

Industrial Organic Hemp 101

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Industrial hemp (*Cannabis sativa* L.) is a low-THC, multi-product field crop that can be grown to certified-organic standards for grain, fibre, or both — but only inside a licensed, tested, and documented compliance envelope. This guide walks a new producer or processor from regulation through soil, cultivation, harvest, processing, quality assurance, and market entry.

Two regulatory regimes frame it: Canada's *Industrial Hemp Regulations* (IHR, SOR/2018-145) under the *Cannabis Act*, and the U.S. federal hemp definition and USDA Domestic Hemp Production Program (7 CFR Part 990). Both are in active change in 2026, so every regulatory figure below carries a source and should be re-checked before each season.

Scope note. Organic status is a separate certification layered on top of hemp licensing: in Canada under the Canadian Organic Standards (CAN/CGSB-32.310 and 32.311), in the U.S. under the USDA National Organic Program. Agronomic figures are field-trial ranges, not guarantees; local extension data should override them.

Section I — Regulatory Frameworks and Legal Compliance

No hemp is legal until three things line up: a licence, a certified approved seed (Canada) or a registered lot (U.S.), and a passing THC test. Both countries are rewriting their rules in 2026, so treat this section as a dated snapshot.

1.1 Jurisdictional parameters

Element	Canada — Industrial Hemp Regulations	United States — USDA / 7 CFR Part 990
Legal basis	<i>Cannabis Act</i> ; IHR SOR/2018-145, last amended 4 June 2026 (text)	7 U.S.C. §1639o, amended by P.L. 119-37; 7 CFR Part 990 (eCFR)
Regulator	Health Canada	USDA-AMS, or an approved State/Tribal plan

Element	Canada — Industrial Hemp Regulations	United States — USDA / 7 CFR Part 990
Licence	Health Canada licence per activity (sell, import/export, cultivate, propagate, clean seed, process grain, prepare seed)	USDA or State/Tribal producer licence; criminal history report dated within 60 days of application
Site report	Variety, hectares, GPS of each site within 30 days of seeding	Acreage and lot locations to FSA within 30 days of planting
Seed rule	Only pedigreed seed of an approved cultivar may be sown	No federal cultivar list; State plans may add rules
Records	Kept at least 1 year	Per Part 990 reporting, incl. disposal of non-compliant plants

What is changing. Health Canada ran a consultation on cutting IHR red tape from 16 May to 30 June 2026, with any draft amendments to be pre-published in *Canada Gazette* Part I ([Health Canada](#)). In the U.S., P.L. 119-37 (signed 12 Nov 2025) replaces the delta-9 test with a total-THC test; a later law (P.L. 119-103) delays parts of the new definition to 11 Dec 2026 ([CRS IF13136, 28 Sep 2026](#)).

1.2 THC thresholds and varietal selection

The limit is 0.3% w/w in both countries, but what is counted differs.

- **Canada:** 0.3% THC or less in flowering heads and leaves, and the test must account for THCA converting to THC (IHR s. 1(2)–(3)).
- **U.S. today:** USDA pre-harvest testing already measures total THC (post-decarboxylation) under Part 990.
- **U.S. under P.L. 119-37:** the statute itself moves to 0.3% total THC on a dry-weight basis and explicitly names industrial hemp as included ([CRS IF13136](#)). It also caps final cannabinoid products at 0.4 mg total THC per container — a consumer-product rule, not a field rule.

Total THC is calculated as:

$$\text{Total THC} = \Delta^9\text{-THC} + 0.877 \times \text{THCA}$$

Variety choice is your first compliance decision. Canada had 93 approved cultivars for the 2026 season ([StratCann](#)); check Health Canada's current List of Approved Cultivars before buying seed. Pick certified fibre or grain genetics with a multi-year compliance record — CBD-type genetics raise hot-crop risk sharply.

1.3 Licensing, permits and chain of custody

Canada

1. Apply for a Health Canada licence covering every activity you will do (cultivate, sell, process grain, etc.).
2. Buy pedigreed seed of an approved cultivar; keep the official seed tag.
3. File variety, hectares, GPS coordinates and land-owner consent within 30 days of seeding.
4. If growing for seed: sample and dry flowering heads and leaves, test at a competent laboratory, submit results within 15 days, and retain a sample for 1 year.
5. Import or export seed or grain only with a permit per shipment; report to Health Canada within 20 days of release or export.
6. Grain processors must render grain non-viable and keep viability test records.
7. Keep records of form, variety, kg moved, dates, buyers and test results for at least 1 year.

United States

1. Obtain a USDA or State/Tribal licence (with criminal history reports for key participants).
2. Report each lot to FSA within 30 days of planting.
3. Have a trained sampling agent sample no more than 30 days before harvest; harvest within 30 days of sampling or re-sample ([USDA sampling guidelines](#)).
4. Dispose of or remediate non-compliant lots and report it.

Organic overlay. Certified-organic hemp adds a three-year transition on the land, an organic system plan, and buffer zones, audited by a certifier — run both paper trails from day one.

Section II — Agronomic Science and Soil Health Management

Hemp rewards well-drained, uncompacted, fertile ground and punishes everything else; nitrogen supply is the main yield lever in an organic system.

2.1 Soil preparation and bio-remediation

Parameter	Working target	Source
Soil texture	Well-drained sandy loam; heavy clay compacts and hemp is very sensitive to compaction	OMAFRA via Field Crop News
pH	6.0–7.5 (Ontario); 6.2–7.0 for fibre (Rutgers); many labs aim near 6.4–6.5	Field Crop News , Rutgers FS1343 , UF/IFAS SS689
Soil temperature at seeding	8–10 °C optimal; germinates at 4–6 °C	Field Crop News
Seedbed	Firm, packed, good seed-to-soil contact	Field Crop News

Soil-test 4–6 weeks before planting and correct pH with lime well ahead of seeding.

Phytoremediation — use with care. Hemp tolerates and takes up heavy metals such as cadmium and lead, mostly into the roots. But a field study on metal-polluted farmland concluded hemp is *not* an efficient plant for cleaning contaminated ground ([Sci. Total Environ. study, PMC10682123](#)), and a 2026 study recommends restricting food, supplement and medicinal hemp to uncontaminated soils ([Štukelj & Flajšman 2026](#)). Rule for an organic operation: remediation crops go to non-food uses (fibre, energy, materials), and never share a lot with food-grade grain.

2.2 Organic nutrient cycling

Hemp is not a low-input crop. Canadian research cited by UF/IFAS measured total plant uptake around 224 lb N/acre ([UF/IFAS SS689](#)). Conventional guides recommend up to 110 kg N/ha in Ontario, and about 125–150 lb/acre for grain versus 50–150 lb/acre for fibre ([Parr, Legacy Hemp](#)). Grain needs more N than fibre ([Western Producer](#)); excess N causes lodging and delays maturity.

Organic ways to meet that demand:

- **Legume pre-crop** — plough down a clover, alfalfa or pea/vetch stand the season before hemp.
- **Manure and compost** — apply to soil test; credit only the plant-available fraction in year one.

- **Approved organic fertilizers** — pelleted poultry manure or other inputs listed in the permitted substances lists for early-season N.
- **Early availability** — hemp grows fast in its first 6–8 weeks; N must be available then, not after canopy closure.

Check every input against your certifier's permitted substances list before applying it.

2.3 Root architecture and crop rotation

Hemp's taproot can loosen subsoil, and its fast canopy shades out weeds — the main organic weed tool, since herbicide options are limited ([Western Producer](#)).

Rotation rules of thumb:

- Follow a legume or forage to supply N.
- Avoid following canola, sunflower or soybean: sclerotinia can carry over, particularly after canola.
- Leave at least 3 years between hemp crops on the same field to limit disease and volunteer plants.
- Follow hemp with a cereal to clean up volunteers and use residual fertility.

Section III — Cultivation Techniques by End-Use Objective

Decide the end market before you buy seed: it sets variety, seeding rate, nitrogen and harvest date. Fibre wants about three times the seed of a grain stand.

Parameter	Grain (seed & oil)	Fibre (bast & hurd)	Dual-purpose
Variety type	Short, early grain cultivars	Tall fibre cultivars	Taller dual-purpose cultivars
Seeding rate	20–25 kg/ha (Alberta); ~22 kg/ha or 100–125 seeds/m ² (Sask.)	40–60 kg/ha (Alberta); ~66 kg/ha or 300–375 seeds/m ² (Sask.)	Between the two; set by variety
Seeding depth	2–3 cm	2–3 cm	2–3 cm
N for max yield (Alberta trials)	~120 kg/ha	~90 kg/ha	Grain target governs
Days to harvest	90–120	60–90	Grain timing; stalk is coarser

Parameter	Grain (seed & oil)	Fibre (bast & hurd)	Dual-purpose
Typical yield	850–1,000 kg/ha average; up to 1,200–1,500 kg/ha	6–12 t/ha dry stalk (high-yield fibre types)	Both, each below its single-purpose peak

Sources: [Alberta trials](#), [Slaski 2018](#), [Saskatchewan guide](#), [Manitoba Agriculture](#), [Purdue harvest & storage](#).

3.1 Grain production (seed & oil)

- Use a shorter, early cultivar: easier to combine and less fibre wrapping.
- Calculate seeding rate from thousand-kernel weight and target plant stand; Manitoba uses a 30% seedling mortality assumption.
- Plant into soil at 8–10 °C with good moisture; about half the crop's water need falls during flowering and seed set ([OMAFRA](#)).
- Do not over-feed N: past about 120 kg/ha, grain yield falls and lodging rises.
- Keep grain fields free of green weed seed — it complicates drying and lowers grade.

3.2 Fibre production (bast & hurd)

- Seed densely so stems grow tall, thin and unbranched — fine stems carry a higher share of bast fibre.
- Seeding date matters more for fibre than grain: early seeding gives taller plants ([Western Producer](#)).
- For textile-grade fibre, cut at flowering after pollen shed but before seed set, about 70–90 days after seeding. Fibre cut after seed harvest is lignified and fit only for coarse industrial uses ([OMAFRA](#)).
- Standard swathers usually cannot handle fibre hemp; line up specialized cutting equipment first ([Rutgers](#)).

3.3 Dual-purpose and biomass operations

Dual-purpose is the most common industrial hemp system: combine the seed, then bale the remaining straw ([Rutgers](#)).

- Plant a tall dual-purpose variety at a grain-leaning rate.
- Harvest at grain maturity; accept that the straw is coarser and suits hurd, bedding, hempcrete or composites more than textiles.

- Cut high with the combine (about 1 m) to limit fibre wrap, then cut and bale the standing stalk separately ([hemp.com combinig guide](https://hemp.com/combinig/guide)).
- Budget for two harvest operations and two buyers before planting.

Section IV — Harvest, Post-Harvest Handling and Primary Processing

Moisture is the control variable at every step: combine grain wet (22–30%) and dry it fast; bale stalk below 15% and let it reach about 10%.

4.1 Timing and maturity indicators

Crop	Harvest trigger	Moisture at harvest	Storage target
Grain	~70% of seed ripe and seed starting to shatter; ~100–120 days after seeding	22–30% (straight cut); ~30% if swathing	Dry to ≤12% (OMAFRA) — Saskatchewan advises <10%
Textile fibre	Early flowering / pollen shed, before seed set; ~70–90 days	Stalk dries in field during retting	Bale <15%, continue to ~10%
Industrial fibre	Any time after flowering	As above	As above

Sources: [OMAFRA via Field Crop News](#), [Saskatchewan guide](#).

- **U.S. growers:** harvest only after the pre-harvest THC sample is taken, and within 30 days of it.
- **Grain:** later combining means more shattering, bird loss and lower quality (hemp.com). Start aeration drying immediately — wet hemp grain heats fast.
- **Fibre:** a SARE trial found bast share peaked at 38.6% of the stalk at the earliest harvest (74 days), as stems grew woodier later ([SARE ONE22-410](#)).

4.2 Field retting and baling

Retting lets field microbes break down the pectin and other binders holding bast fibre to the hurd.

1. **Cut** with equipment rated for hemp; lay stalks evenly for uniform retting.
2. **Dew-ret** in the field, typically 21–28 days for late-summer cuts in Canadian experience ([Rutgers](#)). Turn the swath for even exposure.
3. **Check daily near the end.** Under-retted stalk decorticates poorly and gives coarse fibre; over-retting weakens fibre ([Cannabis Business Times](#), [SARE](#)).
4. **Bale** below 15% stalk moisture and store dry and covered so bales keep drying to about 10% ([OMAFRA](#)). Wetter bales mould, heat and can self-ignite.

Water retting gives cleaner, softer fibre but adds water treatment and cost; dew retting is the low-capital default.

4.3 Decortication and seed cleaning

Decortication mechanically splits retted straw into bast fibre, hurd, short fibre and dust. One patent filing gives typical product shares of about 20–25% bast, 40–50% hurd, 0–5% short fibre and 25–40% dust by weight ([US Pat. 12018404](#)). An older Ontario rule of thumb: about 1 t bast and 2–3 t core from 3–4 t of good dry retted straw ([hemp.com](#)).

- Target $\geq 95\%$ clean fibre and $\geq 95\%$ clean hurd as a separation benchmark.
- Feed stalk of consistent diameter (roughly $\frac{3}{8}$ – $\frac{1}{2}$ inch) for even retting and processing.
- Contract a decorticator before planting — transport of low-density bales is the main cost killer.

Seed cleaning and conditioning

- Dry immediately after combining; clean out green weed seed and plant matter, which hold moisture.
- Store cool, dry and dark. Processors look for low oxidation; Purdue notes a preference for peroxide value under 2 meq/kg ([Purdue](#)).
- In Canada, grain going to food processing must be rendered non-viable, with viability tested at an accredited lab (IHR s. 25).
- Keep certified-organic lots physically separate and documented through cleaning, drying and storage.

Section V — Supply Chain Economics, Quality Assurance and Markets

Buyers pay for documented quality: an accredited certificate of analysis, a clean contaminant screen, and a carbon claim you can defend. Sign the offtake contract before you plant.

5.1 Laboratory testing and quality assurance

Test	Why	Who requires it
THC / total THC	Legal status of the crop	Canada: competent laboratory, validated methods, results to Health Canada within 15 days (seed crops). U.S.: USDA pre-harvest compliance test
Heavy metals (Cd, Pb, As, Hg)	Hemp takes up metals; disqualifies food and feed lots	Food, feed and supplement buyers; organic certifiers on suspect land
Moisture, peroxide value, free fatty acids	Grain storage life and oil quality	Food processors (Purdue cites PV <2 meq/kg)
Microbial, mycotoxins, pesticide residue	Food safety; proof of organic integrity	Food buyers, certifiers
Seed viability	Non-viable grain rule	Canada IHR s. 25 (accredited seed lab)

Lab selection. ISO/IEC 17025 accreditation is scope-specific — confirm the lab is accredited for the exact analyte and matrix you need ([CASRAI](#)). In the U.S., USDA has delayed enforcing its DEA-registered-lab requirement until 31 Dec 2026 because of limited capacity ([USDA AMS, 23 Dec 2025](#)); labs report results through USDA's HeMP platform ([USDA AMS](#)).

QA routine for every lot:

- ☐ Lot ID linked from seed tag → field → harvest → bin/bale → sale
- ☐ Retained sample stored (Canada: at least 1 year for seed-crop THC samples)
- ☐ COA from an accredited lab on file before the lot ships

- ☐ Organic transaction certificate or equivalent issued with each sale

5.2 Life cycle assessment and carbon sequestration

Hemp’s carbon story is real but conditional: it holds up only when the biomass goes into long-lived products.

- **Field stage.** An Italian cradle-to-farm-gate LCA found a cultivation footprint of 1.9 kg CO2eq per kg of grain (conventional outdoor). Carbon stored in crop residues offset the cultivation footprint, more so in organic outdoor systems ([Meffo Kemda et al. 2024, Frontiers](#)).
- **Food products.** The same study found hemp oil and flour still net carbon-positive; it concluded the chain is carbon-neutral only when all plant parts go into durable goods.
- **Hempcrete.** LCAs commonly report lime-hemp concrete as carbon-negative, with lime binder production the main hotspot ([Materials 2023, PMC10672900](#)). A U.S. cradle-to-gate study found carbon negativity at no less than 20% hemp by weight ([Dev. Built Env. 2024](#)). Published net results range from about –1.6 to –79 kg CO2e per m² of wall ([Arehart, CU Boulder](#)).

For any carbon claim: follow ISO 14040/14044, state the system boundary (cradle-to-gate vs. full life), and do not count biogenic storage in short-lived products.

5.3 B2B market integration

Market	Plant fraction	What buyers check	Organic premium likely?
Food (hearts, oil, protein)	Grain	THC residue, metals, micro, PV, organic certificate	Yes — the main organic market
Animal nutrition	Grain, meal, cake	Regulatory approval for the species, THC, metals	Depends on approval; check CFIA / FDA-CVM status first
Textiles	Long bast fibre	Fineness, length, retting uniformity	Yes for certified organic textiles
Bioplastics & composites	Short bast fibre, hurd	Fibre cleanliness, moisture, consistency	Limited; buyers pay for spec and volume

Market	Plant fraction	What buyers check	Organic premium likely?
Hempcrete & insulation	Hurd (shiv), fibre	Particle size, dust, clean $\geq 95\%$	Rarely; carbon data matters more
Animal bedding	Hurd, dust	Dust level, absorbency	No

Contracting checklist

1. Name the buyer, fraction, spec, price basis and delivery point before seeding.
2. Match variety and seeding rate to that spec (Section III).
3. Price in moisture, dockage and cleanliness discounts.
4. Confirm the processor is licensed (Canada: holders of an IHR or Cannabis Regulations licence for flowers, leaves and branches).
5. Map freight — low-density stalk rarely travels profitably far from a decorticator.
6. Keep U.S. grain and fibre clear of the post-2026 intoxicating-product rules by selling only non-cannabinoid fractions.

Sources and verification notes

All figures were checked by live web search on 5 Oct 2026. Regulatory items are the most time-sensitive; re-verify before each season.

Regulation

- [Industrial Hemp Regulations, SOR/2018-145 \(Justice Laws, current to 14 Jun 2026\)](#)
- [Health Canada — Consultation on potential IHR amendments \(May–Jun 2026\)](#)
- [StratCann — 2026 consultation and 93 approved cultivars](#)
- [CRS IF13136 — Changes to the statutory definition of hemp \(28 Sep 2026\)](#)
- [CRS IF13136 \(17 Aug 2026 version\)](#)
- [7 CFR Part 990, Subpart C \(eCFR\)](#)
- [USDA AMS — Sampling Guidelines for Hemp](#)
- [USDA AMS — DEA lab enforcement delayed to 31 Dec 2026](#)
- [USDA AMS — Information for hemp testing laboratories](#)

Agronomy, harvest and processing

- [OMAFRA hemp production requirements \(Field Crop News\)](#)

- [Manitoba Agriculture — Industrial hemp production and management](#)
- [Alberta — Slaski hemp agronomy backgrounder \(2018\)](#)
- [Saskatchewan hemp production guide \(republished\)](#)
- [Rutgers NJAES FS1343 — Hemp production for fiber](#)
- [UF/IFAS SS689 — Nutrient requirements of hemp](#)
- [Parr, Legacy Hemp — Rules, regulations and agronomics](#)
- [Western Producer — Alberta hemp trials](#)
- [Purdue — Industrial hemp harvest and storage](#)
- [hemp.com — Combining hemp for seed · Harvesting fibre hemp](#)
- [SARE ONE22-410 — Hemp fiber supply chain](#)
- [Cannabis Business Times — Decortication tips](#)
- [US Patent 12018404 — Decortication processing](#)

Soil contamination, QA and carbon

- [Hemp in heavy-metal-contaminated agricultural soils \(PMC10682123\)](#)
- [Štukelj & Flajšman 2026 — Metals in hemp grown in contaminated soil](#)
- [CASRAI — Cannabis/hemp testing requirements](#)
- [Meffo Kemda et al. 2024 — LCA of hemp cultivation and seed foods](#)
- [LCA of a hemp-based building material \(Materials 2023\)](#)
- [Hempcrete cradle-to-gate GWP, U.S. \(Dev. Built Env. 2024\)](#)
- [Arehart — Carbon storage potential of hempcrete](#)

Open items to confirm before publishing: final Health Canada IHR amendments (not yet pre-published as of this date); the USDA rule implementing the total-THC definition; current CFIA and FDA-CVM status for hemp feed ingredients; and the Canadian Organic Standards permitted-substances list in force for your certifier.