

*Industrial Hemp Investigative and Advisory Task Force report / submitted to the Illinois Senate and to the Illinois House of Representatives, January 26, 2000.*

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*The Industrial Hemp Investigative and Advisory Task Force was created to study the economic viability of industrial hemp production in Illinois, to identify any legal or other obstacles to industrial hemp production, and to make recommendations.*

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## **Industrial Hemp Investigative and Advisory Task Force Report**

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## **Background on Industrial Hemp**

### **History of Industrial Hemp**

Industrial hemp is one of the world's oldest and most versatile plants. Documentation of its use dates back to the twenty-eighth century BC, where the hemp plant was used by the ancient Chinese in textiles and cooking. The ancient Greeks also were known to make fine linens and clothes with its strong and durable fibers. Industrial hemp was also a staple crop of the American Colonies with both President Washington and Jefferson growing it on their plantations.

The first copy of US Declaration of Independence was written on hemp paper, Betsy Ross hand crafted the first American Flag from hemp fibers, Henry Ford used hemp in early automobiles, and the first Levi's jeans were made from hemp cloth.

The use of industrial hemp declined through the nineteenth century as a result of the rise of more convenient and economical resources such as cotton, flax, and wool. Furthermore the advent of the paper made from wood pulp hastened hemp's inability to compete as a viable crop. Finally, in 1937 the United States effectively prohibited the cultivation of cannabis, the species name for hemp, with the Marijuana Tax Act of 1937 because of the government's fear of the plant's psychoactive substances.

With the onset of World War II, the United States desperately needed a viable fiber crop to be used in the manufacture of clothing, rope and tents. The ban on hemp outlined in the 1937 Act was temporarily lifted to meet military needs. Because hemp could be adapted and grown throughout the corn belt, Illinois hemp production flourished. As a result several mills for extracting the fiber were constructed in northern Illinois by the federal government. Each mill processed the industrial hemp from about four thousand acres. Since the straw had to be transported to the mill, all industrial hemp was grown within twelve miles of each plant. Growers had to sign a contract to sell their straw the Commodity Credit Corporation, purchase approved seed and rent special machines for cutting and binding the industrial hemp. During World War II, the federal government subsidized industrial hemp for farmers who grew more than a million acres.

### **Industrial Hemp Plant Description**

Industrial hemp is a distinct variety of the plant species *cannabis sativa* L. This annual herbaceous plant with a slender stem, ranging in height from four to fifteen feet and a diameter from 1/4" to 3/4" is a member the mulberry family. The innermost layer is the pith, surrounded by woody material known as Hurd. Outside of this layer is the growing tissue which develops into hurd on the inside and into the bast fibers the outside. The stem is more or less branched, depending on how densely the crop is planted. When sown thickly the stems do not bran The leaves are of a palmate type and each leaf has seven to eleven leaflets with serrated edges. The strong taproot penetrates deeply into the soil. However, if the soil conditions are unfavorable, the main root remains short, and lateral roots become more developed.

University of Illinois Scientists represented on the Task Force stated that the overall appearance of industrial hemp in production is different from the hemp that is grown for marijuana. Industrial hemp

plants are planted densely, and the plants display little branching and have very long stem. Such a growth pattern and plant morphology would be useless for hemp that is grown for its drug production because the leaves and flowers are what is needed.

Close examination of the foliage of industrial hemp and marijuana would yield differences related to the degree of THC production. THC is produced in a glandular trichome, what appears to be small hairs. Low THC production is associated with glandular hairs that are short with white colored heads. High THC production is associated with longer glandular trichome that have yellow or brown heads. Plants lacking THC production are devoid of glandular trichome. These differences in the trichome have been used as markers in breeding studies for plants with differing levels of THC production. The trichome can be observed using a magnifying glass.

Chemical tests for THC are available and can be used by law enforcement for determining the THC levels of plant material. These tests typically involve sampling a small amount of plant material and yield a color which is indicative of the THC level. Such tests have the capability to definitively determine if plant material is industrial hemp marijuana.

### **Soil**

Industrial hemp can be grown on a wide variety of soils, and much of Illinois has the appropriate soil for industrial hemp growth. Industrial hemp grows best on well-drained, fertile, medium-to-heavy soils, especially silty loam, clay loam and silty clay. Hemp would probably not grow well on soils that are too sandy such as those present in Mason County. Hemp is extremely sensitive to flooding. To achieve an optimum hemp yield, nutrients must be available to the crop. A hemp field produces a very large bulk of plant material in a short vegetative period. The nitrogen uptake is most intensive the first six to eight weeks, while potassium and particularly phosphorous are needed more during flowering and seed formation. Industrial hemp requires eighty to a hundred lbs. per acre of nitrogen, thirty-five to fifty lbs. per acre of phosphate and fifty-two to seventy lbs. per acre of potash.

### **Growing Conditions**

Industrial hemp prefers a mild climate with a rainfall of at least twenty five to thirty inches per year. Moisture is particularly important during the early stages of growth. A normal stand of two-hundred to three hundred industrial hemp plants per square meter shade out the weeds, leaving the fields weed-free at harvest. No chemicals are needed for growing this low maintenance crop. The best time to seed hemp should be dictated by the weather and soil conditions. Hemp can be seeded as early as two weeks prior to corn provided that soil conditions are optimum. However, seeding should not begin until soil temperatures have reached a minimum of forty-two to forty-six degrees Fahrenheit. Hemp seed germinates within twenty-four to forty-eight hours, and emerges in five to seven days with good moisture and warm temperature. Hemp grown for fiber should be seeded as early as possible while hemp for grain should be seeded later to minimize the height of the stalk. In Europe, planting is conducted mid-March to mid-April. The growing season for industrial hemp is about one hundred-twenty to one hundred fifty days. Hence, harvesting would take place in late-August through September.

### **Rotation**

Industrial hemp can be incorporated into a crop rotation, which may improve the health of the soil, due to the reduction in competing weeds and the reduction of herbicide and pesticide treatments.

### **Equipment**

Planting of industrial hemp could be done by seed broadcast or seed drilling. Based upon the literature, seed drilling would appear to be the best means of planting. Harvesting requires cutting the stems at the ground level. Harvesting is more efficient when special equipment is used. However, it is also possible to harvest hemp using conventional equipment that is used for harvesting forage crops. After harvest and field drying, the hemp stalks can be collected with a baler. John Deere in Holland is one example of a company who has produced a piece of equipment called the John Deere Kemper harvester that can cut and chop hemp stalks.

### **Retting**

After the harvest of industrial hemp, bast fibers, which are the long, strong fibers that grow the length of the industrial hemp stalk, are separated from the hemp stalk through the "retting" process. The process of retting involves the microbial decay of pectin, the substance that glues the fiber to the woody core of the hemp stem. Depending on the weather, it takes fourteen to twenty-one days for retting to be completed. During retting, the stems need to be turned once or twice order to allow for even retting, since the stems close to the ground will remain green while the top ones turn brown. When the fibers turn golden or grayish in color and are easily separated from the wood into fine fibers retting is completed. Retting can also be accomplished by water retting, warm water retting and chemical retting.

### **Harvesting**

Industrial hemp is harvested at various stages of growth, depending on the purpose for which it will be used. Harvesting stalks for high quality fiber occurs as soon as the last pollen is shed; for use in building materials, the stalks are harvested at maximum height. Harvesting for seed occurs four to six weeks later, when 60 percent of the seed has ripened. For fiber production the crop is usually cut, retted in the field baled and stored or processed.

### **Cost of Production**

The Oregon Natural Resources Council compiled a possible industrial hemp production budget that were developed using typical costs associated with irrigated field corn in the Pacific Northwest. The bud not only included the variable productions costs such as tillage, seed, and fertilizer; it also included the fixed costs including insurance and amortization of equipment costs. The total production cost per acre was estimated to be \$616.30, the gross income was estimated to be \$375.00 and the net projected return estimate was \$241.30. A similar study conducted by a university in Illinois would benefit farmers in the long run, because then they will know what to expect.

### **Uses of Industrial Hemp**

Primary fibers are long-staple length fibers that can be spun and woven into a fine, crisp, linen-like fabric and used for apparel textiles, home furnishing textiles and carpeting. Anti-mildew and anti-microbial properties make them very suitable for sails, tarps, awnings, and floor coverings. Primary fibers can be cut to shorter staple lengths to accommodate a variety of spinning systems. Hemp fiber blended with wool, cotton, linen or other fibers, adds strength, durability, absorbency and breathability.

Hemp blended fabrics are cool and comfortable to wear and touch. In addition it can be used to make printing paper, fine and specialty papers, newsprint, brake and clutch linings, rope and carpet.

Core fiber is derived from the sturdy, wood-like hollow stalk of the hemp plant. Sometimes referred to as "hurd," it is twice as absorbent wood shavings, making it an excellent animal bedding and garden mulch. It can be easily blended with lime to create strong, lightweight concrete or plaster. Its high cellulose content means it can be applied the manufacturing of plastics. Like primary fiber, it is biodegradable and possesses anti-mildew and antimicrobial properties.

Seed production requires a warmer climate and a longer growing season than hemp fiber production to allow for seed maturation. The seed is light brown to dark gray, in some cases mottled and contains between 2 to 35 percent oils and 25 percent proteins. Hemp seed has eight essential amino acids and three essential fatty acids. It can be ground up and used in soups, cereals, cakes and other foods. Raw hemp seed has commonly been used as feed for domesticated animals as well.

Oil is pressed from the industrial hemp seed. Hemp oil is low in saturated fats at 8 percent of total oil volume; canola contains 6 percent. Oil extracted from the seeds can be used in paints, varnishes, cooking, burning and precision lubrication, as well as in cosmetics.

## **Overview**

### **International**

It is legal to grow industrial hemp in: Austria, Australia, Canada, Chile, China, Croatia, Czech Republic, Denmark, England, Finland, France, Germany, Holland, Hungary, Ireland, Italy, Korea Democratic People's Republic, Republic of Korea, the Netherlands, New Zealand, Nicaragua, Poland, Portugal, Romania, Russia Federation, Slovenia, South Africa, Spain, Switzerland and the Ukraine.

Australia allows research of industrial hemp. China leads in the export of industrial hemp paper and textiles. France first harvested a substantial crop in 1994. Many technologies and products are being developed in Germany, but they are importing raw materials for clothes and paper. Hungary is rebuilding their hemp industry and is exporting hemp fabric to the United States. Russia maintains the largest hemp germ plasm collection in the world at the N.I. Vavilov Scientific Research Institute of Plant Industry in Saint Petersburg.

### **North America**

Hungary, the Netherlands and China are major sources of raw hemp that is imported into the United States. The United States exports raw or retted hemp to Belgium, Panama, Canada and Haiti after some value added activities have occurred, that was previously imported into the United States.

### **Canada**

Canadian hemp cultivation is in its fifth year with 1998 being the first year for commercial licenses. In the early 1990's, Canadian farmers began their campaign to reintroduce industrial hemp. Goef Kime, an Ontario farmer, pioneered the effort and was granted permission from the government to plant a research test plot. Hemp production is concentrated in specific areas across Canada and is composed mainly of

small acreage. In 1998, 346 applications were received for licenses to cultivate industrial hemp, out of the 346 applications, 246 licenses were granted, which roughly totaled around 6,000 acres of industrial hemp production. In 1999 Health Canada received 715 applications for license to cultivate industrial hemp, and out of the 715 applications, 674 were granted for cultivation, which roughly totals 35,000 acres of industrial hemp production.

The Therapeutic Products Programme of Health Canada is the regulatory agency which oversees the commercial cultivation of industrial hemp in Canada. They established regulations in March 1998 to provide a framework to allow the commercial production and processing of industrial hemp and hemp products without creating undue risk to Canadians while conforming with the requirements of international conventions and obligations. A licensing and permitting scheme are used to control activities under the Industrial Hemp Regulations such that importers, exporters, distributors, growers and processors will be required to apply for and maintain a license or permit to carry out any the activities authorized under the Regulations. Only seeds of approved industrial hemp varieties which have a THC level lower than 0.3 percent in their leaves and flowering heads can be planted.

Jean Marie LaPrise, president of Kenex, Ltd. and an industrial hemp producer in Canada is one of the largest producers, growing approximately 2000+ acres for fiber, grain and seed. LaPrise and his company work closely with the Royal Canadian Mountain Police (RCMP) and Health Canada. Kenex tests the plants for THC levels with a color metric system where red indicates a high THC level and white low THC level.

### **United States**

Because the Controlled Substances Act classifies all cannabis, including industrial hemp as marijuana, industrial hemp is a Schedule I controlled substance. Nonetheless the DEA does not prohibit the cultivation of marijuana for industrial hemp. However under the federal Controlled Substances Act, marijuana is a Schedule I controlled substance. Any person who seeks to cultivate it for industrial hemp must first register with the DEA as a Schedule I manufacturer. In determining whether to issue a registration, the DEA must consider a variety of factors, including whether the applicant has been granted the appropriate state authority to cultivate and what security procedures the applicant will use to prevent the diversion of controlled substance material. The security precautions are extensive and expensive. This process requires that the state has regulations or statute governing the growth of cannabis before granting registration.

Colorado introduced legislation in 1995 to allow farmers to grow industrial hemp, but did not pass. In 1999 sixteen states introduced legislation for study, research or production of industrial hemp. The legislation passed Arkansas, California, Hawaii, Illinois, Minnesota, Montana, New Mexico, North Dakota and Virginia. Legislation did not pass in Iowa, Maryland, New Hampshire, Oregon, Tennessee, Vermont and Wisconsin. Sizable constituencies in Colorado, Idaho, Kansas, Kentucky, Missouri and Pennsylvania have organized to study and promote the hemp industry.

### **Economic Viability**

Industrial hemp produces three main raw materials: bast fibers, hurds, and seeds. The potential for using these three ingredients in different manners makes industrial hemp a versatile product. Whether the cultivation of industrial hemp could lead to a thriving industry, create employment and profits has not been adequately tested. With only two years of commercial production in Canada, growing industrial hemp has benefited a limited number of growers there. The economic advantage for Illinois may lie in its being among the first states to develop and capture the hemp market, but the size of the risk is difficult to judge.

At the annual Illinois Farm Bureau meeting in December of 1999, the Farm Bureau adopted policy #66, which states; Presently, the US imports all of its industrial hemp from Canada and thirty-two other foreign nations. This is a product that can be efficiently produced in country, providing not only an alternative crop, but jobs for America workers. Therefore, we will aggressively pursue actions necessary to require the Drug Enforcement Agency (DEA) to issue permits to US producers allowing the production of industrial hemp.

To date, legal constraints have prevented industrial hemp from being grown on a large scale in most developed nations, so there has been incentive to develop new technology that would maximize hemp's profitability. The bottom line of growing hemp is the cost of transportation to a processing center. Since hemp is a bulky crop, it is not cost-effective to ship hemp far from a processing plant. Jean Ma LaPrise stated that a processing plant for seed could be 150 miles away, but for processing hemp stalks it would be feasible to have the plant 50 miles away. In terms of community economic development, hemp cultivation could lead to jobs in processing centers, as well as in small weaving factories, seed crushing facilities, and pulp mills. Until legislative restrictions are removed from hemp, it is unlikely that investments in improved technology will be made or that the required industrial infrastructure will be developed.

## **Obstacles**

### **United States Government Codes/DEA**

A review of Federal and State Statutes found, that until legislative restrictions need to be removed regarding cannabis sativa. United States Government Codes/Drug Enforcement Administration Pursuant to Title 21, United States Code (21 U.S.C.), Section 802 (1 Defines marijuana as, all parts of the plant Cannabis Sativa L., whether growing or not; the seeds thereof; the resin extracted from any part of such plant, and every compound, manufacture, salt derivative, mixture or preparation of such plant, its seeds or resin. Such terms do not include the mature stalks of such plant, fiber produced from such stalks, oil or cake made from the seeds of such plant, any other compound, manufacture, salt derivative, mixture, or preparation of such mature stalks (except the resin extracted therefrom), fiber, oil, or cake, or the sterilized seed of such plant which is incapable of germination.

Since marijuana is classified as a Schedule I under the Controlled Substances Act and is in Schedule I and IV of the Single Convention Narcotic Drugs, its cultivation, importation, exportation, and distribution are strictly regulated in the United States and throughout the world. The Single Convention Treaty requires that countries adopt necessary controls to prevent the misuse of, and illicit traffic in, the leaves of the cannabis plant.

In the past, the DEA has not granted any registrations for the cultivation of marijuana for industrial purposes. The Controlled Substances Act requires that a determination be made that any such production would be in the public interest. A prime consideration of the public interest rests with the threat of a diversion associated with cultivation. The cultivation of the marijuana plant exclusively for commercial/industrial purposes has many associated risks relating to a diversion into the illicit drug traffic.

In pursuant to 21 U.S.C. 823(a), anyone seeking to grow marijuana must apply for registration as a manufacturer. DEA must consider the following criteria in consideration of an application of this type:

- 1) Maintenance of effective controls against diversion, and limitation of the bulk manufacture (propagation is considered manufacture) to a number of establishments which can produce an adequate and uninterrupted supply of these substances under adequately competitive conditions for legitimate industrial purposes.
- 2) Compliance with applicants, state and local laws;
- 3) Promotion of technical advances in the art of manufacturing these substances;
- 4) A prior conviction record of the applicant under federal and state laws relating to the manufacture, distribution, or dispensing of such substances;
- 5) Past experiences in the manufacture of controlled substances and the existence in the establishment of effective control against a diversion; and
- 6) Such other factors as may be relevant to and consistent with the public health and safety.

Any application to grow marijuana must include detailed documentation regarding these requirements.

The following citations are United States Code that state the law:

21 U.S.C. 812 (10) - Cannabis sativa L. is a controlled substance.

21 U.S.C. 841 - The production, cultivation, or dispensing of Cannabis sativa L. is a felony.

21 U.S.C. 844 - The possession of Cannabis sativa L. is a federal offense.

### **Illinois State Statutes**

Pursuant to 740 ILCS 20/, the Cannabis and Controlled Substances To Claim Act defines cannabis, which includes marihuana as a controlled substance.

Pursuant to 720 ILCS 5501, the Cannabis Control Act, the possession, delivery, and unauthorized production are a state offense.

Pursuant to 505 ILCS 100/, the Illinois Noxious Weed Law, marijuana cannabis sativa L. has been designated and declared a noxious weed within the sovereign territory of the State of Illinois.

## **Recommendations**

The following recommendations are a consensus of the Task Force.

Based upon the review of literature and testimony presented before the task force, the members find that given industrial hemp's versatility, and there is potential for industrial hemp to be an important alternative crop in Illinois. In order for Illinois to maintain its agricultural leadership role in the United States, the task force believes that the General Assembly should enact immediately upon the following recommendations:

- 1) Redefine cannabis sativa L. by differentiating between industrial hemp and marijuana, and include that industrial hemp can contain a level of not greater than 0.3 percent tetrahydrocannabinol (THC) in the Illinois State Statute 740 LCS 20/, the Cannabis and Controlled Substances Tort Claim Act.
- 2) Redefine cannabis sativa L. in Illinois State Statute 720 ILCS 550, the Cannabis Control Act.
- 3) Redefine marijuana (cannabis sativa L.) as not being a noxious weed in Illinois State Statute 505 ILCS/100, the Illinois Noxious Weed Law.
- 4) Encourage Congress to make the necessary changes in the United States Codes: 21 U.S.C. 812 (10), 21 U.S.C. 841, and 21 U.S.C. 844 that relate to cannabis sativa L. (industrial hemp) for production, possession and delivery.
- 3) Recommend the Drug Enforcement Agency and the National Office of Drug Control Policy to adopt a new definition of industrial hemp that would allow a 0.3 percent tetrahydrocannabinol (THC) level in industrial hemp and to make it legal to produce, possess, and deliver industrial hemp in the United States and internationally.
- 4) Request a permit from the DEA to grow industrial hemp on research test plots on universities throughout Illinois. By universities doing research now on industrial hemp, the State of Illinois will be in a position to capitalize the market.
- 5) Allocate money to the universities in Illinois and to the National Research Lab in Peoria, Illinois to conduct a complete market analysis on industrial hemp, and to develop an industrial hemp research test plots, so that they can establish planting dates, harvesting dates and guidelines, establish new industrial hemp varieties which would perform well in Illinois and have low THC levels, establish guidelines for farm machinery use in industrial hemp production, establish viable seed stocks and germ plasm collections, establish guidelines for industrial hemp's' use in conjunction or rotation with current crops, do an economic modeling of profitability, study susceptibility to pathogens and pests, and monitor field production performance, including fiber yields in different regions of Illinois.

- 6) Setup regional informational meetings throughout Illinois for law enforcers, state officials, farmers, businesses, and the general public on industrial hemp.
- 7) Investigate new tools to lower cost to regulate and test industrial hemp.
- 8) Encourage the DEA to ensure state participation in the development of rules and regulations of industrial hemp.
- 9) Adopt a resolution to urge the DEA to work with the USDA to set up a program for the certification of hemp seeds and the regulation of industrial hemp.
- 10) Set up a committee to evaluate and research infrastructure needs and processing capability for full production of industrial hemp.
- 11) Support and fund the establishment of a U.S. and international certified seed bank for industrial hemp (germ plasm) in Illinois.
- 12) Adopt a resolution to urge the DEA and the USDA to jointly establish a protocol for outlying the procedures to allow the recormercialization of industrial hemp in the U.S.
- 13) Adopt a resolution to Congress to establish an aggressive new research program to update the knowledge fund of industrial hemp, se production and marketing.

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