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Hemp in the United States and Canada

Regulation and Industrial Development Strategies Towards a Whole-Plant Approach

By

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education, policy analysis and value-chain capacity building
for hemp as a climate-smart driver of capacity and opportunity for all

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Meristem Institute is a Vermont (USA) non-profit that supports education, policy analysis and capacity building in industrial hemp and related value chains.

Like its namesake, Meristem's purpose is to foster and differentiate the growth of industrial hemp as a driver of capacity and opportunity for all.

Our vision is for hemp to fulfill its promise as a climate-smart commodity and become a keystone of biobased manufacturing and diversified agricultural economies.

Herrick ("Rick") Fox is President of Meristem Institute, Inc., and Co-Founder of Meristem Farms, LLC, a Vermont producer of distinctive hemp crops and consumer products. He also co-chairs the Government Affairs Committee of the National Industrial Hemp Council of America (Washington D.C.), and the Committee on Policy and Regulations of the Federation of International Hemp Organizations (Brussels).

Prior to starting Meristem Farms, Rick completed his 15-year USDA career in senior management with USDA's Foreign Agricultural Service, leading a division in agricultural trade capacity-building. Before that he worked in the USDA Forest Service, first in land management on National Forests and later in policy with senior USDA officials and the US Senate Committee on Agriculture. In his early career, Rick lived in Siberia and the Russian Far East for 6 years in the 1990's, working in conservation and forest science.

Rick holds a B.S. from U.C. Berkeley and a Master's in Forest Science from Yale. An avid skier and hiker since early childhood, Rick now practices gravity management by chucking hemp in the highlands of northern Vermont with his wife and their 3 kids.

Hemp in the United States

2014-2022: "Once upon a molecule"

- Most hemp production in the U.S. has been "floral hemp" for CBD production: 40% of 13,189 ha, 87.5% of $712M (2021).
- 86,000 to 103,000 employees in 2021, excluding retail (Whitney Economics)
- Planting doubled or tripled each year after legalization, from zero in 2014 to a peak of 31,067 ha in 2019; it fell to 13,189 ha in 2021 and fell further in 2022.
- Prices fell from $3.45/% biomass and $6,000/kg isolate in 2019 to $0.70/% and $3600/kg isolate in 2020.
- Biomass prices remain largely unchanged; isolate is wholesaling for $600/kg.
- Some US CBD producers pivoted to statutory loopholes allowing hemp-derived tetrahydrocannabinols regarded by many to be intoxicating.
- UNCTAD reports that the U.S. is the world's largest exporter of CBD; one wonders what would have happened to prices were this not the case.

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Opportunities for growth in U.S. fiber and grain

- As CBD prices—and then production—plummeted since 2020, some farmers' interest in fiber and grain production has increased;
- Grain: Some states allow feeding of hemp to animals under certain exemptions; Kentucky became first state to officially approve hemp in animal feed in 2022;
- Fiber: Hempcrete approved for residential buildings in the U.S. in 2022.
- Forecast of 7.8M acres of hemp in 2030 (62% grain, 36% fiber, 2% flower)
- Major Federal funding in infrastructure, renewable energy and climate-smart agriculture could drive investments and production for fiber.
  - "Inflation Reduction Act" (primarily a climate bill): major R&D in hemp for carbon sequestration and as feedstock for biofuels;
  - Infrastructure Bill: potential funding for hemp-fiber construction materials (erosion mats, noise barriers, engineered composites, building materials)
  - USDA Partnership for Climate-Smart Commodities investing > $50M in hemp fiber and grain production.
- USG funding for agricultural development and reconstruction in Ukraine may include hemp; US hemp export promotion actively funded by USDA

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Regulatory uncertainty is the main barrier to growth

- Interest among farmers is increasing, but many farmers were hurt by the post-2020 bust and are reluctant to re-engage, even for a different type of hemp crop;
- Continuing regulatory uncertainty focused on THC continues to deter investment in the sector, constraining infrastructure for fiber and grain. This was the top-ranked concern in a 2022 survey of U.S. hemp industry enterprises.
- Requirement that hemp contain not more than 0.3% delta-9 THC: undue risk for farmers; allows other intoxicating THCs into the hemp market.
    - 0.3% was selected arbitrarily for testing leaves (not flower) in 1976.
    - *46 states favor changing to 1% total concentration of tetrahydrocannabinols; fixes both problems.*

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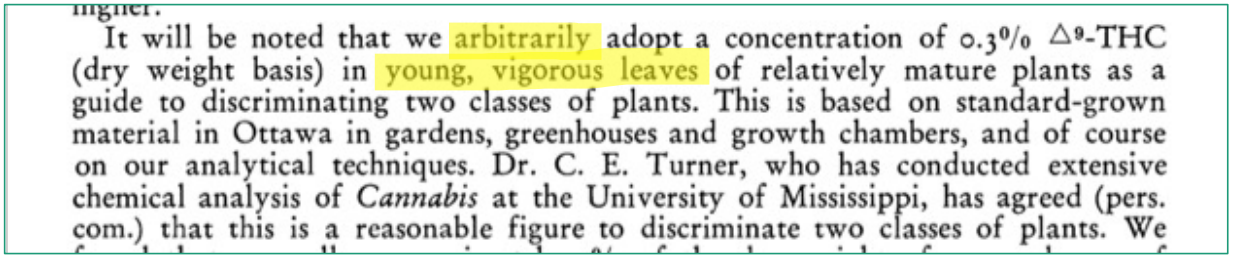
A Practical and Natural Taxonomy for Cannabis Author(s):

Ernest Small and Arthur Cronquist
Source: *Taxon,* Vol. 25, No. 4 (Aug., 1976), pp. 405-435
https://www.jstor.org/stable/1220524
Accessed: 08-07-2019 21:03 UTC



higher.

It will be noted that we arbitrarily adopt a concentration of 0.3% Δ^9-THC (dry weight basis) in young, vigorous leaves of relatively mature plants as a guide to discriminating two classes of plants. This is based on standard-grown material in Ottawa in gardens, greenhouses and growth chambers, and of course on our analytical techniques. Dr. C. E. Turner, who has conducted extensive chemical analysis of *Cannabis* at the University of Mississippi, has agreed (pers. com.) that this is a reasonable figure to discriminate two classes of plants. We

Regulatory uncertainty is the main barrier to growth

- Field sampling of highly variable crops does not achieve burden of proof for non-compliance; (*"not more than"* means *'innocent until proven guilty.')*
  - Crops are sampled and tested 30 days prior to harvest for d9-THC + (0.877 X THCA) < 0.3%, assumes every THCA molecule converts to d9 even though this is impossible outside a vacuum (30%-60% converts)
  - USDA regulations incorporate uncertainty, but only for laboratory results; no accounting for field sampling variance.
  - Lab reports are interpreted based on the estimate itself even though regs require using the low end of the 95% confidence interval
  - Sampling protocols of as little as 1 plant per acre cannot even produce a confidence interval;
  - Cost-prohibitive for farmers and agencies: several states have opted our hemp programs altogether, leaving producers to obtain USDA licenses.
  - It's "compliance theatre." *Replace field sampling with testing of flower products entering commerce, or broaden the use of USDA 'performance-based sampling.'*

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Regulatory uncertainty is the main barrier to growth

- FDA failure to approve CBD in food and supplements (and hemp in animal feed), along with compliance risks, restricts availability of banking and capital:
  - US banking regulations sanction those providing services to illicit manufacturing; banks are risk-averse and place their own burdensome requirements and high fees on clients, if they provide services at all
  - CBD currently not allowed due to FD&C Act 'prior-use drug exclusion.' (Epidiolex)
  - Epidiolex contains extra-strength formulation of CBD, like Rx-strength acetaminophen compared to what's sold over the counter (ironically, the CBD in Epidiolex is extracted from high-THC cannabis, not hemp)
- Patchwork of state laws: some allow CBD in food and/or supplements; some allow animal feed; some use the 0.3% Total THC standard for finished products, in excess of Federal law.
- Criminal background checks for all hemp producers deters many from entering; no other Federally lawful crop is subject to such requirement.

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Hemp in Canada

(Canada information in this presentation is courtesy of the Canadian Hemp Trade Association)

- Canada is a leader in the hemp food sector, with dehulled seed (hearts), hemp seed oil, protein concentrates, and toasted hemp seeds leading the way.
- Total sales in 2020 was $209 million, mostly of processed hempseed products (food).

Key Performance Indicators	2020	Source/Assumptions
Seeded Acres	60,500	Health Canada (converted to seeded acres)
Production (Tonnes)	38,800	CHTA Estimates
Farm Gate Sales (C$,m)	56	CHTA Estimates
Export Sales (C$, M)	127	Statistics Canada
Domestic Sales (C$, M)	82	CHTA Estimates
Industry Sales (C$, M)	209	Domestic + Export
Number of Jobs (FTE)	1,000	5 FTE/$1M Industry Sales
Jobs Payroll (C$, M)	63	$60,000 TC/FTE
Annual Invested Capital1 (C$, M)	60	2 x Industry Sales, amortized over 7 years
R&D Investment (C$, M)	10	5% of Industry sales
Federal/Provincial Taxes (C$, M)	10	4% of Industry Sales
Economic Contribution (C$, M)	445	Total Industry Sales x 2.127 Multiplier

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Reliance on seed production for food

- Canadian hemp production and processing were re-established in 1998 after a 60-year prohibition; significant commercial production began in 2003.
- Seeded acreage began to expand in 2010, with a high of 44,600 ha in 2017. but then declined to 24,696 ha by 2021, as food processors focused on buying existing hempseed inventories. CHTA believes that expansion resumed in 2022.
- The volatility of hemp seeded area in Canada, although trending up, has been attributed to the reliance on whole food (i.e. seeds in a bag) as the dominant revenue stream.
- Lower marketing risks associated with incorporating Feed, Fibre and Fractions revenue streams will support continued expansion with less annual volatility. The development of the hemp food ingredient market will also propel future growth.

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Regulatory challenges

The Canadian definition of industrial hemp is *a Cannabis plant, or any part of that plant, in which the concentration of THC is 0.3% w/w or less in the flowering heads and leaves*. Industrial hemp also includes the derivatives of industrial hemp plants and plant parts, **excluding the flowering parts or the leaves.**

- Stakeholders are working with the government of Canada to register hemp seed and its derivatives as livestock feed ingredients.
- The fibre decortication (primary processing) sector is expanding its capacity. Value-added fibre processors will continue to increase their capacity and range of products.
- Harvest of chaff (flowers, leaves and stems) by hemp farmers first occurred in 2018, but sale is restricted to Licensed Processors (LPs) operating within the Cannabis Act.
- Only LPs are allowed to extract the cannabinoids (primarily CBD), from the hemp chaff; otherwise it is typically disposed of in the field.

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Prospects for Growth

- Canada's hemp industry has developed on the back of a single revenue stream – food. The addition of multiple revenue streams (feed, fibre and fractions) will reduce risk and increase producer returns.
- Farm gate sales are expected to increase from $81 million in 2021 to $428 million in 2030.
- Total industry sales are expected to increase from $2.769 million in 2021 to $1.1 billion in 2030.
- The industry's contribution to the broader Canadian economy is expected to increase from $587 million to $1 billion in 2025 and $2.4 billion in 2030.
- Seeded hemp area is forecast to increase from 24,500 ha to 40,000 ha in 2025 and 93,000 ha in 2030.

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Prospects for Growth

- Total production is forecast to increase from 39,000 to 244,000 tonnes/yr by 2030.
- Largest growth forecast in hemp straw; adding 125,000 tonnes/year by 2030.
- The next largest will be in conventional hempseed; adding 31,000 tonnes/year.
- Livestock feed and organic hempseed production are expected to increase by 22,000 and 18,000 tonnes/year respectively.
- As the market for hemp biomass/chaff matures, production is expected to increase by over 5,000 tonnes/year.

Key Performance Indicators	2020 (Baseline)	2025 (Goal)	2030 (Vision)
Seeded Acres	60,500	99,000	229,000
Production (Tonnes)	38,800	94,000	244,000
Farm Gate Sales (C$,m)	56	155	428
Export Sales (C$, M)	127	198	522
Domestic Sales (C$, M)	82	272	602
Industry Sales (C$, M)	209	470	1,124
Number of Jobs (FTE)	1,000	2,400	5,600
Jobs Payroll (C$, M)	63	141	337
Annual Invested Capital1 (C$, M)	60	134	321
R&D Investment (C$, M)	10	24	56
Federal/Provincial Taxes (C$, M)	10	24	56
Economic Contribution (C$, M)	445	1,000	2,391

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Parting Thoughts

- Hemp industry volatility in both U.S. and Canada is attributable to focus on a narrow range of value chains (CBD in the U.S., seeds in Canada).
- Regulatory uncertainty and emphasis on THC is the primary barrier to growth.
- A whole-plant approach to developing and regulating hemp production could solve both problems.
- How can regulatory frameworks best support a whole-plant approach to hemp production?
- How can international development and trade best support a whole-plant approach?
- What actions can be taken, now and in the future, toward implementing a whole-plant approach to hemp production around the world?

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