized seeds:** more expensive, less labor to ID and rouge males



[University of Vermont](#)



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- Weekly Agricultural Report



Connecticut Department of Agriculture Hemp Grower/Processor Application and Licensing

Supporting documents for the application for a license, sample forms and information.

On-Line Application <https://www.elicense.ct.gov/Default.aspx>

Forms

- Consent to Criminal History Records Check [Consent to criminal history records check with spb letter 5.14.19.pdf](#)
- Consent to Grow or Process Hemp on Leased Property [Consent to grow process hemp on private land 5.13.19.pdf](#)
- Destruction Report [Destruction report 6.3.19.pdf](#)
- Grow Site(s), Storage location(s) or Seed Modification Request [Site seed modification request 6.3.19](#)
- Harvest Report [Harvest report 6.3.19.pdf](#)
- Indoor Planting Report [Indoor planting report 6.3.19.pdf](#)
- On-Site Manager or Signing Authority Modification Request [On site manager signing authority modification request 6.3.19.pdf](#)
- Outdoor Planting Report [Field planting report 6.3.19.pdf](#)
- Post-Harvest Report [Post-harvest report 6.3.19.pdf](#)
- Sample Legal Description [Sample legal description 5.24.19.pdf](#)

Guidance and Instruction Documents

- Choosing a Laboratory [Choosing a laboratory.pdf](#)
- Compliance Policy [Compliance policy 5.14.19.pdf](#)
- Connecticut Hemp Public Act 19-3 [Public act 19-3.pdf](#)
- Due Dates for Reports [Due date overview updated 5.14.19.pdf](#)
- Federal 2018 Farm Bill [Hemp - 2018 farm bill.pdf](#)
- Fee Schedule [Fee schedule 5.14.19.pdf](#)
- Grower Application Checklist [Grower application checklist 5.14.19.pdf](#)
- Hemp Program FAQ [Hemp program faq 5.14.19.pdf](#)
- Hemp Sample Chain of Custody Form [Hemp sample chain of custody 5.13.19.pdf](#)
- Instructions for Creating Plot Maps [Instructions for creating maps 5.14.19.pdf](#)
- Pre-Harvest Hemp Sampling Procedures [Pre-harvest hemp sampling procedures 5.14.19.pdf](#)
- Processor Application Checklist [Processor application checklist 5.14.19.pdf](#)
- Sample Hemp Research Plan [Sample hemp research plan.pdf](#)
- Sample Hemp Marketing Plan [Sample hemp marketing plan.pdf](#)
- Sample Legal Description [Sample legal description 5.24.19.pdf](#)
- Seed Sources [Certified seed sources 5 20 19.pdf](#) *(Note: This is not an exhaustive list nor is it an endorsement of any organization.)*
- Transporting Hemp or Hemp Samples [Transporting hemp in connecticut.pdf](#)
- Voluntary Destruction Methods [Voluntary destruction methods 5.14.19.pdf](#)

Approved Hemp CBD Varieties

The following high CBD varieties of hemp seed/clones have been approved by DATCP to grow in Wisconsin in 2019.

Approval to grow does not guarantee a variety will pass the DATCP pre-harvest regulatory test as THC levels in high CBD hemp varieties are not stable. **Growers are responsible for monitoring their crops. Any field/variety that does not pass the required DATCP pre-harvest regulatory test with a delta-9 Total THC concentration of 0.3% or below will be ordered to be destroyed.** DATCP calculates Total THC as $d9\text{-THC} + 0.877 \cdot \text{THCa}$ and we round down so $0.399 = 0.3\%$.

To seek approval of a high-CBD variety not included on this list please send the name of the variety, the name of the supplier, and a lab analysis of the variety (often referred to as a Certificate of Analysis) to

DATCPIndustrialHemp@Wisconsin.gov.

A-2	Cherry Cinco	Mojave Cherry Wine
A 9 Auto	Cherry Cross	Mountain Mango
A11 Auto	Cherry F	Murphy's Medley
Abacus	Cherry G	N9 (Jet Fuel)
ACDC Super CBD	Cherry Hybrid	NEO (GR-NEO5-01-17)
Afternoon Delight	Cherry Kandy (Nate Moon)	Northern Remedy
Altitude	Cherry Pie	Northern Spectrum
Apollo	Cherry Struck	Northern Suzy
Auto Pilot 1.0	Cherry Tres	NBS CBD 1
Awesome Blossom	Cherry Uno	Oregon Cherry or Original Cherry Otto 1
Berry Blast	Cherry Wine	Otto 2
Berry Blossom	Cherry Wine 51	Otto 2 x AC/DC
Boax	Cherry x Abacus	Otto 2 x Franklin
Boax x Autoflower	Cherry x ACDC	Palm
Boax x Cherry Wine	Cherry x Otto 2 Sweetened Cherub	Parkdale Boutique Strains 1, 2 and
Boring 'Ol Hemp Strains 1-4 Boutique	Coag	Purple Emperor
Feminized Strains 1 and 2 Boxwine	Cobbler	3 Peacemaker
Bubblegum	Colorado Cherry Colorado Cherry 5	R23, R24, R25, R26, R27
Bubblegum x Otto	Colorado Gold	Red Kross
Buddha's Hand	CS2	Relief Now
Canna Tsu	Deschutes	RN12

Starting seedlings (for CBD)

- Need 3-4 weeks
- Use 50 or 72 cell tray

How many plants/acre?

- 4 ft x 4 ft = 2,722
- 5 ft x 5 ft = 1,742
- 6 ft x 6 ft = 1,210

Cost of planting materials per acre (6 ft. x 6 ft.)

- \$1-\$2 seed (\$1) = \$1,210
- \$3 to \$8 per plant (\$3) = \$3,630
- \$4-8 per clone (\$4) = \$4,840



[Image: Marry Jane](#)

Seed rate and spacing for grain & fiber

- Seeding depth: 1/2 to 1 inch
- Seeding rate for grain: ~30 lb/acre
for fiber: ~50 lb/acre
- Row spacing: for grain : 8-16"
for fiber ≤ 8"
- Average grain yield: 600 – 1200 lbs/acre
- Oil content: 30-35%
- Average fiber yield: 3 – 5 ton/acre

UVM 2018: CBD hemp variety trial

- Site: Alburgh, VT
- Spacing: 5 ft x 5 ft
- Planting date: 6 July (seedling started in GH: 14 May)
- Varieties: Boax, Carmagnola selezionata, Otto, Otto x Boax
- Fertilization: preplant (15-June): 100 lbs N per acre; and 9-Aug: 50 lbs N per acre
- Harvest date: 12-Oct and 15-Oct for outdoor plants and 16-Oct for indoor plants

UVM 2018: CBD hemp variety trial

- Flower buds were removed by hand and by using the EZTrim Debudder (Broomfield, CO).
- Wet bud yield weight and unmarketable bud weight were recorded. The flower buds were then dried at 80°F until dry enough for storage without molding.



UVM 2018 findings: Inside hoop house

Variety	Plant weight (lb/plant)	Plant height (cm)	Unmarketable dry flower yield (lb/plant)	Dry matter flower yield (lb/plant)
Boax	19.6 ab	179	0.007 a	2.25 a
Carmagnola selezionata	6.87 c	219	0.054 b	0.70 b
Otto	24.2 a	217	0.003 a	2.22 a
Otto x boax	16.6 b	168	0.005 a	2.05 a
p-value	<0.0001	NS	0.0003	0.0004

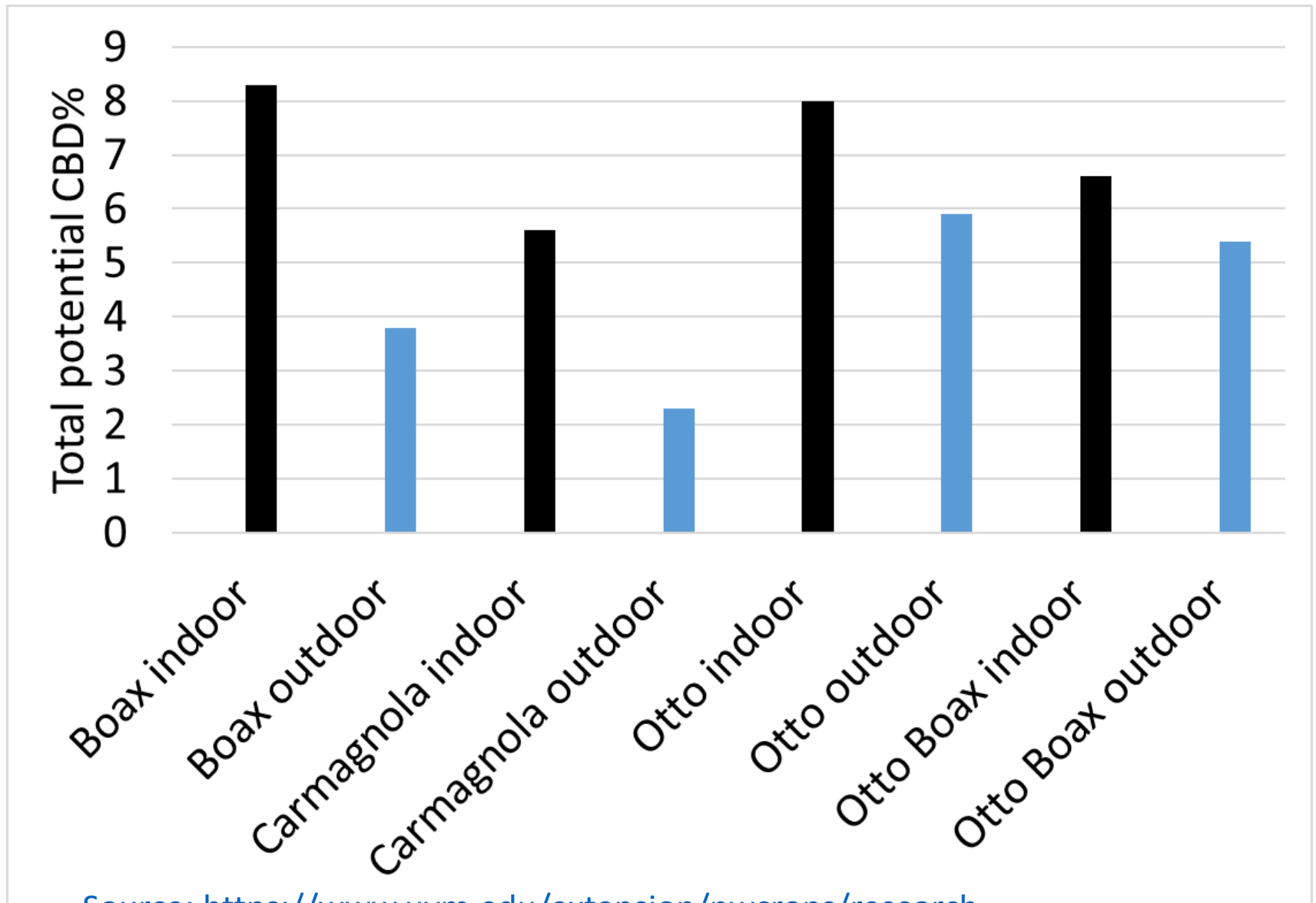
Source: <https://www.uvm.edu/extension/nwcrops/research>

UVM 2018 findings: Outdoor

Variety	Plant weight (lb/plant)	Plant height (cm)	unmarketable dry flower yield (lb/plant)	Dry matter flower yield (lb/plant)
Boax	17.1 a	147 b	0.074	2.27 a
Carmagnola selezionata	5.0 b	192 ab	0.050	0.65 b
Otto	22.0 a	187 a	0.00	1.69 a
Otto x boax	18.7 b	153 ab	0.011	2.04 a
p-value	0.005	0.047	NS	0.001

Source: <https://www.uvm.edu/extension/nwcrops/research>

UVM 2018 findings



Source: <https://www.uvm.edu/extension/nwcrops/research>

UVM 2018 plant spacing and planting date trial

- Fertilizers: 100 lbs N, 70 lbs P, 70 lbs K per acre using Kreher's poultry manure (5-4-3) and Pro-Gro (5-3-4).
- An additional 50 lbs N per acre was added 3 weeks later in the form of sodium nitrate (16-0-0).
- The plants were harvested by hand on 16-Oct by first using a chainsaw to cut down the entire plant.
- The whole plant weight was recorded.

UVM 2018 plant spacing and planting date trial

Plant spacing (ft x ft)	Dry matter flower yield (lb/plant)	Unmarketable dry matter (lb/plant)	Dry matter flower yield (lb/acre)	Unmarketable dry matter (lb/acre)
1 x 1	0.84 c	0.000 a	3669 a	7.1 a
3 x 3	0.60 b	0.003 a	2894 b	12.4 a
5 x 5	1.35 a	0.049 b	2354 c	86.6 b
LSD (0.10)	0.093	0.019	411	35.9

Source: <https://www.uvm.edu/extension/nwcrops/research>

UVM 2018 plant spacing and planting date trial

Planting dates	Dry matter flower yield (lb/plant)	Unmarketable dry matter flower yield (lb/plant)	Dry matter flower yield (lb/acre)	Unmarketable dry matter flower yield (lb/acre)
14-Jun	0.74	0.0151	2920	39
21-Jun	0.672	0.0223	3243	39
27-Jun	0.621	0.0149	2755	30
LSD (0.10)	NS	NS	NS	NS

Source: <https://www.uvm.edu/extension/nwcrops/research>

Drying temp affecting CBD content

Treatment	Ave actual temp	Ave RH	Harvest moisture
80 °F buds only	79.3	74.7	71.2
105 °F buds only	86.4	34.6	69.1
Ambient buds only	59	60.8	NA

UVM 2018

Source: <https://www.uvm.edu/extension/nwcrops/research>

Drying temp affecting CBD content

Treatment	Potential CBD
80 °F buds only	7.01 ab
105 °F buds only	5.88 b
Ambient buds only	7.71 a
LSD (0.10)	1.29

UVM 2018

While the use of higher temperatures results in faster drying rates, producers should consider the potential impact of drying temperature on the quality of their product. In this trial, drying at a higher temperature (above 80°F) resulted in significantly lower total potential CBD concentrations.

Source: <https://www.uvm.edu/extension/nwcrops/research>

Weeds

- Fiber and grain crops should be planted into weed free fields.
- Hemp grows very quickly and reaches one foot tall within 2-4 weeks during warm weather
- Dense planting helps to close canopy and shade weeds quickly
- **No pesticides are approved in U.S. for in-season weed management for hemp**



Photo: The Oregonian

Diseases



Powdery mildew

Botrytis blight

Mosaic (viral)

Stem canker (*Phytophthora*, *Pythium*)

Vascular wilt (*Fusarium*, *Verticillium*)

Root rot (Soil borne pathogens)

Nematode disease (root-knot, lesions, etc.)

Common Problems of Cannabis Plants

Photos by Shouhua Wang

Diseases

- *Botrytis* (grey mold)
- *Sclerotinia* (white mold)
- Fusarium root rot
- Powdery mildew



Fusarium root rot



Photos by Shouhua Wang



Insects

- European corn borers and aphids
- Japanese beetles
- Tarnished plant bugs
- Mites
- Western black flea beetles



Photos: Frank Peairs



Photo: Frank Peairs



Japanese beetle on hemp
[Colorado State University](https://www.colostate.edu/)



Photo: Whitney Cranshaw, Colorado St. Univ.



[TN.gov](https://www.tn.gov/)



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Hemp harvest: Grain

- Grain hemp is harvested when shattering begins
- Seed heads mature from bottom up
- Only 70-75% of seeds are ripe at this point
- Grain is between 22-30% moisture
- Plants are still green at harvesting
- Conventional combine can be used.



Madison.com

Hemp harvest: Fiber

- Fiber is windrowed between early bloom and seed set and left in the field for ~5 weeks for 'retting' - a process in which pectineous substances that bind together elemental bast fibers become degraded
- When fibers are $\leq 15\%$ moisture, it is round and square baled



Photo: Matt Barton, University of Kentucky



Photo: Natrij - [Public Domain](#)

Hemp harvest: CBD

- CBD hemp is harvested at peak flowering
- CBD testing can be used to target harvest
- Weather is critical to yield and quality
- Hand harvesting of whole plants is standard
- Immediate drying at moderate temperature with good ventilation is critical



catawba.ces.ncsu.edu

Industrial Hemp Budgets 2019- Kentucky

CBD Plasticulture Model						
		Quant.	Unit	Price		Total
Gross Returns Per Acre						
	CBD%	6%				
	Price Per %	\$5.00				
	Dry Matter Yield	1,200	lbs	\$30.00		\$36,000.00
Total Revenue						\$36,000.00
Variable Costs Per Acre						
	Transplants	1500	plants	\$5.00		\$7,500.00
	Nitrogen (Solid urea 46%)	100	units	\$0.47		\$47.00
	Phosphorous (P2O5)	30	units	\$0.60		\$18.00
	Potassium (K2O)	45	units	\$0.38		\$17.10
	Lime - Delivered and Spr	0.3	ton	\$20.00		\$6.00
	Chemicals (not yet availa	1	acre	\$0.00		\$0.00
	Soil Test	1	field	\$7.00		\$7.00
	Disk Harrow/Plowing	1	acre	\$31.50		\$31.50
	Planting/Setting	1500	plants	\$0.20		\$300.00
	Black Plastic/Drip Line	1	acre	\$515.00		\$515.00
	Irrigation	90	hours	\$0.40		\$36.00
	Roguing Male Plants	0	hours	\$0.00		\$0.00
	Harvest Cost	32.4	hours	\$12.50		\$405.00
	Drying Costs	0	lbs of wet	\$1.50		\$0.00
	Grinding Cost	1	acre	\$0.00		\$0.00
	Tote Containers	5	acre	\$35.00		\$175.00
	Transporting Floral Mate	1,200	lb	\$0.003	Miles to market	30
	Custom Work	1	acre	\$0.00		\$0.00
	Cash Rent	1	acre	\$300.00		\$300.00
	Crop Insurance	1	acre	\$0.00		\$0.00
	Application & License Fe	1	per year	\$400.00	# of acres	1
	Lab Test	1	# of test	\$300.00	# of acres	1
	Interest on Operating Ca	\$10,165.60	dollars	6.0%	# of Months	6.0
	Other Variable Costs	1	acre	\$0.00		\$0.00
	Unallocated Labor	1	hours	\$0.00		\$0.00
Total Variable Costs Per Acre						\$10,470.57
Return Above Variable Costs Per Acre						\$25,529
Breakeven Analysis						
	Breakeven Yield at \$30 /lb of CBD	9	/lb per acre to cover variable costs			
	Breakeven Cost at 1200 lbs of CBD	\$349.02	/lb to cover variable costs			
Sensitivity Analysis						
	Price per % CBD	Total Revenue	Returns Above Variable Costs			
	\$6	\$43,200	\$32,729			
	\$5	\$36,000	\$25,529			
	\$4	\$28,800	\$18,329			
	\$3	\$21,600	\$11,129			
	\$2	\$14,400	\$3,929			
	\$1	\$7,200	-\$3,271			

http://www.uky.edu/Ag/AgriculturalEconomics/mark_tyler_pubs.php