

Growing Industrial Hemp (*Cannabis sativa*) in Northern Western Australia

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Industrial hemp has been an important part of agriculture in many countries around the world for thousands of years, supplying food and fibre for clothing, housing, ship sails and ropes. However, during the mid-20th century, hemp fell from favour in the western world due to innovations such as plastics and the popularisation of drugs such as THC (tetrahydrocannabinol) which brought bans on growing and consuming hemp and its products.

Industrial hemp in Western Australia is defined as *Cannabis sativa* where the leaves, stems and flowering parts contain less 1.0% tetrahydrocannabinol (THC). Industrial hemp does not have the psychoactive effect normally associated with prohibited or marijuana varieties.

In the last decade, regulations regarding cultivation of industrial hemp have eased in all states of Australia making it possible to grow industrial hemp once again.

Industrial hemp has many uses and opportunities exist to produce hemp seed products such as hemp flour, roasted kernels, oil, and fibre for textiles, building products, and potentially as an animal fodder.

Industrial hemp varieties are broadly classified into the following:

- **Seed varieties** for human use and consumption. These varieties grow no higher than 1.5 meters in the 6 to 8 weeks prior to flowering that is typically initiated by long days beginning to shorten.
- **Fibre varieties** often grow to over 3 metres tall. The whole plant is harvested to ground level and may be harvested before flowering.
- **Dual purpose varieties** for seed and fibre.
- **Varieties for high biomass production for livestock** (currently under investigation).
- **Varieties for CBD production** (regulated through other legislation and not covered in

Hemp variety selection - considerations

Before planning to grow a hemp crop consider the following:

1. What product is most profitable and suits the farm production cycle.
2. Select the appropriate variety to suit the location and farming practices.
3. Variety selection is dependent on adaptation to tropical or temperate conditions, the length of the vegetative cycle, height at maturity, seed yield, oil content, biomass yield, fibre content, and regulatory requirements.

this series.)

Before planning to grow industrial hemp, growers need to plan their marketing strategy. Will the product be sold at 'farm gate' prices or potentially be more profitable by processing and marketing the seed, fibre, or oil product either by the growers themselves or in a company or partnership with other producers?

Licences for industrial hemp

Before committing to growing hemp in WA, a [licence](#) to grow, harvest, transport, and/or process hemp should be obtained.

Obtaining seed

The new grower should obtain seed from a reputable seed retailer. All seed purchased should come with a germination and purity test. These are critical to getting the correct seeding rate. Growers should consult further documents in this series regarding seeding rates and varieties.

As hemp flowers are open-pollinated and may collect pollen from other hemp plants many kilometres away, maintaining a consistent variety is difficult. Do not keep seed for the next season in case it is contaminated with high THC pollen.

NOTE: Seed is likely to rapidly lose its germination and viability unless stored correctly. Ensure the seed supplier has kept seed at less than 4°C to ensure best quality.

Which variety?

A comparison of varietal characteristics will provide guidance to identify an appropriate variety. Ensure that the information supplied is confirmed for your local conditions - seek local trial reports from DPIRD or other organisations evaluating a range of varieties for their adaptation to local conditions.

As the recommended varieties may change as new varieties are made available, DPIRD publishes its variety data under separate articles. Growers should obtain the latest test results from DPIRD.

Sowing date

Current research in DPIRD's tropical industrial hemp trials at the Ord River Irrigation Area under furrow irrigation methods confirms sowing hemp seed should occur in May to allow the crop to flower in July and be harvested before the next wet season due to the hot conditions of the wet season from October to March. This avoids the seedling emerging when the soil temperatures are very high.

Critical Daylength & Hemp Production

The **Critical Daylength** requirement of a plant is the length of daily sunlight that induces a plant to commence flowering.

Some varieties may not be primed to flower by the summer day length in the tropics, and other varieties may exhibit an independence from daylength and be productive in the shorter tropical dry season.

Similar trials however in the Northern Territory by the Department of Industry, Tourism and Trade, at similar latitudes under overhead irrigation, found seeding was best in October to November. At this stage, it is unclear why the findings were different, but research is ongoing including determining type of irrigation.

Finding the right situation

Successful industrial hemp production needs well drained soils, fertiliser, water (rain and most likely irrigation), pest and weed management and the machinery to sow, maintain and harvest the crop.

Temperature

Hemp is a warm weather crop, but seed will not germinate well if the soil is too hot. The upper soil temperature for seed germination and emergence is 35°C. However, optimum growth occurs when temperatures are between 25°C and 30°C. It appears that mild weather from mid-May to mid-Sept (120 days) at Kununurra is suitable for establishing hemp.

Photoperiod

The photoperiod response of a variety will determine the planting date so that the crop can be in vegetative phase for at least 60 days before the start of flowering for maximum grain and fibre yield. This may be difficult to fit with other climate needs in the Kununurra area.

Soils

Industrial hemp grows well on light to medium textured soils of sandy to light clay loams. Hemp plants do not tolerate waterlogging conditions.

Drainage is an important factor to consider when selecting a site.

Using raised beds on clay soils can reduce the risk of waterlogging in soils prone to being wet.

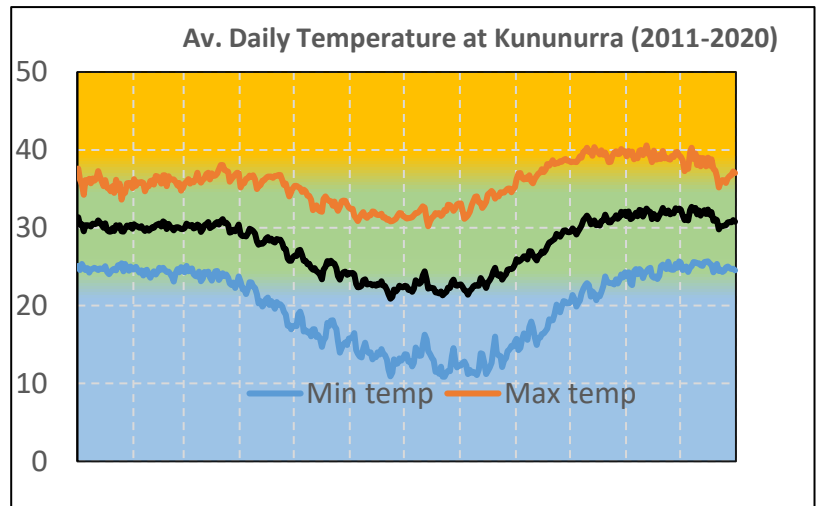


Figure 1 Daily Air Temperatures at Kununurra

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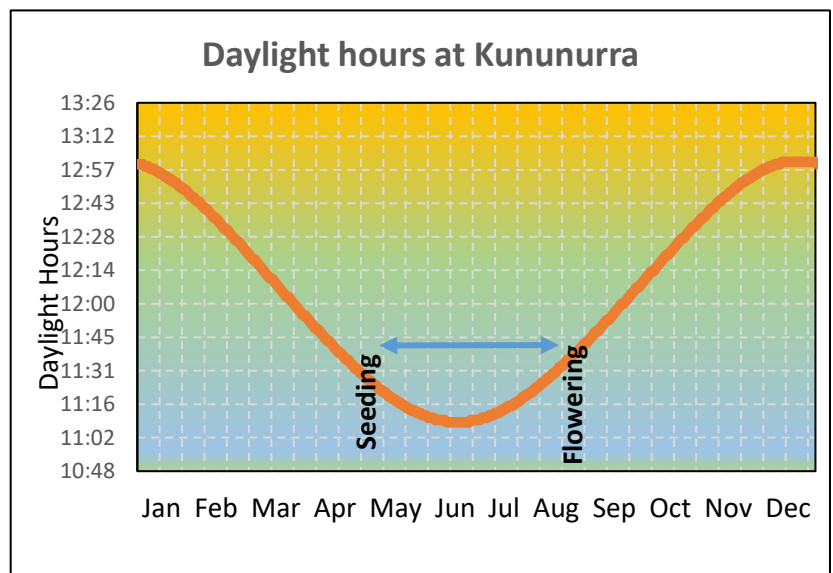


Figure 2 Daylight hours in growing season at Kununurra

Growers should avoid compacted soils as these reduce yields and may add to waterlogging. Soils with pH of more than 6 are preferred. Salinity and soil acidity are likely to reduce crop yields.

Satisfying Crop Needs

Crop Nutrition

It is recommended that a series of soil tests are undertaken when selecting a paddock. Commercial soil tests should give information on availability of the major nutrients, Nitrogen (N), Phosphorous (P) and Potassium (K), and micronutrients such as trace elements, soil acidity (pH) and buffering capacity. An appropriate advisory service will determine optimum levels of nutrient application with expected biomass (kg dry matter per ha), growth and nutrient removal at harvest, possible nutrient deficiencies & residual soil nutrient levels.

Hemp grows best with good levels of nitrogen especially when it is young and actively growing. Trials have shown yield responses with 120-150 kg/ha of N. Likewise, it likes high levels of potassium (120 kg/ha K) and Phosphate (40 kg/ha P).

Fibre crops that grow over 3 meters in 3 months and produce over 10t/ha dry matter, require high N, P, and K which should be supplied by fertilizer if the soil tests show residual soil levels do not match these crop requirements.

Seed or grain crops extract less N, but more P and K from the soil. Therefore seed/grain crops should be fertilised with higher levels of P and K depending on the soil tests.

To Water or Not

In the tropics there is little expectation of rain between May and September, and evaporation is consistently above 5mm per day. Growing hemp in this period means irrigation is a must.

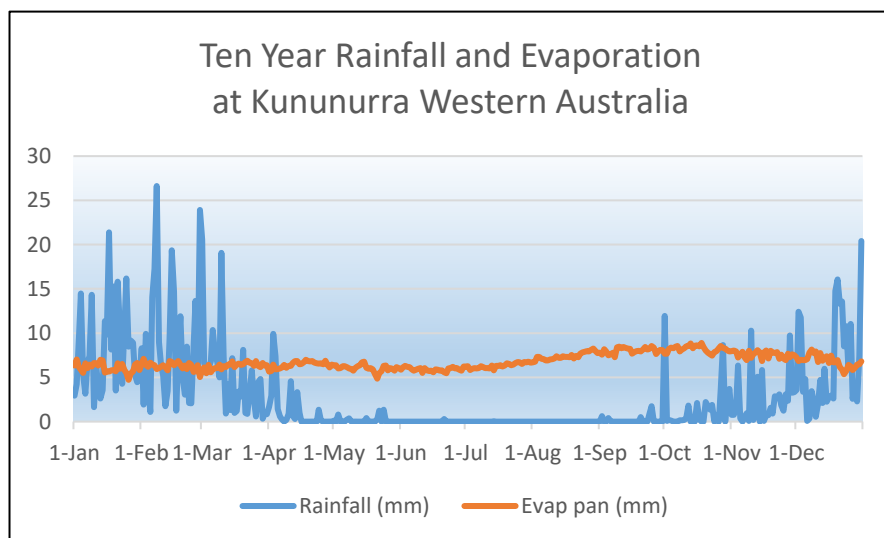


Figure 3 Average Rainfall availability and Water Loss through Evaporation in tropical Western Australia

Industrial hemp is sensitive to dry conditions. Grain yield losses may not be evident during crop growth due to the robust abilities of the established plant.

Without rainfall, the crop may require 6 – 7 megalitres (ML) of irrigation water per hectare. This is approximately equivalent to 600 to 700mm of rainfall.

Until germination has occurred (usually 4–7 days after sowing), irrigation is recommended to keep the surface soil moist. Adequate moisture is required being particularly important during the first six to eight weeks of crop establishment to ensure maximum early canopy closure and effective suppression of weeds.

Ensure that water can be delivered when it is most likely to be needed throughout the season. A wilted crop loses yield potential. The critical times for water are crop establishment and peak crop growth time prior to flowering at around 6 weeks.

Growers are encouraged to install soil moisture meters in their crops for early warning of soil water shortage.

Pests and Diseases

Weeds

The largest early challenge for a successful hemp crop will be weeds. A clean seed bed is important to ensure good establishment of the crop. Weeds rob the small hemp seedlings of water, nutrients and sunlight and reduce the yield significantly if not controlled. Once the crop has reached full leaf coverage of the soil, weeds will be shaded out.

Herbicides such as glyphosate or diquat are commonly used to control weeds in seed bed preparation prior to seeding, as part of a control strategy that may include soil disturbance by cultivation.

Insect Pests

Commonly seen insect pests in hemp in northern Australia include the Native Budworm (*Helicoverpa spp.*) Cabbage Moth, Cabbage Butterfly, and several Armyworms species. Growers should obtain advice on the pest and recommended control measures.

Sowing the crop

Seed bed preparation

A fine, firm, well-prepared flat seedbed is required for fast, uniform germination of hemp seed. Weed control at this point is critical as the small emerging hemp seedlings may not compete with weeds.

Sowing rate/depth

Grain crops usually require between 60-80 plants per square meter at maturity. For fibre production, higher plant density is generally recommended, for example 80-100 seedlings per square meter. Seed should be placed at 10 to 15 mm depth, with good seed - soil contact for best results. Sowing with light soil compaction behind the seeder will assist in germination and establishment. Seed sown too deep will have difficulty evenly germinating, and if it is sown too shallow will risk not germinating at all.

The crop can be planted through conventional seeders or air seeders at the required sowing rate. As the seed is generally soft it should be handled carefully, and the sowing gear set up to reduce crushed or damaged grain. If using air seeders, ensure the air pressure is low as this will reduce the damage caused to the soft seed.

Fertiliser

All the proposed phosphorous (P) and potassium (K) fertiliser should be sown at the same time as the seed, ideally to one side of the seed. Also, half of the nitrogen (N) should be sown with the seed. The other half (approximately 100kg) of nitrogen should be applied to the crop three to four weeks later.

Planning for harvest

Fibre Crops

Good yields of a quality fibre stem product will be achieved if harvest starts when 50% of male plants are flowering (or when female plants have just started flowering).

Grain Crops

Seed heads mature from the bottom of the flower, upwards, and the seed is mature once the seed coat has hardened. When maturation has reached 60-70% (over half of the seed coats have commenced hardening), harvest should be undertaken.

Hemp grains needs to be harvested with some moisture in the grain otherwise grain may be lost through shattering. Generally, the seed is harvested at around 20% moisture and must be dried immediately after harvest to less than 10% moisture to ensure germination is not affected.

As the seed is soft, it is easily damaged by incorrectly operating harvest machinery. Due to the bulk of whole plant, only the seed head should be harvested, and cutting should be as high as possible on the plant. This will reduce machine blockages and further seed damage and loss.

Many of the above topics are covered in more detail in further information bulletins on www.agric.wa.gov.au. Alternatively, you may also contact the authors.

Contact

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