



2018 INDUSTRIAL HEMP PILOT PROGRAM ANNUAL REPORT

Introduction

The Minnesota Industrial Hemp Development Act (IHDA), Minnesota Statutes 18K, became law at the conclusion of the 2015 legislative session. Industrial hemp is defined as *Cannabis sativa* L. with a delta-9 tetrahydrocannabinol (THC) content of 0.3% by dry weight or less. The Minnesota IHDA provided for the development of a research pilot program administered by the Minnesota Department of Agriculture (MDA).

The U.S. Agricultural Act of 2014, section 7606 ("2014 Farm Bill") authorized state departments of agriculture to develop research pilot programs to study the growth, cultivation, and marketing of industrial hemp as an agricultural crop. The MDA obtained a Drug Enforcement Administration (DEA) Schedule 1 Research Registration in January 2016 in order to legally import hemp seed. The MDA established a pilot program for researchers and farmers to grow industrial hemp in Minnesota for the 2016 season.

On December 20, 2018, the Agricultural Improvement Act of 2018 ("2018 Farm Bill") became law. Section 10113 "Hemp Production" excludes hemp from the definition of marijuana in the federal Controlled Substances Act. The U.S. Department of Agriculture (USDA) now has the authority to regulate hemp and oversee commercial cultivation programs administered by state and tribal governments. Minnesota will continue to operate an Industrial Hemp Pilot Program through 2019, allowing farmers to continue growing hemp while the Minnesota state plan is developed, approved by USDA, and implemented.

All first-time applicants are required to submit fingerprints to the MDA and pass a criminal history background check. The applicants must also submit a detailed map of the growing and processing locations and state their research goals. As long as the pilot program continues to operate, the licensees must report agronomic, processing, and marketing findings at the end of the growing season.

THC Testing

Each field is inspected and sampled within 30 days of harvest. The average date of sampling was 79 days after planting. To take a sample, the inspector randomly selected 30 plants per field, cut the top two inches of the plants, and placed all 30 cuttings into an individual paper bag to make a single, homogenized sample. The plant material was then taken to Legend Technical Services Laboratory in St. Paul for cannabinoid analysis using High Performance Liquid Chromatography (HPLC). The MDA looked at delta-9 THC concentration without decarboxylation for regulatory purposes. In 2018, the average delta-9 THC concentration across all samples was 0.014%, well below the required 0.3% threshold (Table 1).

The 2018 Farm Bill specifically requires states and tribes to look at delta-9 THC post-decarboxylation for regulatory purposes. Minnesota will therefore begin looking at the total delta-9 THC post-decarboxylation concentration starting in 2019. Total delta-9 THC obtained by gas chromatography (GC) is equal to $[\text{delta-9 THC} + (\text{THCA} \times 0.877)]$ obtained by high-pressure gas chromatography (HPLC). Average cannabinoid concentrations for all hemp sampled by the MDA in the 2016, 2017, and 2018 seasons are listed in Table 1.

Table 1: Average Percentage Cannabinoid Concentration for Hemp Samples

| Average Concentration Across All Samples | Delta-9 THC (Tetrahydrocannabinol) | THCA (Tetrahydrocannabinolic Acid) | Total delta-9 THC (post decarboxylation) | CBD (Cannabidiol) | CBDA (Cannabidiolic Acid) |
|---|---|---|---|--------------------------|----------------------------------|
| 2016 | 0.003% | 0.046% | 0.044% | 0.008% | 0.590% |
| 2017 | 0.012% | 0.085% | 0.086% | 0.068% | 1.199% |
| 2018 | 0.014% | 0.164% | 0.156% | 0.060% | 2.312% |

Cultivation History

The cultivation and yield data for the 2016, 2017, and 2018 seasons are summarized in the table below (Table 2).

Table 2. Licensee, Planting, and Seed Statistics

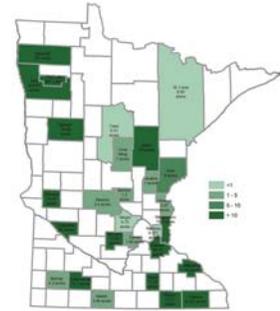
| Statistic | 2016 | 2017 | 2018 |
|--------------------------------------|-------------|-------------|-------------|
| Approved Pilot Applicants | 7 | 47 | 65 |
| Licensed Growers | 6 | 33 | 43 |
| Licensed Processors- Processing Only | 0 | 5 | 8 |
| Approved Acreage | N/A | 2,258 | 1,258 |
| Outdoor Acreage Planted | 38 | 1,202 | 709 |
| Indoor Square Footage Planted | 0 | 0 | 54,618 |
| Total Fields | 8 | 59 | 49 |
| Avg. Field Size | 5 | 22 | 16 |
| Varieties Planted | 6 | 18 | 31 |
| % Acres Planted for Grain | 94.7% | 99.3% | 87.9% |
| % Acres Planted for CBD | 0.0% | 0.4% | 10.1% |
| % Acres Planted for Fiber | 5.3% | 0.3% | 2.0% |
| Amount of seed imported (in pounds) | 1,565 | 46,017 | 20,369 |

2018 Season

In 2018, there was an increase in the number of license holders, and a decrease in the amount of acreage grown. This was partly attributable to the fact that markets and processors for hemp continued to be very limited.

Also, the proportion of growers growing for CBD production increased in 2018. Each CBD grower grew less acreage than each hemp grain grower due to the more costly and labor intensive nature of the cultivation. Approximately 10% of the acreage planted was for CBD production in 2018.

Figure 1. Map of Acreage Grown in 2019



The average planting date was June 11. Fields grown for grain or fiber production were seeded with grain

drills or broadcast planters. Fields grown for CBD production were generally either direct-seeded by hand or the seeds started indoors or purchased as clones, and then transplanted into the field in June. The average date of harvest for CBD production was 121 days after planting; for grain production, 92 days; and, for fiber, 85 days.

Growers were located all across the state (Figure 1). Processors were generally clustered in or near the Twin Cities area.

A majority of the growers applied fertilizer to their fields—either manure or granular fertilizer. The hemp experienced little or no pest damage. Irrigation was used sparingly only in CBD grows. It was an unusually wet year for most areas.

Weeds were suppressed by the dense growth pattern of the hemp plants in fields which had good germination and canopy closure. Fields that had quick seedling establishment, high germination percentages, and tight row spacing generally had low weed pressure. Many areas of Minnesota experienced very high rainfall events early in the season. If the field was flooded within a week or so of planting, then generally the hemp seed struggled to germinate and grow quickly, and the weeds gained an advantage that the hemp was never able to overcome.

Grain was harvested by combine for most of the fields planted for grain production. Most growers straight-combined with a draper/flex head. If the head had a floating cutter bar, then it was pinned to a high, non-floating position. Two growers swathed their field and then followed with a grain pick-up combine.

The fields grown for CBD production were harvested by hand. Plants were cut at the base, and hung to dry and cure in an indoor storage area. Average yields for grain, fiber, and flower can be found in Table 3.

Table 3. THC, Yield, and Financial Data Statistics

| Statistics | 2016 | 2017 | 2018 |
|----------------------------------|-------|------|-------|
| THC Tests Conducted | 17 | 110 | 82 |
| Pass (at or below 0.3% THC) | 17 | 110 | 82 |
| Fail (over 0.3% THC) | 0 | 0 | 0 |
| Avg. Yield for Grain (lbs/acre) | 1,334 | 790 | 1,071 |
| Avg. Yield for Fiber (tons/acre) | 1.07 | 0.23 | 0.56 |

| Statistics | 2016 | 2017 | 2018 |
|--|-----------|-----------|-----------------|
| Avg. Yield for Floral Material (lbs/acre) | N/A | 275 | 972 |
| Avg. Cost to Grow (\$/acre) | \$300 | \$6,078 | \$4,462 |
| Total Gross Profits Reported as of End of the Year | -\$45,485 | \$239,387 | not enough data |
| Avg. Gross Profit | -\$9,805 | \$7,254 | not enough data |

Drying, Storage, and Handling Techniques

Hemp grain producers generally harvested at 15 - 25% moisture and then dried down the grain to 8 - 10% moisture in preparation for long-term storage. The grain must be put on air immediately in order to prevent spoilage - either in aerated bins or by moving/cleaning it frequently until the moisture has fallen to an acceptable level.

Hemp growers producing high-CBD plants hung the harvested, whole plants indoors for approximately two weeks to dry and cure the flowers. Air flow and/or ambient heating was occasionally necessary to prevent mold from developing in the flower heads. After curing, the flowers were then cut by hand or stripped with a bucking/trimming machine.

Markets

Growers have reported sales of \$0.40 per pound for conventional hemp grain, and \$1.00 per pound for certified organic. Gross profits per acre based on average Minnesota grain yields over the last three years would be \$426 per acre for conventional and \$1,065 per acre for organic. Four companies purchased grain from Minnesota growers in 2017 and 2018.

The growers that harvested fiber did not report any sales of harvested material. There are various textile, paper, construction, and composites manufacturers in Minnesota that have expressed interest in purchasing hemp fiber. However, without large-scale decortication capabilities in the state, that market has not yet opened up.

The CBD hemp growers reported yields of 0.5- 1 pound of dried floral material per plant. As of the end of 2018, there are four CBD processors operating in Minnesota. Typical market prices for CBD flower is \$35-\$100 per pound, depending on quality and CBD concentration.

Conclusion

Growers continue to report difficulties cleaning, drying, and properly storing hemp grain. On-farm storage for 12-18 months is commonplace. Grain must be stored properly to prevent spoilage and microbial growth. Grain processing is generally not occurring within the state, so the farmer must be aware of the necessity of shipping longer distances than they are accustomed to.

The fastest growth in hemp production and marketing is in the CBD space. As of the time of this report, the MDA had received 130 applications for the 2019 season. Of those, 85 were planning to grow for CBD, 30 were planning to produce grain, and some intending to do both. Many more CBD processors/extractors are planning to start operating in Minnesota. Seed and clone production should become more common in the Midwest. Breeding efforts will begin to come to fruition and varieties specifically bred for cultivation in Minnesota will become available within the next few years.

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