

An introduction to growing hemp in Indiana

by

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INTRODUCTION

Industrial Hemp or *Cannabis sativa* L. is an herbaceous plant in the *Cannabis* genus and belongs to the Cannabaceae family. It is known as one of the world's most useful plant groups and is one of the oldest domesticated crops (Hemp Museum).

Currently, industrial hemp is being grown in over 30 countries that benefit from its countless uses and an established hemp market. In America, farmers have been watching as other countries, like Canada, are on the verge of having a \$1 billion per year hemp industry (Gordon, 2017). Although hemp has been vilified for many years in the U.S., current policy is finally recognizing how hemp could give farmers a new rotational crop. Hemp could help play a key role in dealing with a changing climate and provide a profitable, environmentally sound addition to current crops grown in Indiana (Purdue Hemp, 2015). In a Midwest market dominated by corn and soybean, hemp can be a crop used to diversify the agricultural industry and boost the water and soil quality of the environment (O'Connell, 2017).

TOPIC SELECTION

The passage of the 2014 U.S Farm Bill made it possible for industrial hemp to be grown or cultivated for educational and research purposes. Agricultural pilot programs were then created at the State level that allowed for industrial hemp cultivation. With the inclusion of hemp in the 2018 U.S. Farm Bill, also known as the Agriculture Improvement Act of 2018, many people inside the agricultural community and outside are optimistic about the potential of hemp (HR2).

I had been following the progress of hemp legalization. Once the possibility became a reality in Indiana, I took many opportunities to interact with researchers, agronomic consultants, potential growers, and the community to gauge their understanding of this crop. Local agricultural groups and campaigns are informing the public of the many positive uses and products that hemp fiber and seeds can provide, but skepticism still needs to be overcome. Hemp has the ability to be a profitable prospect, but there is uncertainty surrounding this old but new to us crop that stems from a general lack of information and research. Now seemed like an excellent opportunity to discuss an essential yet controversial topic to help educate a curious public that includes agricultural students or anyone interested in growing hemp.

WHY A LEARNING MODULE?

I chose to develop a learning module to broaden my knowledge and understanding of industrial hemp. Many people have heard about this specialty crop, such as hemp clothing or hemp skincare products, but few know the origins of how those products were created. Many people still do not see the difference between the two varieties of *Cannabis*, and while the two varieties have many of the same features, they have very distinct differences and uses. There is a gap in public knowledge concerning hemp. Still, there is enough idealism in the Midwest to fuel the determination that it will take to help establish this new industry in Indiana. Understanding how a plant that has helped build and support our nation was criminalized and then recently federally legalized is a testament to the potential this crop has to offer.

Hemp is spoken of in casual conversation in connection with biodiversity and sustainability. The larger conversation is that the potential of hemp has yet to be fully realized. The climate and soil conditions in Indiana are considered ideal for the cultivation of hemp, and many growers want to test this new market. With the increased interest in hemp, farmers, the public, and policymakers are wondering what economic opportunities and environmental benefits this crop could provide. A module that can educate these promising attributes would alleviate the confusing and often overwhelming pool of information.

ABOUT THE MODULE

The first chapter of the module focuses on the origins of industrial hemp and the history of this crop in the United States. Humanity has utilized this crop to make paper, textiles, fiber, and medicines for thousands of years (Dwyer, 1998). A small scrap of hemp rope, believed to date back to 8,000 B.C., was located on a piece of pottery in an ancient village in modern-day Taiwan. This hemp relic is thought to be the oldest example of human industry (Cannabis Museum). A quick look at the timeline of *Cannabis sativa* L. in U.S. Agriculture illustrates the history of hemp in our country.

Historically, hemp has been an important crop for North America. By the time the Puritans landed on Plymouth rock, hemp had already been growing in North American soil, and it has been grown in nearly every state since then. The Founding Fathers of our great nation, George Washington, Thomas Jefferson, and John Adams, were known to have grown hemp on their estates. Early settlers produced hemp for oil, sailcloth, and clothing (Gunnells, 2019).

The second chapter focuses on the basics of what the plant, called hemp, is. The hemp plant has three main types: fiber, oilseed/grain, and CBD. Hemp has been selectively bred over many years to produce tall and thin plants with stalks that will create bast fibers and hurds. Pollinated plants will produce a flower that contains an oval-shaped seed that is a highly nutritious source of protein. Feminized hemp plants will produce a flower that contains high concentrations of cannabidiol or CBD. The flower buds are harvested for the valuable oils that can be obtained from them.

Hemp is a dioecious plant sensitive to the local temperature and daylight. Having a specific photoperiod means that flowering will be triggered by shorter days. Female plants will dominate the fields and plots where hemp is planted to reduce the impact on fiber or seed production. CBD hemp will have to be entirely feminized to ensure quality flower production.

Hemp is not marijuana. While the two look and smell alike, they are chemically and structurally different. The traits and characteristics of each species of *Cannabis sativa* L. have been developed through selective breeding. Hemp was bred for its fiber and marijuana for its narcotic components.

The third section focuses on management practices for achieving the proper growth and development for hemp production. All three types of hemp are planted close to mid-May when soil temperatures and local temperatures reach 50 degrees or higher. Fertile loamy soils with good organic matter are the best place to plant hemp seeds. While they require good soil-to-seed contact and moisture in their early stages of

growth, poorly structured soils and too much precipitation can cause low germination and damping off.

While all three varieties have the exact basic requirements for planting, they are different in their planting populations. Fiber is grown in a dense population to promote vertical growth and high-quality bast fiber. Oilseed/grain is planted similar to regular row crops with varied spacing between rows. CBD is the most labor-intensive and requires more spacing between rows for equipment and handwork to be done without disturbing the plants and the valuable flower.

A crop fertility program should always include a recent soil analysis, and a crop of hemp will be no different. The results of an analysis will reveal the existing nutrients in the field(s). Understanding the four stages of growth for this crop is key. Vegetative is the most vital and nutrient demanding stage during the growing season, because 50 percent of the final stem length will occur. The flowering/seed growth stage will determine to the quality of the harvested material at the end of a 16-week suggested fertility program.

Hemp can be affected by diseases and pests in the field, just like any other crop. During initial trials in Indiana, many local insect pests or diseases were not observed, but these will increase with cultivation. Hemp is a crop that must be grown with minimal pesticides, herbicides, and fungicides. The EPA has a list of allowable applications for use on *Cannabis sativa*. Many commonly used products would be applied illegally if used on hemp (Wallheimer, 2018). This means that there are still many challenges that Midwest farmers will face when trying to protect their investment from pathogens and

local pests. Thankfully, a growing number of resources can provide guidance and assistance to a grower if applications are necessary (ISDA, 2021).

During August/October, hemp will be ready for harvest in Indiana. All three types are harvested using different equipment and methods. Europe and Canada have a well-developed processing infrastructure and a finished-goods industry. In the U.S., these markets will have to be strengthened and expanded since specialized harvesting equipment is currently only available overseas. Midwestern farmers are utilizing or retrofitting equipment already on their farms and using new equipment from domestic innovators. Incorrect harvesting methods can render acres of hemp useless, so the final product must be harvested appropriately to ensure high quality.

The harvest method used is different for each type hemp grown. Traditional and specialized equipment have been used with positive results. While each type of hemp crop is harvested differently, all mature plants must be legally compliant. Crops must test below the 0.3% THC legal limit (S.B. 52). Compliance can be achieved with a regular testing program that will meticulously test samples of the hemp crop throughout all growth stages.

Hemp can be used for a myriad of purposes, and the fourth chapter will discuss the many uses and benefits of this crop. Hemp biomass can be used as animal feed, paper, textiles, and biofuel. The seeds and flowers of the hemp plant produce an oil that can be used in health foods and various organic body care products. The seeds are full of several healthy minerals, amino acids, and fatty acids that make up proteins that the human body needs (Crichton-Stuart, 2018). Health and beauty markets have been

expanding to include hemp in many of their products and the CBD oil it can provide, with increasing popularity. Alternative building materials are being developed, such as Hempcrete. Hempcrete is a type of concrete that can be a new form of carbon-negative building material and could be an alternative to our current carbon-intensive construction materials (Jami, 2017). Hemp thermoset compression molding, created to make panel insulation for many major car companies, can now be made from hemp fiber grown right here in the United States (Titan Hemp).

The benefits of growing hemp are perfect for regenerative agriculture. This new mindset focuses on repairing soil fertility, increasing biodiversity, and limiting water waste. Midwestern soils have been damaged due to poor tillage, monoculture, and overfertilization. These practices have forced farmers to rethink how they farm. With the decreased number of acres available for crop growth, it has become apparent that growers need to focus on repairing the soils that they have vs. finding new soil to farm. By utilizing soil-building techniques that will result in beneficial products, hemp can also help sequester carbon and mitigate climate change. Not only can hemp be a profitable crop, but it can also be an eco-friendly and alternative solution to soil pollution (O'Connell, 2017).

The fifth and final chapter of the module pertains to growing hemp in Indiana. Since becoming legal in Indiana in 2018, many farmers have been willing to take the risk and grow hemp under research permits. In the past year, legal changes at the state and federal level have allowed farmers to plan to commercially sell and process their hemp in 2021 for the first time since the 1930s. For the 2020 growing season, the Office

of the Indiana State Chemist issued 256 licenses, and roughly 300 handler sites were planned (OISC, 2020).

China, Europe, and Canada already dominate the hemp markets, with Canada leading with their hemp seed industry (Ministry of Hemp). The U.S. is behind, and we have much to do before we can compete on a global scale. To support and incentivize local farmers, new and old, the federal government has allowed regulations to be governed at a state level. Local authorities will need to understand what is at stake for their growers trying to save their farms and create sustainability.

The time for the restoration of hemp is upon us, and it is up to local agronomists, producers, and advocates in Indiana to steer the direction of legislation and let local farmers learn how to grow hemp. As of 2020, hemp seed is now considered an agricultural commodity and subject to the Indiana State Seed Laws. Producing hemp for seed breeding needs will be the focus of breeders and local farmers growing it for grain. Breeding will help build local hemp varieties and varietal purity to ensure farmers' seed lines are clean and are held to the same standards set by Indiana seed companies for corn, soybean, and wheat.

Hemp has the ability to create new jobs and businesses, but one has to consider all parts of this industry. Financing, insurance, shipping, quality control, and further research are just a few systems that need to be better implemented before a farmer can benefit from hemp as a major crop. A strong market is required to provide the right business market for hemp fiber, seed, and CBD. As the industry continues to strengthen and grow, the enthusiasm will eventually attract the infrastructure needed to support

hemp as a viable crop. Hemp has brought processing plants and manufacturing jobs to other states such as Kentucky and Colorado, and Indiana is hoping for the same. These processing plants are currently being developed in the State of Indiana. BDX-Indiana, built in 2019, is a CBD extraction company based in Westfield, Indiana, that can process up to 750,000 lbs. of hemp a year. FlexForm Technologies has manufactured low-pressure compression molding from natural bast fibers since 2008 in Elkhart, Indiana. The Michigan City-based company Viobin decided to expand its hemp production plant in 2019 in Indiana to process hemp for CBD products. Indiana's fledgling hemp industry has an advocate in the Heartland Hemp Cooperative. HHC is working to build and develop a fair market among member-owners and growers within southern Indiana. The ideal climate, soil conditions, and burgeoning infrastructure are positioning Indiana to be a national leader in hemp cultivation.

VALUE OF THE MODULE

This module is valuable for several reasons. The most important is that it provides an introduction to a plant that has been wrongfully criminalized for over eighty years in the United States. The 2018 Farm Bill legalized hemp at a federal level. While the process of growing hemp can be heavily regulated, there is the potential for hemp to be one of the most valuable crops in the nation. The module highlights many uses and benefits of hemp as a commodity crop that can now be grown commercially and processed in Indiana. The benefits of hemp products to growers are listed to show their value to consumers. As more jurisdictions accept the legalization of hemp and processing infrastructure grows, many believe that hemp will become a significant

contributor to the agricultural community. The possibilities that hemp has to offer are still being fully realized. Hopefully, as research increases along with cultivation and public awareness, more will learn to accept hemp as a new crop despite having a negative association with marijuana. A grower can successfully grow hemp by starting small and having contracts with processors set up for the harvested product. What should not be overlooked is the understanding that it takes time to learn to grow a new crop. Agricultural students and new growers will be essential in helping the general public embrace hemp as an eco-friendly crop with many uses—one of the most intriguing opportunities that Indiana farmers have seen in generations.

SUMMARY

This module was created to provide educational material to those interested in learning more about the crop known as Industrial hemp. Hemp has a long history in the U.S., fraught with both acceptance and criminalization. Many growers, researchers, and regulatory legislators see a future for hemp in Indiana. This misunderstood crop has many issues that will need to be addressed before it's accepted as a new commodity crop. This will require sharing resources with states like Kentucky and Colorado, who are more established in the hemp industry. Capitalizing on hemp as a new market will take time to join Canada or Europe and their established hemp industries. Indiana's local hemp varieties, which grew well in the midwestern climate and soils, have been mostly destroyed, and breeders have a lot of work ahead of them to increase and reintroduce local varieties. Planning and patience on the part of growers will play a significant role in revitalizing the hemp industry in the U.S.

History has shown that hemp has potential as a valuable crop for human civilization, and it has been grown for centuries all across the globe. More research and understanding are needed to make hemp an economically viable addition to a farmer's rotation once again. The prohibition of the past decades will require effort to spur the growth of an industry. This new crop will provide healthy alternatives that are economically and environmentally sound for our agricultural future. It will be necessary to properly educate a producer about the benefits of growing hemp as a new and viably sound crop. More importantly, the overall purpose of this module is to show how a local grower could start growing hemp in the Midwest: specifically, in Indiana. Many uncharted events will need to be navigated, but they shape an exciting future for a new generation of growers who wish to grow hemp.

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