



2021 Hemp Program Annual Report

Plant Protection Division
Prepared February 2022

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Minnesota Hemp Program

The 2014 Farm Bill contained a provision to allow state departments of agriculture to administer pilot programs to study the growth, cultivation, and marketing of hemp. In 2015, the Minnesota Industrial Hemp Development Act (IHDA) (MINN. STAT. 18K) became law. This allowed the Minnesota Department of Agriculture (MDA) to create a hemp pilot program. The Minnesota Hemp Pilot Program operated from 2016 through 2020.

The 2018 Farm Bill officially legalized hemp cultivation nationally for commercial purposes and removed it from the Controlled Substances Act. On October 31, 2019, the United States Department of Agriculture (USDA) released the Interim Final Rule (7 CFR part 990), which formed the regulatory framework for all hemp cultivation nationwide. Each state and tribal authority are required to submit a plan to the USDA for approval to regulate hemp within their jurisdictions. The Minnesota State Plan was approved in July 2020 and became effective January 1, 2021.

On January 15, 2021, the USDA released the Final Rule (86 FR 5596). The Final Rule contains key changes from the Interim Final Rule based on comments from states, growers, and others in the hemp industry. The revised Minnesota State Plan, updated to incorporate the federal Final Rule for commercial hemp regulation, was approved by USDA and went into effect on May 6, 2021. The [Minnesota plan](#) can be viewed in its entirety on the USDA website.

This report only covers the activities included under the MDA Hemp Program. The [hemp plans for tribal entities in Minnesota](#) are also available on the USDA website.



Figure 1. Hemp plants growing in Minnesota.

Background

To become licensed under the MDA Hemp Program, applicants must register their specific growing and processing locations and pay the annual program fees. Table 1 provides an overview of licensing by the Minnesota Hemp Program since it began in 2016.

Table 1. Minnesota Licensing and Acreage Statistics 2016-2021

Statistic	2016	2017	2018	2019	2020	2021
Applicants	7	47	65	505	586	459
Licensed Growers	6	33	43	353	461	348
Licensed Processors	0	5	21	214	232	247
Outdoor Acreage Planted	38	1,202	709	7,353	4,690	2,830
Indoor Square Footage Planted	0	0	54,618	403,304	282,790	318,713

**Some licensees hold both Grower and Processor license categories; they are included in each category in this table.*

The greatest amount of acreage was planted for CBD production in 2021 (Table 2). Grain production followed at 39% of the total percentage of acres planted, with significantly smaller amounts for the cannabinoid CBG and fiber.

Table 2. Percentage of acreage grown per crop type by year

Statistic	2016	2017	2018	2019	2020	2021
% Acres Planted for Grain	94.7%	99.3%	89.5%	25.2%	48%	39%
% Acres Planted for CBD	0.0%	0.4%	9.6%	74.4%	38.6%	52%
% Acres Planted for CBG	-	-	-	-	4.7%	3%
% Acres Planted for Fiber	5.3%	0.3%	0.9%	0.4%	8.7%	6%

THC Testing

Hemp is defined under state and federal law as the plant *Cannabis sativa* L. with a delta-9 tetrahydrocannabinol (THC) concentration of no more than 0.3% by dry weight. The 2018 Farm Bill specified that delta-9 THC must be determined by post-decarboxylation (Total THC). Compliance of a hemp lot is based on whether the percentage of Total THC result determined on a dry weight basis includes a value of 0.30% within a range specified by a measurement of uncertainty. The measurement of uncertainty adopted by the MDA Hemp Program is based on the laboratory measurement of uncertainty plus sampling variability. The measurement of uncertainty for 2021 was approximately +/- 24% of the value of the percent Total THC test results.

Growers are required by law to report the location of each variety and lot of hemp that they plant to the MDA for regulatory sampling no more than 30 days prior to harvest. To sample a hemp lot, the inspector takes a cutting from 30 different plants randomly selected throughout the population. The top five inches of the female flower are cut from each of the 30 plants, and the cuttings are placed in a single paper bag. The plant material is dried and homogenized by grinding prior to the laboratory analysis for Total THC. Lots which have less than 30 plants are sampled proportionally. All planted varieties are sampled and tested separately.

The pilot program and original state plan required the MDA to sample and test every hemp lot produced in Minnesota. The revised state plan allows the MDA to sample based on random and risk-based factors, as long as the sampling plan ensures 95% confidence that hemp entering the marketplace meets the legal threshold for THC. In 2021, 33 lots were deemed to be low risk based on the parameters laid out in the state plan. Thirty of those lots were still sampled by the MDA because the grower was growing other lots that were high risk, and since the inspector was going to the site to sample the high risk lots they sampled all lots present, regardless of risk factor. A total of three low risk lots were sampled by the growers themselves according to a sampling protocol supplied by MDA and sent to the same lab that processes all the regulatory samples. All the grower sampled low risk lots passed.



Figure 2. An MDA inspector taking a sample of a hemp plant.

In 2021, the MDA collected 520 samples. Of those, 69 tested above the 0.3% THC threshold. The failure rate for initial THC tests was 12%. The failure rates for 2019 and 2020 were similar, with 10% in 2020 and 13% in 2019. The range of the THC concentration for the 2021 failed samples is provided in the table below. A negligent violation was issued to growers that grew cannabis that tested above 1% Total THC. A grower can only receive one negligent violation per year. Furthermore, under the state plan and the federal final rule, if a grower receives three negligent violations in a five year period, the grower cannot participate in the hemp program for five years.

Table 3. Range of THC concentration test results for 2021 failed hemp samples (Total Delta-9 THC post-decarboxylation)

THC Results Range	0.40-0.49	0.50-0.59	0.60-0.69	0.70-0.79	0.80-0.89	0.90-0.99	1.0-1.99	2.0 +
Sample Count	18	14	11	7	1	2	11	5

High-cannabidoil (CBD) varieties accounted for 100% of the total failed samples in 2021. [Research from Cornell University](#) has shown that 33 of the 35 high-CBD varieties they tested eventually went above the 0.3% THC threshold if allowed to reach maturity. The MDA has observed on multiple occasions that the Certificate of Analysis (COA) provided by some seed sellers does not accurately represent the hemp lot when sampled according to the MDA’s sampling protocol, which has been reviewed and approved by USDA. In order for growers to have useful information to choose good genetics, they need access to COAs that reflect the true Total THC level of the variety at the point of maturity that the MDA will sample. Hopefully, now that USDA’s final rule has been established and all states and tribes are required to adhere to specific sampling and testing methods, seed suppliers and sellers will be able to use the same methodologies for their parental varieties, thus improving labeling accuracy for growers.

In an effort to help growers make better choices when selecting varieties, the [MDA publishes a spreadsheet](#) each year which summarizes the following information about each hemp variety grown in Minnesota:

- Number of samples collected
- Average Total THC level
- Lowest and highest recorded Total THC level
- Number of samples that have results in the following ranges:
 - ≤0.300%
 - 0.301- 0.500%
 - 0.501- 0.999%
 - ≥1.000%

Remediation

Remediation is the process of rendering non-compliant cannabis lots to become compliant. This was the first year remediation was available to growers that had lots testing between 0.3% and 1% Total THC. Growers can choose from two different remediation options. Remediation can occur by removing and destroying floral material, while retaining stalk, stems, leaf material, and seeds. Remediation can also occur by shredding the entire plant into a homogenized biomass mixture. This material must then be retested and meet the definition of hemp. Remediated lots receive a Fit for Commerce Certificate. In 2021, remediation was attempted on 17 non-compliant lots. Of those 17 lots, 11 were successfully remediated. At a 65% success rate, remediation may not be a viable option for all non-compliant lots, but does provide the grower with an alternative to the destruction of the lot.

Variety Information

Growers must use caution when sourcing genetics. Despite assurances from the vendor claiming that a variety is guaranteed to be low in THC, there is always the possibility of the plants testing above the THC threshold. In addition to the genetic basis for THC, there are environmental factors that affect THC production, including nutrients, light regime, genetics, and length of time under cultivation. Correct timing, testing, and harvesting is essential. In Minnesota, there have been hemp crops grown from the same seed source, planted in different fields, in which one failed and the other passed the THC regulatory test. We recommend that growers establish a testing program to monitor Total THC in their lots so that they can better time harvest to ensure compliance.

It is also important to plant seed that has been produced under controlled conditions. Hemp plants that have been open-pollinated are unpredictable. There have been several growers in Minnesota that saved and grew seed harvested from their previous production, without controlling the cross-pollination, and the offspring were much higher in THC than the parent plants.

The MDA Hemp Program does not test for CBD or other cannabinoid concentrations during the regulatory testing, only Total THC as required by law. The MDA does not have comprehensive data on these other cannabinoids. One important point to note is that seed companies will often provide their buyers a Certificate of Analysis (COA) of the variety at full maturity to show the highest potential CBD level. However, the THC levels are almost certainly above 0.3% at that same maturity level, so it may not be realistic to achieve the yields portrayed on the COA and also pass a THC regulatory test. This industry is still in its infancy, and although genetics for cannabinoid varieties of hemp are improving, growers still need to be vigilant regarding where they source their genetics.

Harvest

The 2021 growing season presented several challenges. In mid-July the entire state entered into a period of significant drought. Because of differing production systems, many CBD/CBG growers had access to irrigation; whereas, the majority of grain and fiber growers did not. Approximately 5% of the hemp lots planted were destroyed due to drought or disease conditions. The most common hemp diseases encountered included Septoria leaf spot and Sclerotinia white mold. Botrytis gray mold, bud rot, powdery mildew, and fusarium wilt were also observed in lesser frequency. Several insect species were also reported as concerns by growers, but no direct crop losses have been calculated. Hemp growers continue to struggle with disease and pest management as they are not sure where to find more information.

There were 1,897 acres harvested in Minnesota in 2021. Although the acreage grown for hemp in 2021 was lower than previous years, Minnesota is still one of the nation’s leaders in the amount of acreage harvested. Minnesota came in third in the amount of acres harvested in 2021, following Colorado and Montana. The average yields for grain, fiber, CBD flower, and CBD biomass for 2020 and 2021 are shown in Figure 3 and 4.

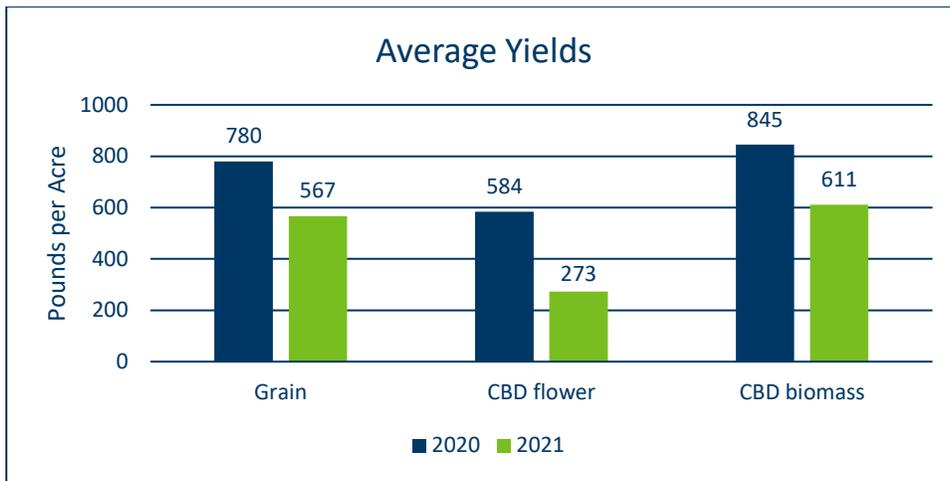


Figure 3. The average yields for grain, CBD flower, and CBD biomass in 2020 and 2021.

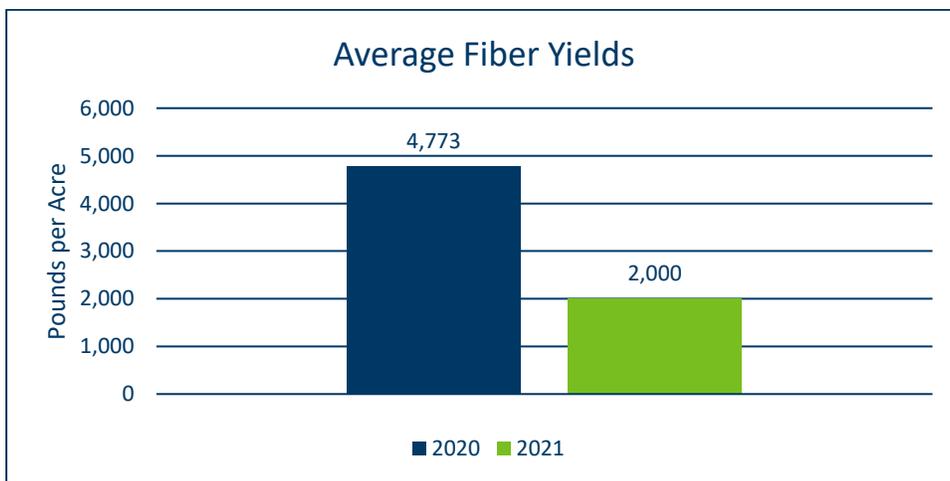


Figure 4. The average fiber yields in 2020 and 2021.

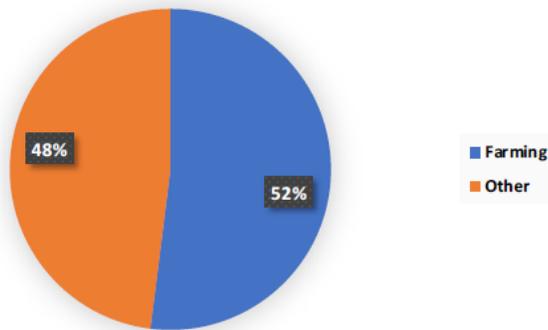
National Statistics

The first National Hemp Report was released on February 17, 2022, by the National Agricultural Statistics Service (NASS). The report in its entirety can be found on the [NASS website](#). According to the National Hemp Report, in 2021, the value of hemp production in the United States totaled \$824 million. There were 54,152 acres planted nationwide in 2021 with a total of 33,480 acres harvested. Minnesota was in the top five for the largest amount of acres planted in 2021 and ended up coming in third for the highest amount of acres harvested.

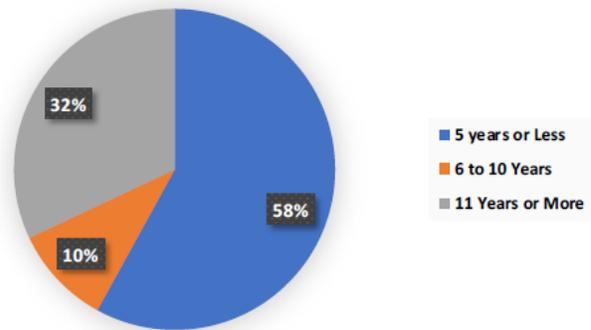
Contract prices for hemp grain in the Midwest averaged \$0.66 per pound. The majority of the fiber grown in the United States was in Montana, and the overall contract prices for fiber in 2021 were \$1.50 per pound. The cost of hemp production is considerable, especially for first-time, small-scale CBD- or CBG- type hemp growers.

The National Hemp Report also included some demographics on hemp growers (Figure 5). Just over half of the hemp growers' primary occupation was farming; while 48% had a different occupation. The majority of hemp growers had five years or less operating any farm. In addition, the age of hemp growers was more evenly distributed with the majority of them between the ages of 35-64.

Primary Occupation



Years Operating Any Farm



Producer Characteristics – Age Group

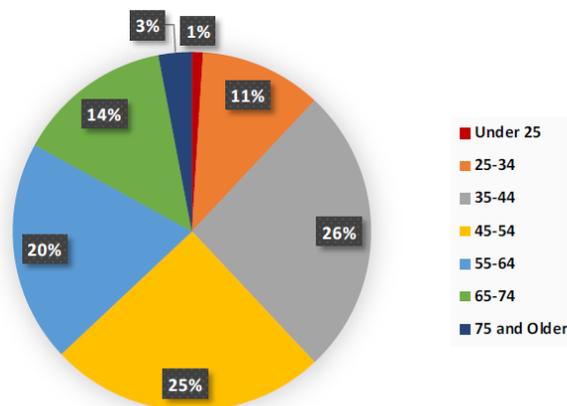


Figure 5. Pie charts showing the primary occupation, years operating any farm, and age demographics from the National Hemp Report.

Processors

There were 247 hemp processors licensed in Minnesota in 2021. A processor is defined as any person or business that converts raw hemp into a product. An MDA Hemp Program license is not required for hemp product manufacturing after it is processed out of its raw form, nor for retail sales. There is still a bottleneck when it comes to processing, as many of the licensed processors do not purchase and process raw hemp on a large scale.

Processors continue to ask for additional regulations to be put in place to promote a fair and even marketplace. In 2021, processor inspections were proposed to the hemp working group. With industry input on the inspection framework, inspections of processing facilities will start in 2022.

Summary

The federal Final Rule made key changes which eased some of the regulatory burden on hemp growers. Random and risk-based sampling and remediation were implemented in 2021. While remediation is a welcome change to the hemp program, it does not solve all the problems.

Growing and processing hemp have certainly provided good opportunities for some in the MDA Hemp Program but have also resulted in crop and financial loss for others. Growers need some way of connecting with trustworthy buyers and help with marketing their product. Proper plant breeding and genetic selection will be extremely important for the hemp industry to flourish moving forward. Until more transparency, consistency, and stability comes to the hemp marketplace, growing and processing hemp will continue to have risks.

When looking back over the past six years of the Minnesota Hemp Program, hemp has dramatically increased in popularity, public awareness, and acceptance, and the overall program has expanded significantly. More investment in processing infrastructure, demand for products, and new innovations continue to foster a brighter future. In order to build a sustaining industry, it will also be important to continue to establish regulations that support farmers and processors while creating an equitable and safe marketplace for the increasing number of consumers who are purchasing hemp products.

For More Information

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