



MEMORANDUM

March 4, 2013

Subject: Potential U.S. Market Effects of Removing Restrictions on Growing Industrial Hemp
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This memorandum was prepared to enable distribution to more than one congressional office.

This memorandum provides information on the U.S. industrial hemp industry, highlighting factors that may affect the overall market for hemp fiber and seed production both domestically and internationally, while focusing on previous market analyses that have been conducted by researchers at the U.S. Department of Agriculture (USDA) and various land grant universities and state agencies.

This memorandum is organized as follows. First, it describes the current U.S. market for retail hemp-based products. Second, it discusses the evolving hemp market in Canada, following the removal of its own restrictions on hemp production in 1998. Third, it presents conclusions from previous market assessments conducted by USDA and some land grant universities. Finally, it describes global production for hemp fibers and seed. Available information from selected feasibility and marketing studies are excerpted, highlighting the expected opportunities and challenges associated with industrial hemp production.

Other background information on the status of current restrictions on U.S. hemp production, which is not repeated here, is available in CRS Report RL32725, *Hemp as an Agricultural Commodity*.

Given the absence since the 1950s of any commercial and unrestricted hemp production in the United States, the Congressional Research Service (CRS) is not able to provide projections of the potential market and employment effects of lifting restrictions on U.S. hemp production within the U.S. Drug Enforcement Agency (DEA) in the Department of Justice.¹ CRS is also not able to predict the potential magnitude and scope of possible future U.S. hemp production should current restrictions be lifted. While expanded market opportunities might exist in some states or localities if current restrictions on production are lifted, it is not possible to predict the potential for future retail sales or employment gains in the United States, either nationally or within certain states or regions.

¹ Under the current U.S. drug policy, all cannabis varieties, including hemp, are considered Schedule I controlled substances under the Controlled Substances Act (CSA, 21 U.S.C. §§801 *et seq.*) and are controlled and regulated by the DEA. Strictly speaking, the CSA does not make growing hemp illegal; rather, it places strict controls on its production and enforces standards governing the security conditions under which the crop must be grown, making it illegal to grow without a DEA permit. Currently there are no active DEA permits and there is no commercial hemp production in the United States.

Part I: Size of Current U.S. Hemp Market

Hemp is not commercially grown in the United States; however, both finished hemp products and raw material inputs are imported and sold for use in manufacturing for a wide range of product categories.² The Hemp Industries Association (HIA) estimates that the total U.S. retail value of hemp products in 2011 was \$452 million, which includes food and body products, clothing, auto parts, building materials and other products.³ Of this, HIA reports that the value of hemp-based food, supplements, and body care sales in the United States is about \$130 million to \$152 million annually. The size of the U.S. market for hemp clothing and textiles is estimated at about \$100 million annually.⁴ Accordingly, the value of sales of food, body products, supplements, as well as clothing and textiles is estimated at about \$230 million to \$252 million per year.⁵

Compared to other U.S. agricultural sectors, the U.S. hemp industry is small, despite a highly dedicated and motivated demand base. For example, the USDA-certified “organic” foods—reported to account for about 4% of total U.S. retail food sales—are reported to have annual sales in excess of \$30 billion annually. By contrast, estimated U.S. sales of \$230 million to \$252 million annually for hemp-based food, body care and fiber products constitute a smaller market overall, compared to total U.S. food sales.

The USDA-certified organic food industry provides a useful point of comparison given the underlying similarities between the two industries. First, the mix of products produced in both the hemp and USDA-certified organic industries is similar: Both are comprised of food, body care products and supplements, as well as clothing and textiles. Second, if restrictions on hemp production were lifted in the United States, then both hemp and organic products would be produced under some sort of regulatory oversight, contributing in some cases to higher production costs (namely, organic products are subject to USDA’s National Organic Program certification standards; hemp production would likely be subject to permits or other regulatory framework similar to those governing Canadian hemp growers). Finally, both industries comprise a small overall share of U.S. agricultural production, although both represent dedicated and specialized niche product markets in the United States.

These two industries differ, however, in an important manner. Specifically, the U.S. organic industry spans a wide range of agricultural products, including fruits, vegetables, tree nuts, and meat and dairy products, among other products, whereas the U.S. hemp industry is based on a single crop. The more narrow scope of the hemp market limits the growth potential for this market, compared to the wide range of USDA-certified organic products.

In the past decade the U.S. organic food industry has grown sharply, rising from an estimated 1% of U.S. food sales (\$6.1 billion) in 2000 to more than 4% (\$26.7 billion) of all food sales in 2010, a nearly five-fold increase over the past decade.⁶ The Organic Trade Association (OTA) reports that the retail value of

² Some estimate that the global market for hemp consists of more than 25,000 products in nine submarkets: agriculture; textiles; recycling; automotive; furniture; food/nutrition/beverages; paper; construction materials; and personal care. For more information, see CRS Report RL32725, *Hemp as an Agricultural Commodity*.

³ R. Fletcher, “U.S. Market for Hemp Food, Body Care and Other Products Continues to Thrive with 2011 Annual Retail Sales Estimated at \$452 Million,” http://www.votehemp.com/PR/2012-09-19-Market_for_Hemp_Food.html.

⁴ HIA, “Hemp Fabric goes High Fashion,” February 11, 2008. Estimate reflects best available current information based on personal communication between CRS and HIA.

⁵ Information on how HIA calculates these estimates is in CRS Report RL32725, *Hemp as an Agricultural Commodity*.

⁶ OTA, “U.S. Organic Industry Overview,” <http://www.ota.com/pics/documents/2011OrganicIndustrySurvey.pdf>; and “Organic foods industry creates more than a half million jobs,” OTA press release, April 25, 2012.

the U.S.-certified organic products reached an estimated \$31 billion in 2011, with an estimated more than 500,000 jobs in the United States.⁷

Nevertheless, comparing the two markets—\$31 billion for U.S. certified organic products and about \$230 million to \$252 million for hemp-based products—and assuming the industry-reported job estimate for the U.S. organic industry of about 500,000 jobs, it may be possible to extrapolate employment in the hemp sectors that produce food, body care products, and clothing at 4,000 jobs nationwide given current annual sales estimates. It is not possible to estimate employment in other U.S. hemp-based sectors, such as for use in construction materials or biofuels. Information is not available on existing businesses or processing facilities that may presently be engaged in such activities within the United States.

Part II: Canada's Evolving Hemp Production

Canada's evolving industrial hemp industry also provides a useful case-study for what might happen in the United States if current restrictions on hemp production are lifted.

The development of Canada's hemp market followed a 60-year prohibition and is strictly regulated.⁸ Oversight of Canada's hemp production is conducted by the Office of Controlled Substances of Health Canada, which issues licenses for all activities involving hemp. 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 (delta-9 tetrahydrocannabinol, marijuana's primary psychoactive chemical) hemp seeds and approved cultivars; and they must allow government testing of their crop for THC levels.⁹

Although hemp cultivation in Canada was legalized in 1998, the market there has developed slowly and encountered disruptions in some years, and continues to face certain challenges, despite widely anticipated market opportunities. Canadian hemp acreage has been variable year-to-year (**Figure 1**). Canada's hemp cultivation still accounts for less than 1% of the country's available farmland. The number of cultivation licenses has also been variable year-to-year, reaching a high of 560 licenses in 2006, followed by a low of 77 licenses in 2008 (with 340 licenses in 2011).¹⁰

⁷ "Organic foods industry creates more than a half million jobs," OTA press release, April 25, 2012, http://www.organicnewsroom.com/2012/04/organic_foods_industry_creates.html. Jobs estimates are based on OTA's commissioned report "2010 Impacts of the U.S. Organic Foods Industry on the U.S. Economy."

⁸ Industrial Hemp Regulations (SOR/98-156), as part of the Controlled Drugs and Substances Act (<http://laws.justice.gc.ca/en/C-38.8/SOR-98-156/index.html>).

⁹ Under Canada's regulation, industrial hemp grown, processed, and sold may contain THC levels no more than 0.3% of the weight of leaves and flowering parts. Canada also has set a maximum level of 10 parts per million (ppm) for THC residues in products derived from hemp grain, such as flour and oil. See CRS Report RL32725, *Hemp as an Agricultural Commodity*.

¹⁰ Health Canada, Industrial Hemp Section, "Cultivation Licenses," October 25, 2011.

A 2008 study of Canadian hemp production cites the following opportunities and continued challenges facing growers in Canada.¹¹ The types of market opportunities cited for Canadian hemp producers include:¹²

- growing markets for hemp seed materials for food and personal care applications;
- a dedicated and favorable demographic, along with societal trends, contributing to new emerging markets;
- resolution in 2004 of import constraints that re-opened the U.S. market (which had been effectively closed in 2000 by DEA);
- overall rising Canadian exports of hemp-based products;
- expanding research and improving production practices to address variable yields; and
- recent upward trends in the number of acres under hemp cultivation in Canada (see **Figure 1**, 2008-2011).

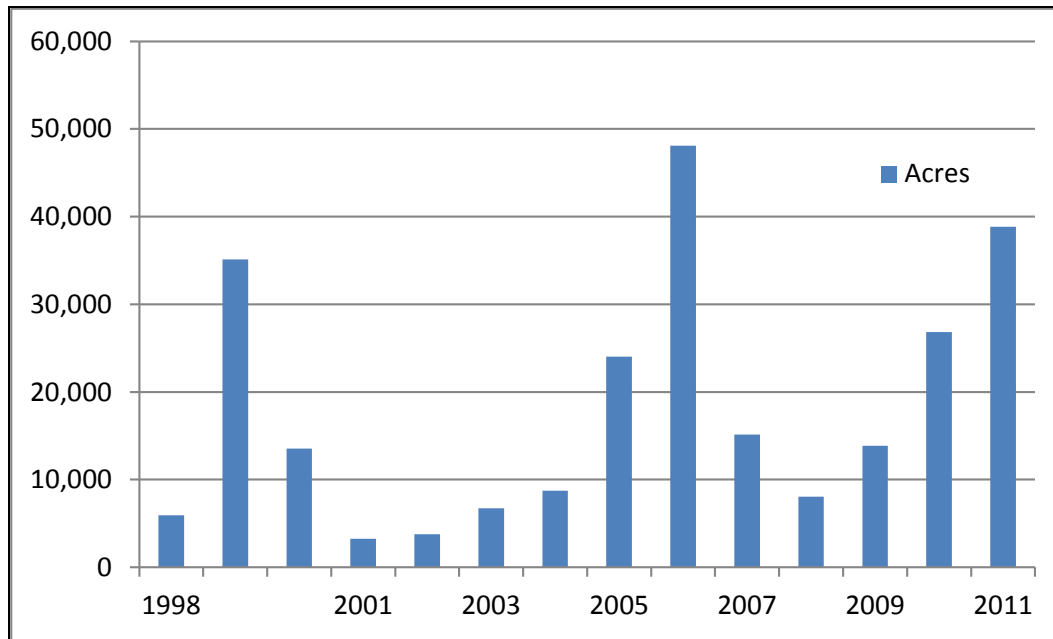
Among the types of continued challenges facing Canada's growers include:

- relatively higher production costs for hemp to comply with the country's licensing regulations (compared to other global jurisdictions, which may not be regulated);
- potential for cross contamination of cultivars, and the cost of testing and proving seeds;
- lack of access to risk capital;
- competition from imports from either lower-cost and mostly unregulated developing countries (such as China, but also countries that export alternative products such as jute and sisal, and other natural fibers) or countries where hemp production may be subsidized (such as in the European Union);
- need to achieve generally recognized as safe (GRAS) status for hemp in the United States, and approvals for other uses and applications;
- limited number of processing facilities that may threaten long term growth;
- need for continued research and public education; and
- need for commitment to hemp as a crop by some government stakeholders.

These same opportunities and challenges facing Canadian hemp growers might also affect U.S. growers of industrial hemp, if current DEA restrictions were relaxed, at least in the near- to mid-term.

¹¹ Manitoba Agriculture, National Industrial Hemp Strategy, March 2008 (prepared for Food and Rural Initiative Agriculture and Agri-Food Canada).

¹² Ibid.

Figure I. Canadian Hemp Acreage, 1998-2011

Source: Agriculture and Agri-Food Canada, "Industrial Hemp Statistics," <http://www4.agr.gc.ca/AAFC-AAC/display-afficher.do?id=1174420265572&lang=eng>.

Note: The downturn in 2007 is viewed as a correction of overproduction in 2006, following the "success of the court case against the DEA in 2004, and continued improvements in breeding, production, and processing," which resulted in part to a "dramatic reduction in hemp acreage planted" in 2007. The downturn in 2007 is also attributed to "increasingly positive economics of growing other crops." Source: Manitoba Agriculture, National Industrial Hemp Strategy, March 2008 (prepared for Food and Rural Initiative Agriculture and Agri-Food Canada).

Part III: Analyses by USDA and Land Grant Universities

In the past two decades, several feasibility and marketing studies have been conducted by researchers at the USDA and various land grant universities and state agencies. Below is a listing of some of these readily available reports and studies (ranked by date).

- Manitoba Agriculture, *National Industrial Hemp Strategy*, March 2008 (prepared for Food and Rural Initiative Agriculture and Agri-Food Canada).
- Maine Agricultural Center, *An Assessment of Industrial Hemp Production in Maine*, January 2007, <http://www.mac.umaine.edu/>.
- T. R. Fortenbery and M. Bennett, "Opportunities for Commercial Hemp Production," *Review of Agricultural Economics*, 26(1): 97-117, 2004.
- J. Bowyer, "Industrial Hemp (*Cannabis sativa* L.) as a Papermaking Raw Material in Minnesota: Technical, Economic and Environmental Considerations," Department of Wood & Paper Science Report Series, May 2001.
- USDA, Economic Research Service, *Industrial Hemp in the United States: Status and Market Potential*, AGES001E, January 2000, <http://www.ers.usda.gov/publications/ages001e/ages001em.pdf>.

- M. J. Cochran, T. E. Windham, and B. Moore, “Feasibility of Industrial Hemp Production in Arkansas,” University of Arkansas, SP102000, May 2000.
- D. G. Kraenzel et al. “Industrial Hemp as an Alternative Crop in North Dakota,” AER 402, North Dakota State University, Fargo, July 1998, <http://ageconsearch.umn.edu/handle/23264>.
- E. C. Thompson et al., *Economic Impact of Industrial Hemp in Kentucky*, Center for Business and Economic Research, University of Kentucky, July 1998.
- D. T. Ehrensing, *Feasibility of Industrial Hemp Production in the United States Pacific Northwest*, SB 681, Oregon State University, May 1998, <http://extension.oregonstate.edu/catalog/html/sb/sb681/>.

Studies by researchers in Canada (2008) and various state report summaries (for example, Arkansas, Kentucky, Maine, Minnesota, North Dakota, Oregon, Vermont) provide a more positive market outlook, citing growing consumer demand and the potential range of product uses for hemp. The 2008 study reported that acreage under cultivation in Canada, “while still showing significant annual fluctuations, is now regarded as being on a strong upward trend.”¹³ Most studies generally note that “hemp ... has such a diversity of possible uses, is being promoted by extremely enthusiastic market developers...”¹⁴ Other studies highlight certain production advantages associated with hemp or acknowledge hemp’s benefits as a rotational crop¹⁵ or further claim that hemp may be less environmentally degrading than other agricultural crops.¹⁶ Some studies also claim certain production advantages to hemp growers, such as relatively low input and management requirements for the crop.¹⁷

Some of the state reports claim that if DEA restrictions on growing hemp in the United States were removed, agricultural producers in their states could benefit. The most comprehensive study of the potential state-wide economic effects of legalizing hemp cultivation in the United States was conducted by researchers at the Center for Business and Economic Research (CBER) at the University of Kentucky (1998). The study concludes:¹⁸

The economic impact if Kentucky again becomes the main source for certified industrial hemp seed in the United States is estimated at 69 full-time equivalent jobs and \$1,300,000 in worker earnings. The total economic impact in Kentucky, assuming one industrial hemp processing facility locating in Kentucky and selling certified seed to other growers, would be 303 full-time equivalent jobs and \$6,700,000 in worker earnings. If two processing facilities were established in Kentucky, industrial hemp would have an economic impact of 537 fulltime equivalent jobs and \$12,100,000 in worker

¹³ Manitoba Agriculture, *National Industrial Hemp Strategy*, March 2008. A study prepared for Food and Rural Initiative Agriculture and Agri-Food Canada.

¹⁴ E. Small and D. Marcus, “Hemp: A New Crop with New Uses for North America,” In: *Trends in New Crops and New Uses*, 2002, p. 321.

¹⁵ See, for example, D. G. Kraenzel et al. “Industrial Hemp as an Alternative Crop in North Dakota,” AER 402, North Dakota State University, Fargo, July 1998; J. B. Kahn, “Hemp ... Why Not?” Berkeley Electronic Press (bepress) Legal Series, Paper 1930, 2007.

¹⁶ See, for example, N. Cherrett et al., “Ecological Footprint and Water Analysis of Cotton, Hemp and Polyester,” Stockholm Environment Institute, 2005; and Reason Foundation, “Illegally Green: Environmental Costs of Hemp Prohibition,” Policy Study 367, March 2008.

¹⁷ See, for example, D. T. Ehrensing, *Feasibility of Industrial Hemp Production in the United States Pacific Northwest*, SB 681, Oregon State University, May 1998.

¹⁸ E. C. Thompson et al., *Economic Impact of Industrial Hemp in Kentucky*, Center for Business and Economic Research, University of Kentucky, July 1998.

earnings. If one processing facility and one industrial hemp paper-pulp plant were established in Kentucky, industrial hemp would have an economic impact of 771 full-time equivalent jobs and \$17,600,000 in worker earnings.

The CBER study claims that “To meet the hemp straw and grain requirements of these bulk commodity uses, hundreds of thousands of acres of industrial hemp would need to be cultivated in North America, and perhaps more”¹⁹ These estimates were based on U.S. demand conditions at the time the study was completed in 1998, and more recent acreage estimates are not available. The study also projects that growers in Kentucky would benefit in the short- and long-run, and derive a profitable return per acre of land planted for both hemp fiber and seed.

Conclusions from other studies focused on the total U.S. market differ from the various state reports and provide an overall less favorable aggregate view of the potential market for hemp growers in the United States. Two studies, conducted by researchers at USDA and University of Wisconsin-Madison (UW-M), highlight some of the continued challenges facing U.S. hemp producers.

For example, USDA’s study (2000) summary states:²⁰

U.S. markets for hemp fiber (specialty textiles, paper, and composites) and seed (in food or crushed for oil) are, and will likely remain, small, thin markets. Uncertainty about longrun demand for hemp products and the potential for oversupply discounts the prospects for hemp as an economically viable alternative crop for American farmers.

The UW-M study (2004) summary states:²¹

The current literature on hemp suggests that it may compete on the margin with traditional crops, but is not likely to generate sizeable profits. Hemp appears slightly more profitable than traditional row crops, but less profitable than other specialty crops. An important constraint to a viable commercial hemp industry is the current state of harvesting and processing technologies, which are quite labor intensive, and result in relatively high per unit costs.

The UW-M study highlights that U.S. hemp growers could be affected by competition from other world producers as well as by certain production limitations in the United States, including yield variability, and lack of harvesting innovations and processing facilities in the United States, as well as difficulty transporting bulk hemp.²² The UW-M study further claims most estimates of profitability from hemp production are highly speculative, and often do not include additional costs of growing hemp in a regulated market, such as the cost associated with “licensing, monitoring, and verification of commercial hemp.”²³

¹⁹ E. C. Thompson et al., *Economic Impact of Industrial Hemp in Kentucky*, pp. 12, 42, and 55.

²⁰ USDA, Economic Research Service, *Industrial Hemp in the United States: Status and Market Potential*, AGES001E, January 2000, <http://www.ers.usda.gov/publications/ages001e/ages001em.pdf>.

²¹ T. R. Fortenbery and M. Bennett, “Opportunities for Commercial Hemp Production,” *Review of Agricultural Economics*, 26(1): 97-117, 2004.

²² *Ibid.*

²³ *Ibid.*

A 2012 crop profile by the University of Kentucky describes the types of registration requirements of obtaining and complying with a DEA permit:²⁴

...even with favorable state laws, potential growers, including researchers, must obtain a DEA manufacturer's permit to produce hemp. DEA application requirements include a nonrefundable fee, FBI background checks, and extensive documentation. In addition, the applicant must be able to demonstrate that effective security protocol will be in place at the production site. These normally include security fencing around the planting, a 24-hour monitoring system, controlled access, and possibly around-the-clock armed guard(s).

Historically, DEA has not granted registrations for the cultivation of industrial hemp (with a possible exception in the late 1990s), given concerns that cultivation “exclusively for commercial/industrial purposes has many associated risks relating to diversion into the illicit drug traffic.”²⁵

Similar to the USDA study, the UW-M study claims most economic studies also “do not account for the potential price impacts associated with a significant increase in the market supply of hemp,” both domestically and globally.²⁶ Given current overall low retail demand levels for industrial hemp in the United States, the industry might not be able to absorb additional farm-level supplies. Oversupply could push prices downward in the market and result in further market disruptions.

Part IV: Global Hemp Production

Approximately 30 countries in Europe, Asia, and North and South America currently permit farmers to grow hemp. Some of these countries never outlawed production, while some countries banned production for certain periods in the past. Recent, reliable, aggregated data on the number of acres worldwide devoted to industrial hemp production are not readily available. China is among the largest producing and exporting countries of hemp textiles and related products, as well as a major supplier of these products to the United States. The European Union (EU) has an active hemp market, with production in most member nations. Production is centered in France, the United Kingdom, Romania, and Hungary.²⁷

Acreage in hemp cultivation worldwide has been mostly flat to decreasing, reported at about 200,000 acres globally in 2011 (**Figure 2**). Although variable year-to-year, global production has increased overall from about 250 million pounds in 1999 to more than 380 million pounds in 2011, mostly due to increasing production of hemp seed (**Figure 3**).²⁸

²⁴ University of Kentucky, Cooperative Extension Service, “Industrial Hemp—Legal Issues,” September 2012, <http://www.uky.edu/Ag/NewCrops/introsheets/hemp.pdf>. See: DEA’s registration procedures (<http://www.deadiversion.usdoj.gov/drugreg/process.htm>) and registration forms (http://www.deadiversion.usdoj.gov/drugreg/reg_apps/onlineforms_new.htm).

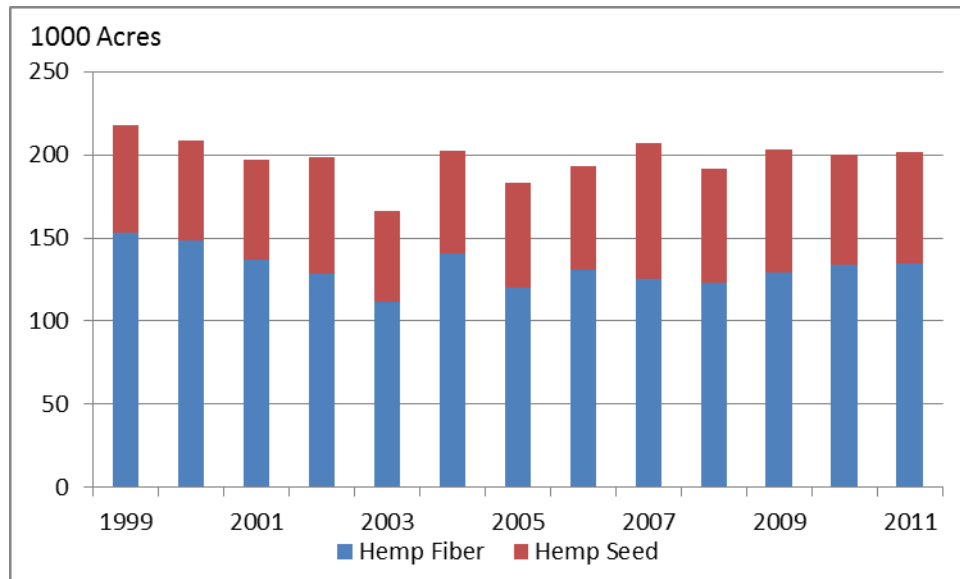
²⁵ DEA, “Statement from the Drug Enforcement Administration On the Industrial Use of Hemp,” March 12, 1998.

²⁶ Ibid.

²⁷ Other EU producing countries: Austria, Denmark, Finland, Germany, Italy, Netherlands, Poland, Portugal, Slovenia, Spain.

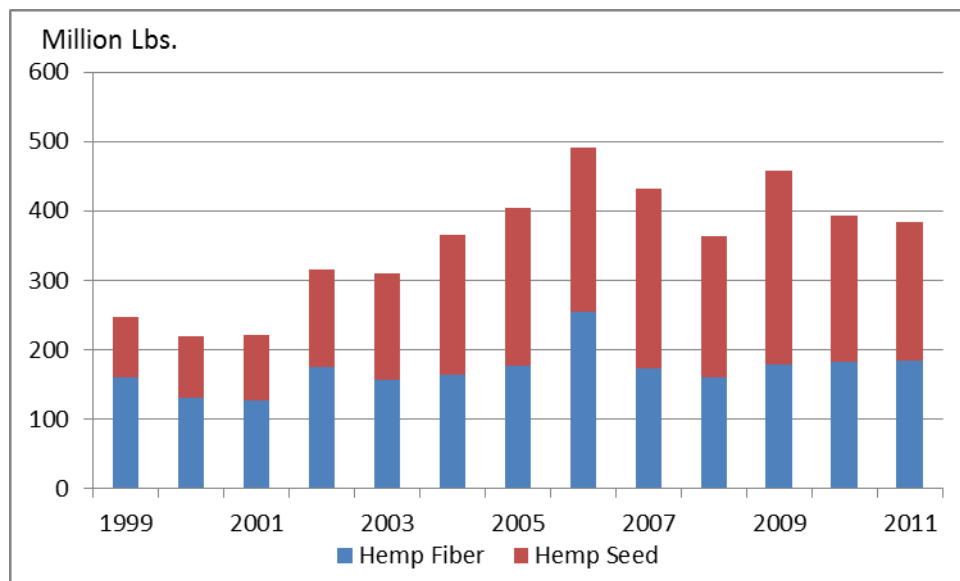
²⁸ Food and Agriculture Organization of the United Nations, FAOSTAT, <http://faostat.fao.org/site/567/default.aspx#ancor>.

Figure 2. Hemp Fiber and Seed, Global Acreage (1999-2011)



Source: FAOSTAT, <http://faostat.fao.org/site/567/default.aspx#ancor>.

Figure 3. Hemp Fiber and Seed, Global Production (1999-2011)



Source: FAOSTAT, <http://faostat.fao.org/site/567/default.aspx#ancor>.

Upward trends in global hemp seed production roughly track similar upward trends in U.S. imports of hemp seed and oil, mostly for use in hemp-based foods, supplements, and body care products. If DEA restrictions on hemp cultivation in the United States were to be lifted, this could allow U.S. producers to capture this small, but promising, market. The value of U.S. imports of hemp seeds and fibers, which are more often used as inputs and ingredients for use in further manufacturing, was nearly \$11.5 million in 2011 (**Table 1**). Compared to available data for 2007, the value of imported hemp products for use as

inputs and ingredients has more than doubled. Trade data are not available for finished products, such as hemp-based clothing or other products including construction materials, carpets, or hemp-based paper products.

It is unknown how much acreage would be required to meet this level of demand for industrial hemp in the United States. It is also unclear to what extent other global producers might out-compete U.S. hemp growers in the future. Currently, the world market for hemp products remains a relatively small, niche and highly specialized market. China, as the world's largest hemp producer, has had and likely will continue to have major influence on market prices and thus on the year-to-year profits of producers and processors in other countries. Canada's head start in the North American market for hemp seed and oil also would likely affect the profitability of a start-up industry in the United States.

Table I. Value and Quantity of U.S. Imports of Selected Hemp Products, 1996-2011

	units	1996	2000	2005	2007	2008	2009	2010	2011
Hemp Seeds (HS 1207990220) ^a	\$1000	—	—	271	2,350	3,111	3,320	5,154	6,054
Hemp Oil and Fractions (HS 1515908010)	\$1000	—	—	711	693	835	726	1,129	839
Hemp Seed Oilcake and Other Solids (HS 2306900130)	\$1000	—	—	—	—	460	1,811	2,369	2,947
True Hemp, raw/processed not spun (HS 5302)	\$1000	100	525	101	88	57	52	33	41
True Hemp Yarn (HS 5308200000)	\$1000	25	396	68	82	202	212	115	425
True Hemp Woven Fabrics (HS 5311004010)	\$1000	1,291	1,617	923	1,579	1,924	751	1,024	1,188
Total		1,416	2,538	2,074	4,789	6,589	6,872	9,822	11,494

Source: Compiled by CRS using data from the U.S. International Trade Commission (USITC), <http://dataweb.usitc.gov>. Data are by Harmonized System (HS) code. Data shown as “—” indicate data are not available as breakout categories for some product subcategories were established only recently.

- a. Data for 2007-2011 were supplemented by reported Canadian export data for hemp seeds (HS 12079910, Hemp seeds, whether or not broken) as reported by Global Trade Atlas, <http://www.gtis.com/gta/>. Official U.S. trade data reported no imports during these years for these HS subcategories. The Canadian export data as reported by Global Trade Atlas also differ for hemp seed oilcake (15159020, Hemp oil and its fractions, whether or not refined but not chemically modified) but were not similarly substituted since other countries exported product to the United States.