

Industrial Hemp in the United States: Status and Market Potential

Abstract

Industrial hemp has been the focus of official interest in several States. However, hemp and marijuana are different varieties of *Cannabis sativa*, which is classified as a controlled substance in the United States. With Canada now allowing hemp production, questions have been raised about the demand for hemp products. 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.

Keywords: industrial hemp, markets, bast fiber, hurds, seed, oil.

The use of commercial or trade names does not imply approval or constitute endorsement by USDA.

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Executive Summary

Industrial hemp and marijuana are different varieties of the same species, *Cannabis sativa* L. Marijuana typically contains 3 to 15 percent of the psychoactive ingredient delta-9-tetrahydrocannabinol (THC) on a dry-weight basis, while industrial hemp contains less than 1 percent. However, the two varieties are indistinguishable by appearance. In the United States, *Cannabis sativa* is classified as a Schedule I controlled substance, regardless of its narcotic content, under the Controlled Substances Act as amended. Since 1990, varieties containing less than 0.3 percent THC have been legalized in Great Britain, Germany, Austria, and Switzerland. Canada and Australia legalized hemp production in 1998. In other countries, such as China, Russia, and Hungary, hemp production was never outlawed.

With Canada now allowing production of industrial hemp, questions have been raised about the potential commercial market demand for industrial hemp products in the United States. Hemp cultivation has been the focus of official interest in several States. The Governor of Kentucky established a Hemp and Related Fiber Crops Task Force in 1994. Legislation passed in Vermont, Hawaii, and North Dakota in 1996 and 1997 authorized agronomic and economic feasibility studies. In 1999, nine States (Arkansas, California, Hawaii, Illinois, Minnesota, Montana, New Mexico, North Dakota, and Virginia) passed legislation concerning the research, study, or production of industrial hemp as a crop. The first test plots of industrial hemp in the United States were planted in Hawaii in December 1999.

Previous experience in the United States and other countries indicates that industrial hemp grows well in areas where corn produces high yields. Plants require plentiful moisture throughout the growing season and need substantial amounts of available nutrients to produce high yields. Hemp can be grown as a fiber, seed, or dual-purpose crop. It is a bast fiber plant similar to flax, kenaf, and jute. The interior of the stalk contains short woody fibers called hurds, while the outer portion contains the long bast fibers. Hemp seeds are smooth and about one-eighth to one-fourth of an inch long.

No data are available on imports of hemp seed and oil into the United States, but data do exist on hemp fiber, yarn, and fabrics. Imports of raw hemp fiber have increased dramatically in the last few years, rising from less than 500 pounds in 1994 to over 1.5 million pounds for the first 9 months of 1999. Yarn imports also have risen substantially, peaking at slightly less than 625,000 pounds in 1997. The switch from yarn to raw fiber in the last 2 years probably reflects the development of U.S. spinning capacity. At least two companies are now spinning hemp yarn from imported fibers. Imports of hemp fabric have more than doubled from over 222,000 pounds in 1995 to about 523,000 pounds in 1998.

Current markets for bast fibers like industrial hemp include specialty textiles, paper, and composites. Hemp hurds are used in various applications such as animal bedding, composites, and low-quality papers. As joint products, finding viable markets for both hemp bast fiber and hurds may increase the chances of a successful business venture. Hemp industry sources and some academic studies cite many potential uses for hemp fiber and hurds. However, for these applications to develop or expand, hemp will have to compete with current raw materials and manufacturing practices. The U.S. market for hemp fibers is, and will likely remain, a small, thin market. Changes in price or quantity could be more disruptive and have a greater adverse impact on market participants than would be the case in a larger market.

Since there is no commercial production of industrial fiber hemp in the United States, the “size” of the market can only be gauged from hemp fiber and product imports. The near-term, low-end size of the U.S. market for hemp as a textile fiber might be defined by considering the domestic production and acreage required to replace imports of hemp fiber, yarn, and fabric in 1999. Assuming a potential U.S. yield of 1,550 pounds of fiber per acre and using linen yarn and fabric conversion factors, the estimated import quantity of hemp fiber, yarn, and fabric in 1999 could have been produced on less than 2,000 acres of land. Given the average size of farms in the United States (near 500 acres), just a few farms could have supplied the hemp fiber equivalent of 1999 import levels.

As a specialty bast fiber, hemp’s closest competing textile fiber is linen. A longer term, high-end size of the potential U.S. market for hemp fiber could be defined as domestic production and acreage required to replace hemp and linen imports. The hemp fiber required to replace the equivalent level of hemp and linen fiber, yarn, and fabric imports in 1999 could have been produced on 250,000 acres—roughly 40 percent of 1999 tobacco acreage, 5 percent of U.S. oat acreage, or 0.4 percent of wheat acreage.

Despite the similarities between hemp and linen, there is no industry consensus as to how closely the markets for the two fibers are allied. But since hemp fiber imports were just 0.5 percent of linen imports during the first 9 months of 1999, the near-term market potential for hemp in the United States for domestic textile production is closer to the low end of the 2,000- to 250,000-acre production-equivalent range. Moreover, the absence of a thriving textile flax (linen) production sector in this country (despite no legal barriers) suggests that hemp, flax’s close cousin in fiber uses and in production techniques, will be unable to sustain adequate profit margins for a large production sector to develop.

In 1998, imports of hemp seed into North America were estimated at 1,300 tons. Given yields in Germany of about 1,000 pounds per acre, it would take 2,600 acres to satisfy the demand for hemp seed. As with fiber imports, it would take only a few average-sized farms to meet this demand. Hemp seeds can be used directly as a food ingredient or crushed for oil and meal. Hemp seeds and flour are being used in nutrition bars, tortilla chips, pretzels, beer, salad dressings, cheese, and ice cream. The market potential for hemp seed as a food ingredient is unknown. However, it probably will remain a small market, like the markets for sesame and poppy seeds. Some consumers may be willing to pay a higher price for hemp-seed-containing products because of the novelty, but otherwise hemp seed will have to compete on taste and functionality with more common food ingredients.

Hemp oil is being used as an ingredient in body-care products, such as lotions, moisturizers, and shampoos, and sold in health food stores as a nutritional supplement. The market for hemp oil is limited by a number of factors. First, mechanical crushing produces a lower oil yield than crushing combined with solvent extraction. Nor does hemp oil undergo degumming and bleaching as do many other vegetable oils. Some consumers prefer an oil that has been processed without chemicals, but others may dislike hemp oil’s color or taste. Second, the oil is high in unsaturated fatty acids, which can easily oxidize, so it is not used for frying and must be kept in dark-colored bottles and has a limited shelf life. Third, to be used as a salad oil, it will have to be tested by the U.S. Food and Drug Administration and found “generally recognized as safe.” Last, as a drying oil, hemp would have to compete on functionality and price with current raw materials, such as linseed and tung oils, in established industrial markets.

Several States have published reports or authorized agronomic and economic feasibility studies of hemp production. The four reports summarized here have focused on different aspects of supply and/or demand. Their estimates of hemp costs and returns reflect these various focuses, as well as different assumed production practices and costs. However, the widest range of estimates exhibited among the reports is for stalk and seed yields and prices—not surprising given the uncertainty about hemp production and current and potential hemp markets. Overall, hemp production was profitable only at the higher end of estimated yields and prices. It seems questionable that U.S. producers could remain profitable at the low end of the estimated net returns, particularly given the thinness of current U.S. hemp markets.

The market for hemp products might easily be oversupplied, as in Canada where the 35,000 acres of hemp produced in 1999 was seemingly more than the market could handle. The *Minneapolis Star Tribune* quotes the general manager of Kenex Ltd., Canada's biggest hemp processor, as saying "It's given us one hell of a glut of grain and fiber. There's been a major overestimation of the market that's out there" (von Sternberg, 1999).