2021 TN Hemp Market Outlook Seminar

Eric Walker, Genamera LLC

- **Hemp:**

  "the plant species ***Cannabis sativa*** **L. and any part of that plant**, including the seeds thereof and all derivatives, extracts, cannabinoids, isomers, acids, salts, and salts of isomers, whether growing or not, **with a delta-9 tetrahydrocannabinol concentration of not more than 0.3 percent on a dry weight basis**."

  USDA-AMS 7 CFR Part 990 Final Rule

  Establishment of a Domestic Hemp Production Program





5596 Federal Register / Vol. 86, No. 11 / Tuesday, January 19, 2021 / Rules and Regulations

DEPARTMENT OF AGRICULTURE

Agricultural Marketing Service

7 CFR Part 990

[Doc. No. AMS–SC–19–0042; SC19–990–2 FR]

Establishment of a Domestic Hemp Production Program

AGENCY: Agricultural Marketing Service, Department of Agriculture (USDA).

ACTION: Final rule.

SUMMARY: This final rule supersedes the interim final rule that established the Domestic Hemp Production Program, as mandated by the Agriculture Improvement Act of 2018 (2018 Farm Bill). This rule includes regulations used by the Department of Agriculture (USDA) to approve plans submitted by States and Indian Tribes for the domestic production of hemp. This rule also includes regulations on the Federal hemp production plan for producers in States or territories of Indian Tribes that do not have their own USDA-approved plans. The program provides requirements for maintaining records about the land where hemp is produced, testing the levels of total delta-9 tetrahydrocannabinol, disposing of non-compliant plants, licensing hemp producers, and ensuring compliance under the new program.

DATES: This rule is effective March 22, 2021.

FOR FURTHER INFORMATION CONTACT: Bill Richmond, Branch Chief, U.S. Domestic Hemp Production Program, Specialty Crops Program, AMS, USDA; 1400 Independence Ave. SW, Stop 0237, Washington, DC 20250–0237; Telephone: (202) 720–2491, Fax: (202) 720–8938, or Email: *William.Richmond@usda.gov*.

SUPPLEMENTARY INFORMATION: This rule is issued under the authority of section 10113 of the 2018 Farm Bill (Pub. L. 115–334; December 20, 2018), which amended the Agricultural Marketing Act of 1946, as previously amended (7 U.S.C. 1621 *et seq.*) (AMA), by adding Subtitle G (sections 297A through 297E). Section 297B of the AMA requires the Secretary of Agriculture (Secretary) to evaluate and approve or disapprove State or Tribal plans regulating the production of hemp. Section 297C of the AMA requires the Secretary to establish a Federal plan for producers in States and territories of Indian Tribes not covered by plans approved under section 297B. Section 297D of the AMA requires the Secretary to promulgate regulations and guidelines relating to the production of hemp under sections 297B and 297C in consultation with the U.S. Attorney General.

AMS issued an interim final rule (IFR) on October 31, 2019 (84 FR 58522), and began its initial implementation of the program. To date, USDA has approved approximately 45 State and Tribal hemp plans. However, not all of the States and Tribes have implemented their plans for various reasons, including the need to take additional steps to complete State legislative or rulemaking processes or to establish the regulatory scheme as well as the extension of the 2014 Farm Bill Program. Thus, as of November 2020, twenty States and nine Tribes have submitted reports on their respective programs. Based on the reports submitted by States and Tribes in 2020, producers have planted 6,166 acres under the 2018 Farm Bill hemp plans, of which approximately 730 acres were subject to disposal.

As of the effective date of this final rule, the interim final rule is superseded. This final rule replaces the IFR at 7 CFR part 990, effective March 22, 2021. The Agricultural Marketing Service (AMS), which has been delegated authority to administer the U.S. Domestic Hemp Production Program, provided multiple opportunities for public comment. AMS accepted comments during an initial comment period from October 31, 2019, through December 31, 2019. This initial comment period was extended for an additional 30 days on December 18, 2019 (84 FR 69295), ending January 29, 2020. AMS reopened the comment period for 30 additional days on September 8, 2020 (85 FR 55363), ending October 8, 2020. A total of approximately 5,900 comments were received during all comment periods from States; Indian Tribes; industry and agricultural organizations; private citizens; members of Congress, the scientific community; agencies; and individuals involved in the growing, processing, transporting and marketing of hemp. A summary of the public comments received and AMS's responses appear under "Comment Analysis" in section IX of this document.

I. Introduction

Hemp is a commodity with numerous industrial and horticultural uses including fabric, paper, construction materials, food products, cosmetics, production of cannabinoids (such as cannabidiol or CBD), and other products.[1] While hemp was produced previously in the United States (U.S.) for hundreds of years, its use diminished in favor of alternatives. Hemp fiber, for instance, which had been used to make rope and clothing, was replaced by less expensive jute and abaca imported from Asia. Rope made from these materials was lighter, more buoyant, and more resistant to saltwater than hemp rope, which required tarring. Improvements in technology further contributed to the decline in hemp use. The cotton gin, for example, simplified the processing of cotton, which replaced hemp in the manufacture of textiles.

The hemp industry continued in the U.S. until the Marihuana Tax Act of 1938. This Act ended the legal production of hemp in the United States, and hemp was added to Schedule I of the Controlled Substances Act (CSA), 21 U.S.C. 801 *et seq.* Prior to the 2018 Farm Bill, all *Cannabis sativa* L., regardless of delta-9 tetrahydrocannabinol (THC) concentration level, fell within the CSA definition of "marihuana" unless the product fell under a narrow range of exceptions (*e.g.*, the "mature stalks" of the plant).[2] As a result, many aspects of domestic production of what is now defined as hemp was limited to persons registered under the CSA to do so.

Under the Agricultural Act of 2014 (2014 Farm Bill), Public Law 113–79, State departments of agriculture and institutions of higher education were permitted to produce hemp as part of a pilot program for research purposes. The authority for hemp production provided in the 2014 Farm Bill was extended until January 1, 2022, by the Continuing Appropriations Act, 2021, and Other Extensions Act (Pub. L. 116–260) (2021 Continuing Appropriations Act).

Hemp production in the U.S. has seen a resurgence in the last several years.

Since importation of seed is covered under USDA's Animal and Plant Health Inspection Service (APHIS) regulations, this final rule does not regulate hemp

[1] Section 297D(c) of the AMA explicitly preserved the authority of the U.S. Food and Drug Administration (FDA) to promulgate regulations and guidance related to the production of hemp under the Federal Food, Drug, and Cosmetic Act (21 U.S.C. 301 *et seq.*) (FD&C Act) and section 351 of the Public Health Service Act (42 U.S.C. 262) (PHS Act). *See* section 297D(c)(1) ("Nothing in this subchapter shall affect or modify . . . the Federal Food, Drug, and Cosmetic Act (21 U.S.C. 301 *et seq.*); section 351 of the Public Health Service Act (42 U.S.C. 262); or the authority of the Commissioner of Food and Drugs and the Secretary of Health and Human Services . . ." under those Acts).

[2] Although the statutory spelling is "marihuana" in the Controlled Substances Act, this rule uses the more commonly used spelling of marijuana.

58522 Federal Register / Vol. 84, No. 211 / Thursday, October 31, 2019 / Rules and Regulations

DEPARTMENT OF AGRICULTURE

Agricultural Marketing Service

7 CFR Part 990

[Doc. No. AMS–SC–19–0042; SC19–990–2 IR]

Establishment of a Domestic Hemp Production Program

AGENCY: Agricultural Marketing Service, USDA.

ACTION: Interim final rule with request for comments.

SUMMARY: This rule establishes a new part specifying the rules and regulations to produce hemp. This action is mandated by the Agriculture Improvement Act of 2018, which amended the Agricultural Marketing Act of 1946. This rule outlines provisions for the Department of Agriculture (USDA) to approve plans submitted by States and Indian Tribes for the domestic production of hemp. It also establishes a Federal plan for producers in States or territories of Indian Tribes that do not have their own USDA-approved plan. The program includes provisions for maintaining information on the land where hemp is produced, testing the levels of delta-9 tetrahydrocannabinol, disposing of plants not meeting necessary requirements, licensing requirements, and ensuring compliance with the requirements of the new part.

DATES:

Effective date: This rule is effective October 31, 2019 through November 1, 2021.

Comment due dates: Comments received by December 30, 2019 will be considered prior to issuance of a final rule. Pursuant to the Paperwork Reduction Act (PRA), comments on the information collection burden must be received by December 30, 2019.

ADDRESSES: Interested persons are invited to submit written comments concerning this rule and the proposed information collection. Comments should be submitted via the Federal eRulemaking portal at *www.regulations.gov*. Comments may also be filed with Docket Clerk, Marketing Order and Agreement Division, Specialty Crops Program, AMS, USDA, 1400 Independence Avenue SW, STOP 0237, Washington, DC 20250–0237; or Fax: (202) 720–8938. All comments should reference the document number and the date and page number of this issue of the **Federal Register** and will be made available for public inspection in the Office of the Docket Clerk during regular business hours or can be viewed at: *www.regulations.gov*. All comments submitted in response to this rule will be included in the record and will be made available to the public.

FOR FURTHER INFORMATION CONTACT: Bill Richmond, Chief, U.S. Domestic Hemp Production Program, Specialty Crops Program, AMS, USDA; 1400 Independence Avenue SW, Stop 0237, Washington, DC 20250–0237; Telephone: (202) 720–2491, Fax: (202) 720–8938, or Email: *William.Richmond@usda.gov* or Patty Bennett, Director, Marketing Order and Agreement Division, Specialty Crops Program, AMS, USDA at the same address and phone number above or Email: *Patty.Bennett@usda.gov*.

Small businesses may request information on complying with this regulation by contacting Richard Lower, Marketing Order and Agreement Division, Specialty Crops Program, AMS, USDA, 1400 Independence Avenue SW, STOP 0237, Washington, DC 20250–0237; Telephone: (202) 720–2491, Fax: (202) 720–8938, or Email: *Richard.Lower@usda.gov*.

SUPPLEMENTARY INFORMATION: This rule is issued under Section 10113 of Public Law 115–334, the Agriculture Improvement Act of 2018 (2018 Farm Bill). Section 10113 amended the Agricultural Marketing Act of 1946 (AMA) by adding Subtitle G (sections 297A through 297D of the AMA). Section 297B of the AMA requires the Secretary of Agriculture (Secretary) to evaluate and approve or disapprove State or Tribal plans regulating the production of hemp. Section 297C of the AMA requires the Secretary to establish a Federal plan for producers in States and territories of Indian Tribes not covered by plans approved under section 297B. Lastly, section 297D of the AMA requires the Secretary to promulgate regulations and guidelines relating to the production of hemp, including sections 297B and 297C, in consultation with the U.S. Attorney General. USDA is committed to issuing the final rule expeditiously after reviewing public comments and obtaining additional information during the initial implementation. This interim final rule will be effective for two years and then be replaced with a final rule.

I. Introduction

Hemp is a commodity that can be used for numerous industrial and horticultural purposes including fabric, paper, construction materials, food products, cosmetics, production of cannabinoids (such as cannabidiol or CBD), and other products.[1] While hemp was produced previously in the U.S. for hundreds of years, its usage diminished in favor of alternatives. Hemp fiber, for instance, which had been used to make rope and clothing, was replaced by less expensive jute and abaca imported from Asia. Ropes made from these materials were lighter and more buoyant, and more resistant to salt water than hemp rope, which required tarring. Improvements in technology further contributed to the decline in hemp usage. The cotton gin, for example, eased the harvesting of cotton, which replaced hemp in the manufacture of textiles.

Hemp production in the U.S. has seen a resurgence in the last five years; however, it remains unclear whether consumer demand will meet the supply. High prices for hemp, driven primarily by demand for use in producing CBD, relative to other crops, have driven increases in planting. Producer interest in hemp production is largely driven by the potential for high returns from sales of hemp flowers to be processed into CBD oil.

USDA regulates the importation of all seeds for planting to ensure safe agricultural trade. Hemp seeds can be imported into the United States from Canada if accompanied by either: (1) A phytosanitary certification from Canada's national plant protection organization to verify the origin of the seed and confirm that no plant pests are detected; or (2) a Federal Seed Analysis Certificate (SAC, PPQ Form 925) for hemp seeds grown in Canada. Hemp seeds imported into the United States from countries other than Canada may be accompanied by a phytosanitary certificate from the exporting country's national plant protection organization to verify the origin of the seed and confirm that no plant pests are detected. Accordingly, since importation of seed is covered under USDA Animal and Plant Health Inspection Service (APHIS) regulations, this rule does not further address hemp seed imports or exports. For imports of hemp plant material,

[1] The 2018 Farm Bill explicitly preserved the authority of the U.S. Food and Drug Administration (FDA) to regulate hemp products under the Federal Food, Drug, and Cosmetic Act (FD&C Act) and section 351 of the Public Health Service Act (PHS Act). See section 297D(c)(1) ("Nothing in this subchapter shall affect or modify . . . the Federal Food, Drug, and Cosmetic Act (21 U.S.C. 301 et seq.); section 351 of the Public Health Service Act (42 U.S.C. 262); or the authority of the Commissioner of Food and Drugs and the Secretary of Health and Human Services . . ." under those Acts). Accordingly, products containing cannabis and cannabis-derived compounds are subject to the same authorities and requirements as FDA-regulated products containing any other substance.

- 1645: Hemp introduced to U.S.
  - New England to VA and PA
- 1775: Hemp brought to KY from VA
- 1840-1860**: Hemp industry flourished**
- Late 1800's through 1912: **Hemp industry declines**
- 1915: 8,400 acres produced in U.S.
- 1917: WWI, 41,200 acres in U.S.
- 1933: **140 acres** of hemp in U.S.
- 1943: WWII, **186,700 harvested acres**
- 1953: Not enough hemp produced in U.S. to
- **1958: Small hemp fiber industry existed in WI until this time**
- 1999-2003: Experimental 0.25-acre plot in Hawaii
- **Agricultural Act of 2014**
- **Agricultural Improvement Act of 2018**
- **2019: IFR est. Domestic Hemp Production Program**
- **2020: Final Rule, Domestic Hemp Prod. Program**

TABLE 355.—*Hemp fiber and hemp seed: Acreage, yield, and production, United States, 1931–43*

Year	Hemp fiber: Acreage harvested	Hemp fiber: Yield per acre	Hemp fiber: Production	Hemp seed: Acreage harvested	Hemp seed: Yield per acre	Hemp seed: Production
	Acres	*Pounds*	*1,000 pounds*	*Acres*	*Pounds*	*1,000 pounds*
1931	320	850	272			
1932	200	800	160			
1933	140	750	105			
1934	500	850	425			
1935	700	875	612			
1936	1,400	725	1,015			
1937	1,300	800	1,040			
1938	1,390	896	1,246	40	540	22
1939	1,440	890	1,282	210	330	69
1940	2,070	804	1,665	510	725	370
1941	7,400	1,001	7,410	2,200	310	682
1942	14,500	960	13,922	29,300	364	10,660
1943[1]	145,900	920	134,251	40,500	396	16,055

[1] Preliminary; based largely on records of War Hemp Industries, Inc.

Bureau of Agricultural Economics.

TABLE 98.—*Hemp fiber and hempseed: Acreage, yield, and production, United States, 1939–54*

Year	Hemp fiber[1]: Acreage harvested	Hemp fiber[1]: Yield per acre	Hemp fiber[1]: Production	Hempseed[2]: Acreage harvested	Hempseed[2]: Yield per acre	Hempseed[2]: Production	Year	Hemp fiber[1]: Acreage harvested	Hemp fiber[1]: Yield per acre	Hemp fiber[1]: Production	Hempseed[2]: Acreage harvested	Hempseed[2]: Yield per acre	Hempseed[2]: Production
	Acres	*Lb.*	*1,000 lb.*	*Acres*	*Lb.*	*1,000 lb.*		*Acres*	*Lb.*	*1,000 lb.*	*Acres*	*Lb.*	*1,000 lb.*
1939	1,440	890	1,282	210	330	69	1947	4,900	950	4,655	600	485	291
1940	2,070	804	1,665	510	725	370	1948	2,800	905	2,534	400	440	176
1941	7,400	1,001	7,410	2,200	310	682	1949	4,500	1,100	4,950	200	440	88
1942	14,500	960	13,922	29,300	364	10,660	1950[3]						
1943	146,200	962	140,680	40,500	346	14,015	1951	1,000	1,100	1,100	140	550	77
1944	53,400	967	51,632	1,200	440	528	1952[4]						
1945	6,900	980	6,762	800	350	280	1953[4]						
1946	4,600	975	4,485	400	530	212	1954[4]						

[1] Wisconsin, 1939–54; Kentucky, 1939–44; Illinois and Minnesota, 1942–44; Iowa, 1943 and 1944; Indiana 1943.
[2] Kentucky, 1939–54; Tennessee, 1942 and 1943.
[3] No production of record.
[4] Not available.

Agricultural Marketing Service. Data for 1931–38 in Agricultural Statistics, 1952, table 111.

H.R.2

One Hundred Fifteenth Congress of the United States of America

AT THE SECOND SESSION

Begun and held at the City of Washington on Wednesday, the third day of January, two thousand and eighteen

An Act

H.R.2—419

SEC. 10113. HEMP PRODUCTION.

The Agricultural Marketing Act of 1946 (7 U.S.C. 1621 et seq.) is amended by adding at the end the following:

"Subtitle G—Hemp Production

"SEC. 297A. DEFINITIONS.

"In this subtitle:

"(1) HEMP.—The term 'hemp' means the plant Cannabis sativa L. and any part of that plant, including the seeds thereof and all derivatives, extracts, cannabinoids, isomers, acids, salts, and salts of isomers, whether growing or not, with a delta-9 tetrahydrocannabinol concentration of not more than 0.3 percent on a dry weight basis.

United States of America

AT THE SECOND SESSION

Begun and held at the City of Washington on Friday, the third day of January, two thousand and fourteen

An Act

To provide for the reform and continuation of agricultural and other programs of the Department of Agriculture through fiscal year 2018, and for other purposes.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled,

SECTION 1. SHORT TITLE; TABLE OF CONTENTS.

(a) SHORT TITLE.—This Act may be cited as the "Agricultural Act of 2014".

(b) TABLE OF CONTENTS.—The table of contents of this Act is as follows:

Sections 7408 and 7409 of the Food, Conservation, and Energy Act of 2008 (Public Law 110–246; 122 Stat. 2013) are both amended by striking "Title III of the Department of Agriculture Reorganization Act of 1994" and inserting "Title III of the Federal Crop Insurance Reform and Department of Agriculture Reorganization Act of 1994".

SEC. 7606. LEGITIMACY OF INDUSTRIAL HEMP RESEARCH.

(a) IN GENERAL.—Notwithstanding the Controlled Substances Act (21 U.S.C. 801 et seq.), the Safe and Drug-Free Schools and Communities Act (20 U.S.C. 7101 et seq.), chapter 81 of title 41, United States Code, or any other Federal law, an institution of higher education (as defined in section 101 of the Higher Education Act of 1965 (20 U.S.C. 1001)) or a State department of agriculture may grow or cultivate industrial hemp if—

(1) the industrial hemp is grown or cultivated for purposes of research conducted under an agricultural pilot program or other agricultural or academic research; and

(2) the growing or cultivating of industrial hemp is allowed under the laws of the State in which such institution of higher education or State department of agriculture is located and such research occurs.

(b) DEFINITIONS.—In this section:

(1) AGRICULTURAL PILOT PROGRAM.—The term "agricultural pilot program" means a pilot program to study the growth, cultivation, or marketing of industrial hemp—

(A) in States that permit the growth or cultivation of industrial hemp under the laws of the State; and

(B) in a manner that—

(i) ensures that only institutions of higher education and State departments of agriculture are used to grow or cultivate industrial hemp;

(ii) requires that sites used for growing or cultivating industrial hemp in a State be certified by, and registered with, the State department of agriculture; and

(iii) authorizes State departments of agriculture to promulgate regulations to carry out the pilot program in the States in accordance with the purposes of this section.

(2) INDUSTRIAL HEMP.—The term "industrial hemp" means the plant Cannabis sativa L. and any part of such plant, whether growing or not, with a delta-9 tetrahydrocannabinol concentration of not more than 0.3 percent on a dry weight basis.

(3) STATE DEPARTMENT OF AGRICULTURE.—The term "State department of agriculture" means the agency, commission, or department of a State government responsible for agriculture within the State.

TITLE VIII—FORESTRY

Subtitle A—Repeal of Certain Forestry Programs

SEC. 8001. FOREST LAND ENHANCEMENT PROGRAM.

(a) REPEAL.—Section 4 of the Cooperative Forestry Assistance Act of 1978 (16 U.S.C. 2103) is repealed.

(b) CONFORMING AMENDMENT.—Section 8002 of the Farm Secu-

U. S. DEPARTMENT OF AGRICULTURE,
BUREAU OF PLANT INDUSTRY—Circular No. 57.
B. T. GALLOWAY, Chief of Bureau.

THE CULTIVATION OF HEMP IN THE UNITED STATES.

BY

LYSTER H. DEWEY,
BOTANIST IN CHARGE OF FIBER INVESTIGATIONS.

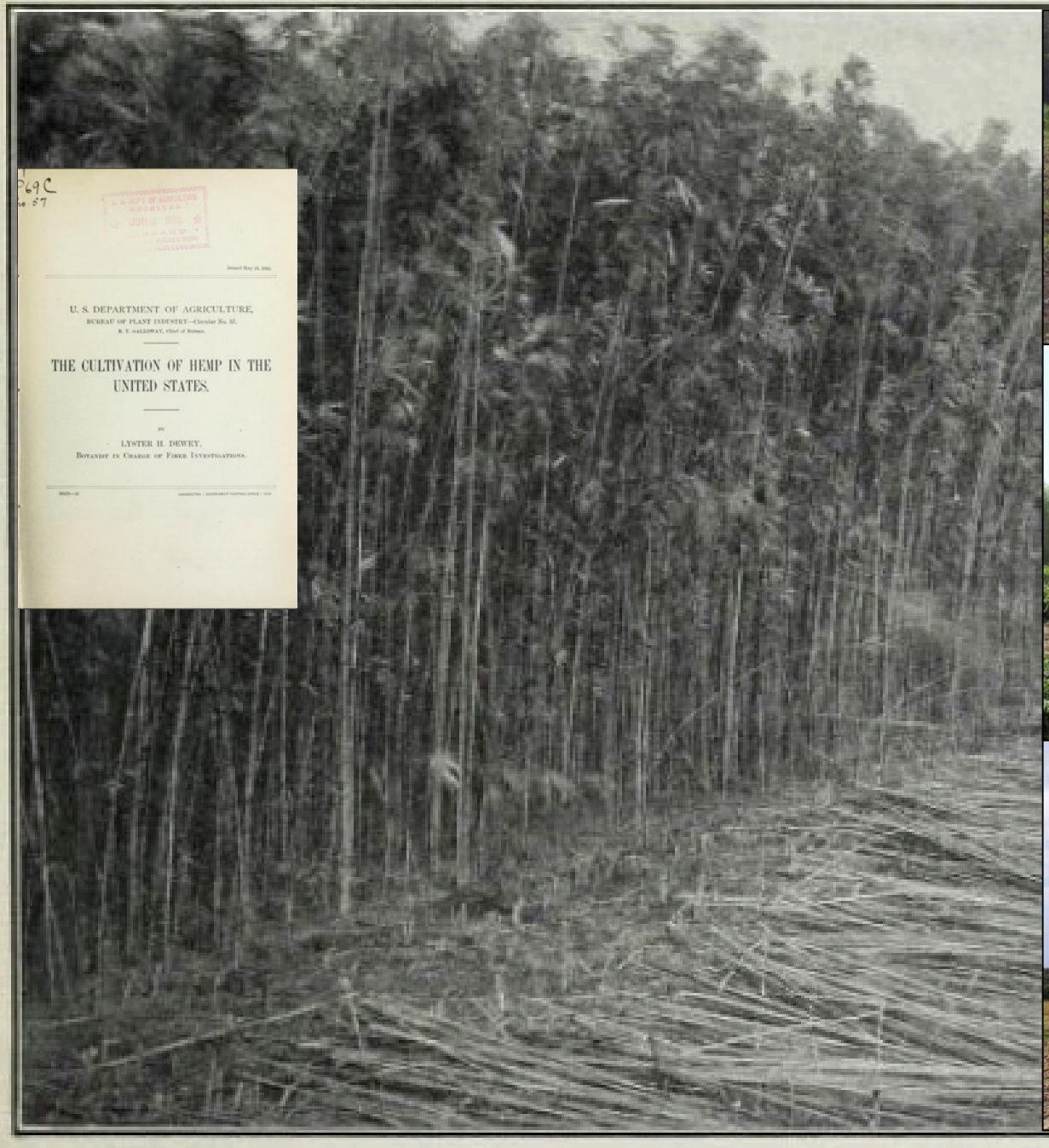
Industrial Hemp in the United States: Status and Market Potential

Abstract

Station Bulletin 681

Feasibility of Industrial Hemp Production in the United States Pacific Northwest

Agricultural Experiment Station
Oregon State University



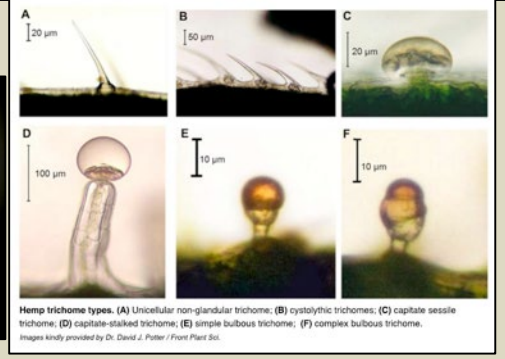
U. S. DEPARTMENT OF AGRICULTURE,
BUREAU OF PLANT INDUSTRY—Circular No. 57.
B. T. GALLOWAY, Chief of Bureau.

THE CULTIVATION OF HEMP IN THE UNITED STATES.

BY

LYSTER H. DEWEY,
Botanist in Charge of Fiber Investigations.

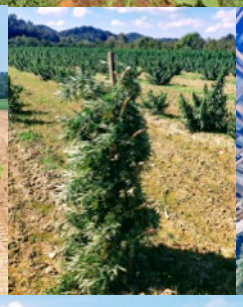
Fig 1.—Field of hemp in Kentucky at harvest time.

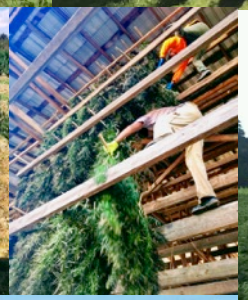


Hemp trichome types. **(A)** Unicellular non-glandular trichome; **(B)** cystolythic trichomes; **(C)** capitate sessile trichome; **(D)** capitate-stalked trichome; **(E)** simple bulbous trichome; **(F)** complex bulbous trichome.

Images kindly provided by Dr. David J. Potter / Front Plant Sci.

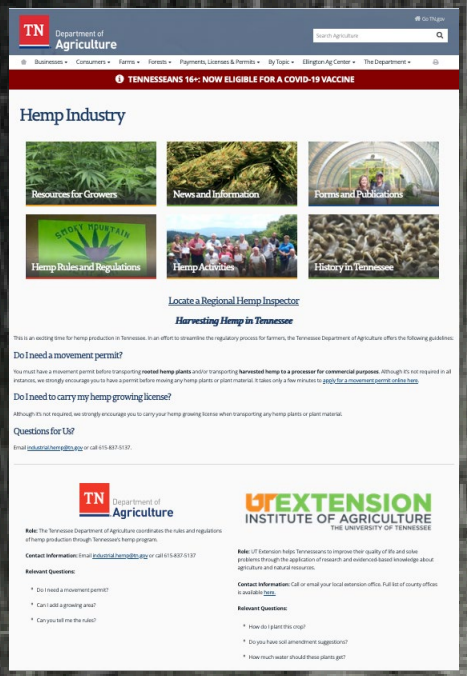
CBD (and other cannabinoids, terpenes) contained in *Cannabis* resin

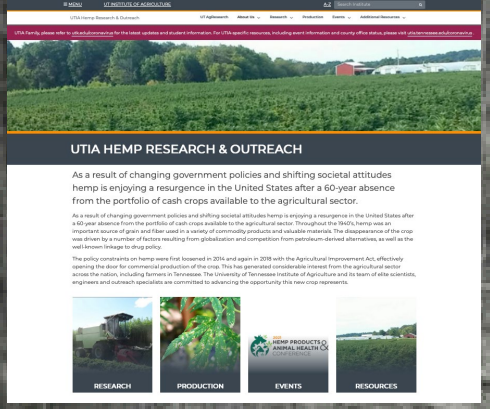


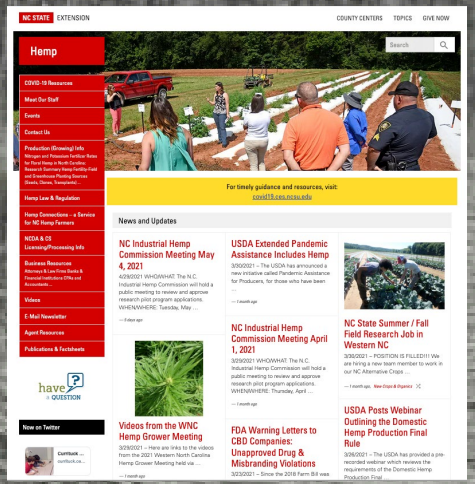


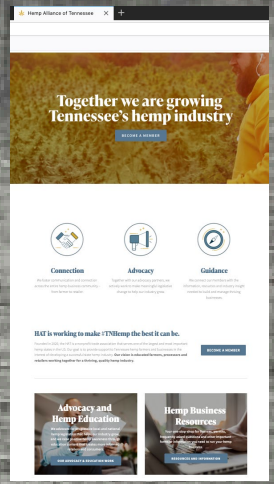
Initial Considerations

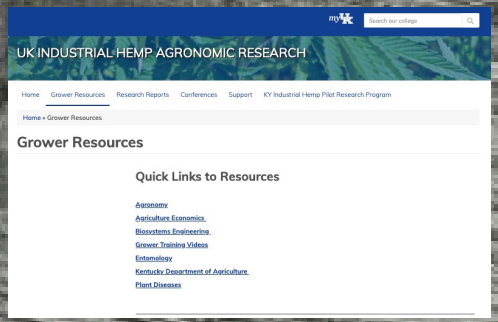
- What are the current laws and rules for hemp production and marketing?
- What are your goals for the crop?
- How much will it cost to produce, harvest, and cure?
- What skills, equipment, supplies, labor, buildings, land, and time will be needed to achieve your goals? Where will you get what is needed?
- If you want to sell, what is your marketing plan? If you have a contract, how good is it (binding, terms, payment, timeframe?)
- Rely on facts only, not emotion, and verify your sources of information, fact check.

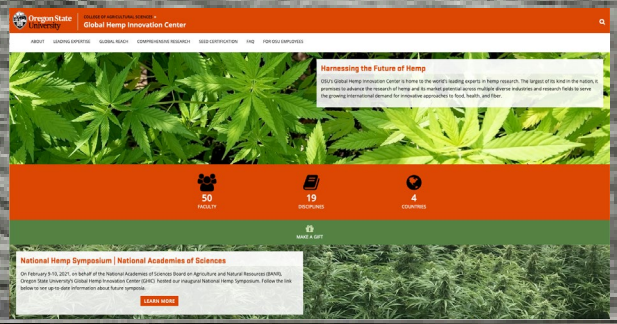












Budgets

- Good hemp budgets are available, but profitability is dependent on surety of market
- University-developed budgets are best tool – non-biased; verify other sources

D 41

Department of Agricultural and Resource Economics

2020 INDUSTRIAL HEMP EXTRACT BIOMASS (CBD) PRODUCTION BUDGET (1 Acre)

June 2020

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This spreadsheet contains the 2020 University of Tennessee Industrial Hemp Extract Biomass (CBD) Production budget. Production systems vary tremendously in industrial hemp production, so producers are encouraged to modify practices, inputs and expenses to reflect their business. There are no protected cells in the spreadsheet, so the user should make sure that any changes made do not affect formulas. Any changes made on the "Industrial Hemp Extract Budget" will be reflected in the "Profit Matrix," where the total cost is utilized to determine the potential profit for several yield and price scenarios. This spreadsheet should not be considered representative of all circumstances and is provided as a template or guide that can be used to estimate production costs for planning purposes. Inputs, production practices and prices for inputs vary tremendously from county to county and farm to farm; as such, producers are encouraged to use their own inputs, input prices and cost structures for planning purposes.

Disclaimer: This budget does NOT imply any production recommendations. Significant variability in plant spacing, fertilization rate, irrigation, labor hours, drying and storage methods, and other input costs exist in the production of industrial hemp for extract. The information contained in this spreadsheet relies on assumptions and observations in Tennessee. The market and price of industrial hemp for extract is not well established, so extreme caution is recommended when evaluating price potential. The profit matrix estimates the profitability of industrial hemp extract production based on different yield and price projections. This budget should not be construed as a reflection of all circumstances across the state, as significant variability will occur. To improve accuracy, users are encouraged to use inputs, prices and processes that are utilized on their specific farms. Note that there is a large amount of uncertainty and unknown factors associated with hemp extract production, costs and markets; therefore, growers should do their own research and understand and manage their risk.

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UTEXTENSION INSTITUTE OF AGRICULTURE

2020 Industrial Hemp Extract Production Budget (1 Acre)

	Description		Quantity	Unit	Total ($/acre)
	Projected Cannabidiol (CBD) % of Dry Matter		10%	% of dry matter	
	Price Per % CBD Oil (***Enter Your Price; Prices Vary***)		$0.75	$ per %	
	Total Plant Population (# of Transplants Per Acre)		1,500	transplants/acre	
	Percent of Transplants Marketed		81%	%	
	Average Dried Floral Material Per Plant (lbs)		1.20	lbs/plant	
	Total Harvested Dried Floral Material		1,458	lbs/acre	
	Other Revenue (government payments, by-products etc.)		$0.00	$/acre	
Estimated Gross Revenue					$10,935.00
EXPENSES		Unit	Quantity (#/acre)	Price ($/unit)	Total ($/acre)
Variable Expenses					
Transplants [2]	Purchased	Transplants	1,500	$3.00	$4,500.00
Soil Test [3]	Soil Fertility Test	plot	1	$15.00	$15.00
	Heavy Metal	plot	1	$40.00	$40.00
	Pesticide Residue	plot	1	$190.00	$190.00
Fertilization [4]	Dolomite Lime - Spread	ton	1	$25.00	$25.00
	Nitrogen - N	lb	150	$0.42	$63.00
	Phosphorus - P	lb	60	$0.33	$19.80
	Potassium - K	lb	60	$0.32	$19.20
	Other	lb	0	$0.00	$0.00
Fertigation	Nitrogen - N	lb	0	$0.48	$0.00
	Other	lb	0	$0.00	$0.00
Weed/Disease/Insect Control	Chemical	acre	0	$0.00	$0.00
	Biological	acre	0	$0.00	$0.00
	Other	acre	0	$0.00	$0.00
Plastic Mulch [5]	Plastic Mulch	acre	0	$285.00	$0.00
Irrigation [6]	Drip Tape	acre	0	$156.00	$0.00
	Pumping Cost	hr	0	$2.14	$0.00
	Water Cost	1,000 gal	0	$3.00	$0.00
Machinery Costs [7]	Fuel, Operator Labor, Repair and Maintenance	ac	1	$253.30	$253.30
Other Processing Costs	Drying/Conditioning/On-Farm Processing	ac	1	$0.00	$0.00
Storage [8]	Opportunity Cost of Storage	ac	1	$333.52	$333.52
Other Expenses [9]		acre	1	$0.00	$0.00
Non-operator Labor Expense [10]					
	Pre-plant and Planting Labor	hrs	50	$12.40	$620.00
	Irrigation Labor	hrs	50	$12.40	$620.00
	Harvest Labor	hrs	100	$12.40	$1,240.00
	Post-harvest Labor	hrs	175	$12.40	$2,170.00
	Management Labor	hrs	25	$15.00	$375.00
	Other Labor	hrs	0	$12.40	$0.00
Total Labor Expense		hrs	400		$5,025.00
Marketing and TDA Charges					
Pallet Boxes	Boxes and Plastic Cover	box	10	$22.50	$225.00
Transportation to Processor [11]	50 miles One-Way to Market	ac	1	$54.62	$54.62
License Fee [12]	Up to 5 acres	plot	1	$250.00	$250.00
Sampling Fee [13]	1 Variety	variety	1	$150.00	$150.00
Inspection Fee [14]		hr	2	$35.00	$70.00
Cannabinoid Test [15]		variety	1	$40.00	$40.00
Total Marketing and TDA Charges					$789.62
Interest [16]	Half of Specified Variable Expenses	$	$11,273.43	6.10%	$343.84
Total Variable Expenses					$11,617.27
Fixed Expenses					
Machinery [17]	Depreciation, Interest, Taxes, Insurance and Housing	ac	1	$49.32	$49.32
Irrigation System [18]	Capital Recovery	ac	0	$424.46	$0.00
Drying Barn [19]	Annual Lease	ac	1	$555.00	$555.00
Drying Materials [20]	Depreciation	ac	1	$90.00	$90.00
Land Rent [21]		ac	1	$95.00	$95.00
Total Fixed Expenses					$749.32
Total Expenses					$12,366.59
RETURNS OVER SPECIFIED EXPENSES					-$1,431.59

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***Disclaimer:** This budget does NOT imply any production recommendations. Significant variability in plant spacing, fertilization rate, irrigation, labor hours, drying and storage methods, and other input costs exist in the production of industrial hemp for extract. This spreadsheet should not be considered representative of all circumstances and is provided as a template or guide that can be used to estimate production costs for planning purposes.

Hemp Extract Net Return Table ($/acre)

Price ($/lb) is determined by CBD percentage and price per percentage in dried floral material (leaves and flower). The mid-point price and yield will update with changes on the budget tab.

		Yield (lb/acre)									
		208	458	708	958	1,208	1,458	1,708	1,958	2,208	2,458	2,708
	0.50	(12,471)	(12,596)	(12,721)	(12,846)	(12,971)	(13,096)	(13,221)	(13,346)	(13,471)	(13,596)	(13,721)
	0.58	(12,263)	(12,138)	(12,013)	(11,888)	(11,763)	(11,638)	(11,513)	(11,388)	(11,263)	(11,138)	(11,013)
	1.50	(12,055)	(11,680)	(11,305)	(10,930)	(10,555)	(10,180)	(9,805)	(9,430)	(9,055)	(8,680)	(8,305)
	2.50	(11,847)	(11,222)	(10,597)	(9,972)	(9,347)	(8,722)	(8,097)	(7,472)	(6,847)	(6,222)	(5,597)
	3.50	(11,639)	(10,764)	(9,889)	(9,014)	(8,139)	(7,264)	(6,389)	(5,514)	(4,639)	(3,764)	(2,889)
	4.50	(11,431)	(10,306)	(9,181)	(8,056)	(6,931)	(5,806)	(4,681)	(3,556)	(2,431)	(1,306)	(181)
	5.50	(11,223)	(9,848)	(8,473)	(7,098)	(5,723)	(4,348)	(2,973)	(1,598)	(223)	1,152	2,527
Price	6.50	(11,015)	(9,390)	(7,765)	(6,140)	(4,515)	(2,890)	(1,265)	360	1,985	3,610	5,235
($/lb)	7.50	(10,807)	(8,932)	(7,057)	(5,182)	(3,307)	(1,432)	443	2,318	4,193	6,068	7,943
	8.50	(10,599)	(8,474)	(6,349)	(4,224)	(2,099)	26	2,151	4,276	6,401	8,526	10,651
	9.50	(10,391)	(8,016)	(5,641)	(3,266)	(891)	1,484	3,859	6,234	8,609	10,984	13,359
	10.50	(10,183)	(7,558)	(4,933)	(2,308)	317	2,942	5,567	8,192	10,817	13,442	16,067
	11.50	(9,975)	(7,100)	(4,225)	(1,350)	1,525	4,400	7,275	10,150	13,025	15,900	18,775
	12.50	(9,767)	(6,642)	(3,517)	(392)	2,733	5,858	8,983	12,108	15,233	18,358	21,483
	13.50	(9,559)	(6,184)	(2,809)	566	3,941	7,316	10,691	14,066	17,441	20,816	24,191
	14.50	(9,351)	(5,726)	(2,101)	1,524	5,149	8,774	12,399	16,024	19,649	23,274	26,899

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***Disclaimer:** The total cost is utilized to determine the potential profit for several yield and price scenarios. The price of industrial hemp for extract is not well established, so extreme caution is recommended when evaluating price potential. This budget should not be construed as a reflection of all circumstances across the state, as significant variability will occur.

CBD Tobacco Model

		Quant.	Unit	Price			Total
Gross Returns Per Acre							
	CBD%	7.5%					
	Price Per %	$0.60					
	Plant Spacing	6x6					
	Plants Per Acre	2723					
	Dry Floral Material (DFM) Per Plant (lbs)	1.00					
	Harvest Index (1=100%)	0.35					
	Total Marketable Dry Floral	2,586.38	lbs		$4.50		$11,638.69
	Crop Insurance	1.00	acre		$0.00		$0.00
Total Revenue							$11,638.69
Variable Costs Per Acre							
	Transplants	2723	plants		$2.17		$5,907.83
	Transplant Trasportation	1	trip		$0.00		$0.00
	Nitrogen (Solid urea 46% N)	100	units		$0.04		$4.00
	Phosphorous (P2O5)	80	units		$0.38		$30.00
	Potassium (K2O)	45	units		$0.30		$13.50
	Lime - Delivered and Spread	0.5	ton		$20.00		$6.00
	Chemicals	1	acre		$0.00		$0.00
	Soil Test	1	field		$7.00		$7.00
	Cultivation (hand/mechanical)	5	hours		$12.36		$64.80
	Roguing males	0	hours		$12.36		$0.00
	Harvest Cost	32.4	hours		$12.36		$419.90
	Operator Labor (Variable)	0	hours		$0.00		$0.00
	Drying Costs	0	lbs wet		$1.50		$0.00
	Grinding Cost	1	acre		$0.00		$0.00
	Tote Container	5	acre		$35.00		$175.00
	Hauling Costs	30	miles		$1.500		$45.00
	Custom Work	1	acre		$0.00		$0.00
	Crop Insurance	1	acre		$0.00		$0.00
	Application & License Fee	1	per year		$400.00	# of acres 5	$80.00
	Lab Test	3	# of test		$60.00	cost per test 1	$180.00
	Cash Land Rent	1	acre		$300.00		$300.00
	Interest on Operating Capital	$6,912.03	dollars		6.0%	# of Months 6.0	$207.36
	Repairs	1	acre		$0.00		$0.00
	Consulting Services	1	acre		$0.00		$0.00
	Other Variable Costs	1	acre		$0.00		$0.00
	Unallocated Labor (hired)		hours		$0.00		$0.00
Total Variable Costs Per Acre							$7,418.30
Return Above Variable Costs Per Acre							$4,219
Specified Fixed Costs		Quant	Unit	Price			
	Tractor (225HP 4WD)	1	acre	$32.21			$32
	Tractor (75HP MFWD)	1	acre	$21.43			$21
	Plow	1	acre	$1.50			$2
	Disc	1	acre	$1.80			$2
	Planter	1	acre	$4.14			$4
	Cultivation (traditional)*	1	acre	$20.00	# of Passes 2		$40.00
	Mist Equip	1	acre	$1.00			$1
	Taxes & Insurance	1	acre	$5.00			$5
	Other Fixed Costs	1	acre	$0.00			$0
	Operator Labor (Fixed)	0	hours	$0.00			$0

Sensitivity Analysis

Returns Above All Specified Costs ($/lb DFM)

$/lb	3.0%	4.0%	5.0%	6.0%	7.0%	8.0%	9.0%	10.0%
$0.20	($5,975)	($5,457)	($4,940)	($4,423)	($3,906)	($3,388)	($2,871)	($2,354)
$0.40	($4,423)	($3,388)	($2,354)	($1,319)	($285)	$750	$1,784	$2,819
$0.60	($2,871)	($1,319)	$233	$1,784	$3,336	$4,888	$6,440	$7,992
$0.80	($1,319)	$750	$2,819	$4,888	$6,957	$9,026	$11,095	$13,165
$1.00	$233	$2,819	$5,405	$7,992	$10,578	$13,165	$15,751	$18,337
$1.20	$1,784	$4,888	$7,992	$11,095	$14,199	$17,303	$20,406	$23,510

Returns Above All Specified Costs at $0.60 /%CBD

DFM lb/Acre	3.0%	4.0%	5.0%	6.0%	7.0%	8.0%	9.0%	10.0%
2000	($3,926)	($2,726)	($1,526)	($326)	$874	$2,074	$3,274	$4,474
2100	($3,746)	($2,486)	($1,226)	$34	$1,294	$2,554	$3,814	$5,074
2200	($3,566)	($2,246)	($926)	$394	$1,714	$3,034	$4,354	$5,674
2300	($3,386)	($2,006)	($626)	$754	$2,134	$3,514	$4,894	$6,274
2400	($3,206)	($1,766)	($326)	$1,114	$2,554	$3,994	$5,434	$6,874
2500	($3,026)	($1,526)	($26)	$1,474	$2,974	$4,474	$5,974	$7,474
2600	($2,846)	($1,286)	$274	$1,834	$3,394	$4,954	$6,514	$8,074
2700	($2,666)	($1,046)	$574	$2,194	$3,814	$5,434	$7,054	$8,674
2800	($2,486)	($806)	$874	$2,554	$4,234	$5,914	$7,594	$9,274
2900	($2,306)	($566)	$1,174	$2,914	$4,654	$6,394	$8,134	$9,874
3000	($2,126)	($326)	$1,474	$3,274	$5,074	$6,874	$8,674	$10,474
3100	($1,946)	($86)	$1,774	$3,634	$5,494	$7,354	$9,214	$11,074
3200	($1,766)	$154	$2,074	$3,994	$5,914	$7,834	$9,754	$11,674
3300	($1,586)	$394	$2,374	$4,354	$6,334	$8,314	$10,294	$12,274
3400	($1,406)	$634	$2,674	$4,714	$6,754	$8,794	$10,834	$12,874
3500	($1,226)	$874	$2,974	$5,074	$7,174	$9,274	$11,374	$13,474
3600	($1,046)	$1,114	$3,274	$5,434	$7,594	$9,754	$11,914	$14,074
3700	($866)	$1,354	$3,574	$5,794	$8,014	$10,234	$12,454	$14,674
3800	($686)	$1,594	$3,874	$6,154	$8,434	$10,714	$12,994	$15,274
3900	($506)	$1,834	$4,174	$6,514	$8,854	$11,194	$13,534	$15,874
4000	($326)	$2,074	$4,474	$6,874	$9,274	$11,674	$14,074	$16,474
4100	($146)	$2,314	$4,774	$7,234	$9,694	$12,154	$14,614	$17,074
4200	$34	$2,554	$5,074	$7,594	$10,114	$12,634	$15,154	$17,674

Cover | Hemp Grain | Hemp Fiber | CBD Row Crop Grain Harvested | CBD Row Crop NO Grain | CBD Tobacco Model | CBD Plasticulture Model | Spacing

Information from a 2020 hemp presentation

- Industrial hemp market projected to grow from $4.6 billion in 2019 to $26.6 billion in 2025*
  - Snacks and cereals estimated as largest market share in 2019
  - Hemp fiber segment projected as largest market share during forecasted period
  - Europe projected as largest market share during forecasted period

Source: Vote Hemp

  - Consumers will demand information on plant origin, farming practices, product composition, and sustainability
  - Baby Boomer consumption escalates, hemp as mental aid (today, one in five Americans)
  - Other cannabinoids in future – CBN, CBG

Source: Forbes

  - 28% of U.S. adults consumed CBD
  - 17% of U.S. consumers purchased a hemp product in 2018-2019

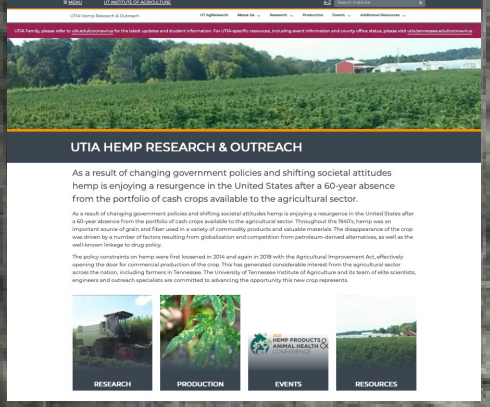
Source: Hemp Business Journal, New Frontier Data

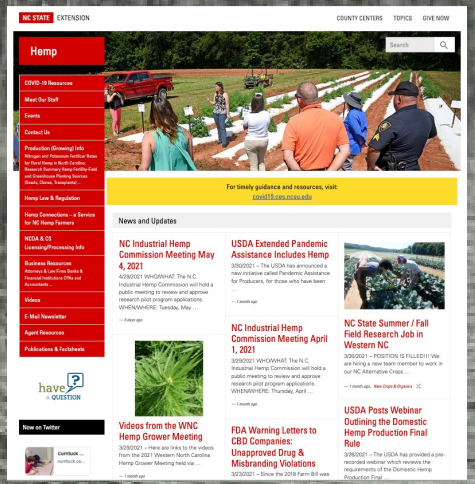
Current situation

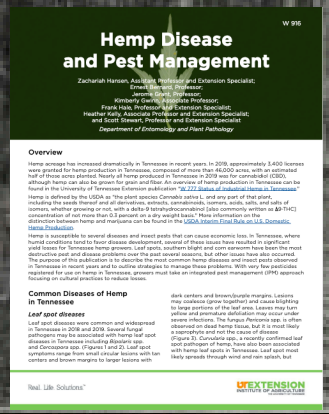
- Many are optimistic about cannabis in 2021, but less committal about hemp specifically
  - How will legalization of medical and recreational cannabis affect the hemp industry?
- There are predictions for more market stability for CBD in 2021, a relatively small but stable hemp grain market, and a speculative but optimistic outlook on hemp fiber
  - Considering history, sources, and agendas, I don't know what 2021 holds for hemp
  - This is still a new, developing, and rapidly changing industry
  - **Hemp derivatives have shifted some focus to other products – legality, DEA?**
  - Attrition in the industry, some commitments not honored, short-term vs. long-term players
- There is – and will remain – a market for hemp products, and therefore, a long-term viable hemp industry
  - It is unknown at this point who the long-term players will be, the size of the industry, and what the market looks like
- Control what you can, be careful, smart, and measured, and do your homework

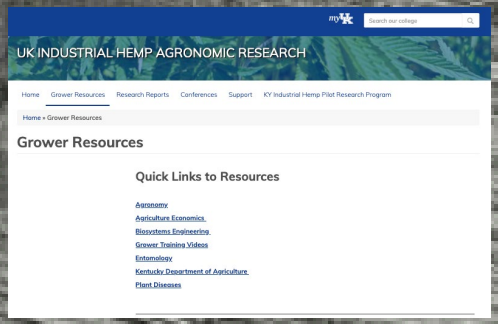
Agronomics

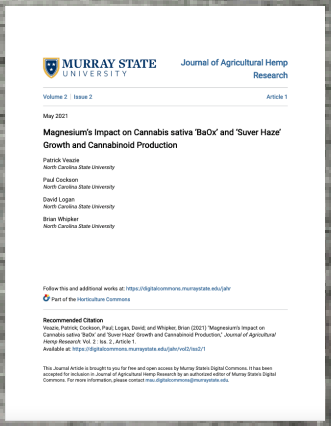
- Limited research-verified information – hemp is a new crop again, takes time and $$$
- Relatively easy to grow from transplanted clones or seedlings if agronomic practices are sound
  - Proven source of hemp seed, clones, or seedlings is absolutely critical – don't count on variety name only
  - Fertile, well-drained, clean site – avoid red, rocky ridges and wet-natured, poorly-drained sites
  - pH 6-7, model tobacco or tomato production model, tobacco fertility works – studies are being conducted
  - For hemp for extracts, 500-3000+ plants per acre (transplant model) – varies by operation
  - Transplant May-July, ability to irrigate is recommended
- Weeds, insect, diseases, males/herm - Start and stay ahead, scout every day









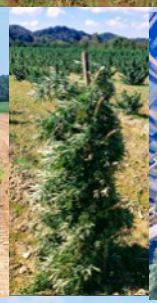


Agronomics - continued

- Hand-harvest for most – whole plant harvest like dark and burley tobacco
- Hang plants in tobacco barns, curing structures, sheds or place in greenhouses, warehouses, or other areas to dry crop
- Spacing plants out to dry, ventilation, and fans are critical to mitigate late-season and post-harvest moldsArea to dry plants/bucked material
- Dryers, green chop? (have backup)
- Proper storage to preserve and prevent post-harvest molds
- Late-season and post-harvest molds are a tremendous problem









Many Questions







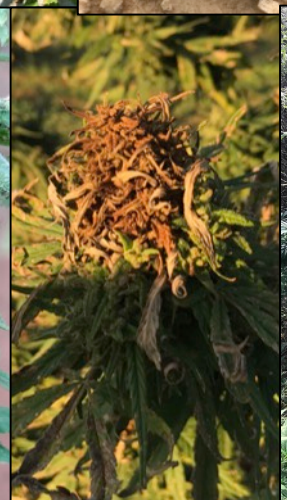




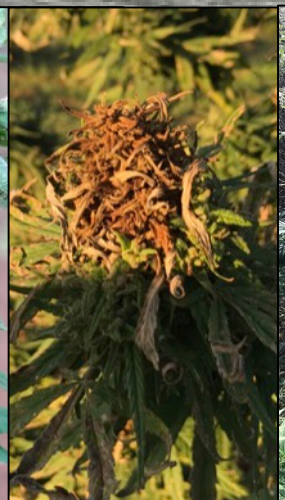









Many Questions



Many Questions










Past, present, future

- Hemp as a crop in the U.S. is new again
  - Perception, emotion major driving forces; science, economics gaining
  - Absent in U.S. for nearly 60 years
- Look to history as we approach future – consider all agriculture
  - Increases in scale, efficiency, and production
  - Decreases in prices
  - Consolidation, integration, and globalization
  - Regions in U.S. better suited to hemp production will become evident
- Hemp is not emus, prawns, switchgrass…
  - Cannabis here to stay: too much money at stake, public and political support
  - Immediate needs and strategic needs: crop will evolve, production practices will change
  - Hemp has been and will continue to develop into a viable crop for some
    - Short-term: A relative few will do well – those with good, sound contracts or markets
    - Long-term: Follow history, market (USDA, FDA, DEA) will decide, stabilize, another U.S. crop

Summary

Hemp for extracts:

- Diverse industry: experience, background, scale, finances, agenda
- Many who are hopeful to dangerously optimistic – can skew judgment
- Many are vulnerable to unverified, confidently spread information that sounds good – prices, market, efficacy
- Involvement in the hemp-for-extracts industry is expensive and risky
  - especially now: market, USDA hemp Final Rule, FDA
- Concerning hemp, fact-check everything, be absolutely objective
  - everyone seems to know everything or nothing, go with proven sources in region
- Producing a good crop is not the biggest challenge for most; the biggest challenge is selling the crop for a good price and receiving payment in a timely manner


Thank you