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The Potential for Industrial Hemp Production in Florida

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The purpose of this report is two-fold: 1) to provide an overview of the most current relevant information about industrial hemp production and infer the potential opportunities and obstacles for its production in Florida, and 2) to estimate the research cost to provide information on the potential for industrial hemp production in Florida.

US production

Industrial hemp or hemp, (*Cannabis sativa* L.), is a multiuse crop that has historically been grown in the United States. Production peaked in the 1940's during World War II for use by the armed forces, but then declined sharply to the point of elimination by the mid 1950s. All cannabis varieties, including hemp used for fiber and marijuana that contains tetrahydrocannabinol (THC) used as a drug, were subsequently classified as "Schedule 1 controlled substances" under the Controlled Substance Act[1]. Since passage of the Controlled Substance Act, growth of any cannabis variety requires permitting by DEA. Currently, no active Federal licenses are known to allow cannabis production, except for some limited research opportunities[1]. As such, the current knowledge of hemp production is generally limited to data and information from outside the United States.

World production

In 2013, approximately 153,000 acres of hemp was produced in 30 different countries. These countries include China, several European countries, and Canada, among others. In general, global production has increased from 250 million pounds in 1999 to 380 million pounds in 2011[1]. However, these trends in production seem to follow U.S. demand for hemp seed and oil[1], rather than reflecting a global demand. As such, acreage in Canada has fluctuated widely. Canada grew 8,500, 23,700, 48,400, and 15,600 acres of hemp in 2004, 2005, 2006, and 2007, respectively. This fluctuation was due to over-production in 2006 and improved economics for production of other crops. There has been a steady increase in hemp-licensed acres in Canada since 2008. In 2013, over 66,000 acres of hemp were grown[2].

Uses

There are numerous varieties of hemp with a short plant type used mainly for seed production and those with a tall plant type used mainly for fiber production. Thus, hemp can be grown and harvested for stalks, seed, or both. The stalks contain fibers that can be used to make products ranging from paper to fabric to rope and construction materials. However, "there is some question as to whether hemp fibers

[1] Hemp as an Agriculture Commodity. https://fas.org/sgp/crs/misc/RL32725.pdf
[2] Industrial Hemp Production. www.gov.mb.ca/agriculture/crops/production/hemp.html

can be profitably processed in the United States"[3]. In addition, little is known about "buying points" for hemp products or the infrastructure and markets that may exist to support their movement and sales. The seeds are commonly crushed for oil that is used in a range of cosmetic products while the resulting seedcake can be used as a protein source in many food products. However, there does not appear to be a crushing mill in the United States that can currently process hemp oilseed[4].

Some have suggested that hemp can be an effective biofuel source. However, there are indications that use of hemp feedstock would not easily compete with switchgrass or corn for bioethanol because of lower biomass production and infrastructure constraints. Nor would hemp oil compete well with rapeseed or canola for production of biodiesel[3] because of lower yield per acre.

Growth and production

Hemp varieties are grown in temperate and tropical climates. Hemp appears to favor growing in well-drained soils that are high in organic matter, with a pH above 6.0[5]. Few soils in Florida meet these combined criteria. The crop has been shown to grow successfully with 75-100 lb/acre nitrogen fertilizers. Hemp does benefit from supplemental irrigation, requiring less water for cropping than kanaf and corn but more than sorghum[6].

Hemp hosts a number of disease and insect pests. The most common insect pests are European corn borer, green stink bug and armyworms, all of which are abundant in Florida with significant negative impact on Florida vegetable and agronomic crops. According to McPartland (2003)[7], hemp is also susceptible to grey molds, rust, southern blight, damping off and powdery mildew among others, as well as root knot nematode. Additionally, there are no pesticides currently registered to manage these pests in hemp. Because of these pest issues and lack of available pesticides, it has been suggested that the "ideal preceding crops for hemp include recently broken pastures or fields sown to perennial grasses"[5]. Considering that many of our current vegetable and row crops are also susceptible to these same diseases, pasturelands would likely require renovation for hemp to grow successfully.

Harvest

Harvest can often take place with modified hay and grain equipment[5]. For fiber harvest, a heavy hay mower can be used to cut the stalks where they then lay on the ground for up to 5 weeks as the fibers loosen in the stem (called retting) in preparation for processing[6]. The retted stalks can then be raked and baled. Considering that many of the cultivars reach heights of over 8 feet, it is uncertain how traditional hay baling equipment can process these long stalks. Additionally, the long fibers have been observed to wrap around moving parts of farm machinery and create a fire hazard. Therefore, care must be taken to keep equipment clean of hemp fibers.

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[3] Potential U.S. Production and Processing. http://www.ers.usda.gov/media/328230/ages001ei_1_.pdf

[4] Appendix D. Literature Review of the Agronomics of Industrial Hemp: Seeding and harvesting. https://www.votehemp.com/PDF/National_Industrial_Hemp_Strategy_Final_Complete2.pdf

[5] Industrial Hemp Production (2014). http://www.uky.edu/Ag/CCD/introsheets/hempproduction.pdf

[6] Amaducci, S. et al. (2000). Crop yield and quality parameters of four annual fibre crops in the North of Italy. Industrial Crops and Products 11:179-186.

[7] McPartland (2003). Diseases of Hemp. http://www.apsnet.org/publications/commonnames/Pages/Hemp.aspx

Market opportunities

Since hemp has not been grown commercially in the U.S. since the 1950's, it is impossible to know the market potential of this crop if U.S. restrictions for production are relaxed. However, some recent economic analyses have been conducted using Oregon, North Dakota and Kentucky as models[4]. There are no Federal assistance programs historically or presently in place to support industrial hemp producers. These analyses predicted that net returns would likely range from $-241 to $319/acre. When compared to returns from other commonly grown crops in Kentucky, net returns from hemp were often projected to be higher than either corn or soybeans. Even though the market potential for the Kentucky model was positive, the study predicted that "anticipated returns were likely not large enough to entice grain producers to shift away from grain production"[1]. In order for hemp to be a viable alternative crop, best production practices would need to be developed in growing regions and returns would need to stabilize to more accurately assess risks and rewards.

Future markets are continuing to emerge, led primarily by the cosmetic and health food industry, leading to greater demand for hemp products. However, with current global production (2013) of just 153,000 acres, even a modest acreage increase could impact world supply and price. Therefore, future economic models would need to account for the impacts of new production on profitability, with particular consideration of the advantages of existing Canadian infrastructure for hemp production and processing, and the cost of labor[6].

Regulation

Anatomical differences between hemp and marijuana exist due to different genetics and growth responses to different environmental conditions[8]. Nevertheless, regulation of the hemp crop will be necessary to ensure that THC levels are below the 0.3% threshold. Although several US states and territories are considering legislation favorable to hemp production, the costs and infrastructure that may be associated with state and federal regulatory oversight are unclear. Canada has more recent history with hemp production, with the first commercial licenses issued in 1998. Below is the regulatory process Canada has implemented.

> "Its program is administered by the Office of Controlled Substances of Health Canada, which issues licenses for all activities involving hemp. Under the regulation, all industrial hemp grown, processed, and sold in Canada may contain THC levels no more than 0.3% of the weight of leaves and flowering parts. To obtain a license to grow hemp, Canadian farmers must submit extensive documentation, including background criminal record checks, the Global Positioning System (GPS) coordinates of their fields, and supporting documents (from the Canadian Seed Growers' Association or the Canadian Food Inspection Agency) regarding their use of low-THC hemp seeds and approved cultivars; and they must allow government testing of their crop for THC levels."[1]

Potential invasiveness

The University of Florida – IFAS has developed an assessment[9] that uses 49 questions to determine the potential invasiveness of a species. Hemp was recently evaluated and scored a 21, placing it into the

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[8] Sawler et al (2015). The Genetic Structure of Marijuana and Hemp. PLOS one. DOI:10.1371/journal.pone.0133292

[9] http://assessment.ifas.ufl.edu

category of "High Risk". The primary reasons for the elevated risk is that hemp produces highly germinable seeds and hosts many common plant diseases. In addition, hemp 'escapes' can be found along riverbanks and other areas in the vicinity of where hemp was grown decades ago, underscoring its' potential to survive in out-of-place areas as a weed.

Conclusion

Hemp has qualities that may potentially make it a commercial option for Florida producers. However, the lack of information regarding management of this crop would make profitability uncertain in Florida. The current lack of industry infrastructure to process this commodity and lack of established markets will likely lead to fluctuating price and unstable profitability. Until infrastructure for processing and profitability is better established, few producers will likely be willing to accept these risks of planting hemp on significant acreage.

To assess the risks and rewards of hemp production in Florida, significant research will be necessary. Trials will need to be conducted to answer questions about cultivar and site selection, fertility and irrigation requirements, harvest techniques, and other production and processing issues. Economic analysis of potential markets, and surveys of grower preferences regarding potential adoption of this new crop would also need to be conducted, and production costs and capital requirements would need to be estimated. In the presence of a thin market, a range of market uncertainties exists from functioning of the supply chain, the demand for hemp product as a material input into manufactured products, and the infrastructure to support its processing. These uncertainties can all translate to forms of market risk.

Budget estimate for needed research

The 3-yr budget below is an estimate of costs for research that addresses the potential for industrial hemp production in Florida. Sites selected for the research are UF/IFAS Research and Education facilities at three locations in Florida. Each location represents different soils and climatic conditions. The locations selected are the 1) West Florida REC in Jay, 2) Plant Sciences Research and Education Unit in Citra, and 3) Everglades REC in Belle Glade. An itemized list of budget needs, timeline, and justification will be updated and submitted upon request.

Studies:	Year 1	Year 2	Year 3
Agronomic management: variety trials, planting dates, harvest efficiency, etc	$270,000	$270,000	$270,000
BMP development: irrigation requirement, fertility, etc	$130,000	$130,000	$130,000
Pest management: nematode susceptibility, invasive risk, volunteer management, etc.	$440,000	$440,000	$440,000
Economics: risk analysis, market development, profitability, grower acceptance	$120,000	$120,000	$120,000
Total direct cost	$960,000	$960,000	$960,000
Indirect Cost (10%)	$96,000	$96,000	$96,000
Total	$1,056,000	$1,056,000	$1,056,000

The requested funds for these trials include the cost for land preparation, supplies, and staff for the conduct of the proposed research.