Hemp offers new growth opportunities

New opportunities for sustainability and growth.

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An industrial hemp field at the University of Kentucky College of Agriculture. The variety of cannabis cultivated for hemp has only small amounts of THC relative to that grown for the production of marijuana or hashish. Photo: UK College of Agriculture

Hemp fiber is gaining traction for its medicinal and industrial applications. How far this industry has progressed is a curiosity for stakeholders such as the public, agriculture and textile sectors. The need for sustainable raw materials to combat global warming and protect the environment has kindled interest in the textile sector to explore alternate fibers such as flax, hemp, kenaf and others. Such efforts enable economic growth and opportunities for innovation, particularly in advanced textiles.

Sustainability landscape and hemp

In 2015, the United Nations adopted its Sustainable Development Goals (SDG). All 17 listed goals are relevant to the manufacturing and textile industries, but several goals are of immediate interest, such as Industry, Innovation and Infrastructure; Climate Action; and Responsible Consumption and Production. With the heightened need to reduce the use of fossil fuel and petroleum-based products, the textile industry must explore biodegradable alternative fibers. Commercially available unconventional fibers may not be applicable to all sectors of the textile industry. However, bast fibers have functional and physical properties that lend themselves to varied industrial and advanced applications.

"Though synthetic fibers have higher consumption, we need to look for alternatives to non-fossil fuel-based synthetics and lower environmental footprint natural fibers like hemp for futuristic use to manage the environmental footprint," says Dr. Siva Pariti, senior technical marketing officer at the United Kingdom-based BluWin, an integrated service provider to the textile, leather, apparel and footwear industries.

Hemp status

The 2018 Farm Bill has supported the production of hemp under the guidance of the Department of Agriculture, which has the oversight authority on hemp plants by states and Indian tribes. Hemp is any part of the plant including seeds from the species Cannabis sativa L. There are strict regulations regarding delta 9 tetrahydrocannabinol (THC) levels, production and disposal activities. Cannabis with a THC level of more than 0.3% is considered a Schedule I controlled material, which is regulated by the Drug Enforcement Administration.

Agriculture-intensive states like Texas and Colorado have authorized the production and sales of hemp as regulated by USDA. Texas House Bill 1325 authorized hemp planting and began issuing licenses in March 2020. With the new Texas legislative session that began in January 2023, there are calls to broaden the medicinal application of hemp products as a way of expanding the compassionate use law. The passage of this bill may encourage producers to plant more acres with a focus on medicinal applications. However, byproducts such as fiber, seed coats and stalks can find applications in textiles.

Hemp is attractive as an alternative to conventional fibers because of favorable agronomical practices, biodegradability and physical characteristics. In the High Plains of Texas where about 3.7 million acres of land are dedicated to upland cotton, producers are looking for opportunities to plant alternative crops in a sustainable fashion with higher yields. The need for climate-smart agriculture has kindled interest in crops like hemp.

"The market is slow to develop. There is a need to develop fiber processing capacity to grow the industry," says Shawn Wade, director of policy analysis and research at the Lubbock-based Plains Cotton Growers (PCG). Likewise, Mark Brown, field services director of PCG, says, "Farmers value the opportunity to diversify. However, High Plains producers have not yet realized income levels needed to make hemp farming attractive."

According to many producers, the fiber segment is nascent and needs a lot of support in terms of research and development, policy initiatives and marketing. While fashion textiles may not be an immediate market, industrial applications in automobiles, insulation and upholstery products seem promising. This market may be small compared to the larger CBD extract market, says Brown.

Major textile manufacturing countries such as India are also progressing with hemp planting and manufacturing. The hilly northern state of Himachal Pradesh has legalized hemp agriculture with low THC content for medicinal and industrial applications. As it is in Texas, the hemp sector is expected to diversify the economy in Himachal Pradesh, which is heavily dependent on tourism.

Several agronomy-related factors such as soil-specific varieties, soil types, irrigation and pesticide needs must be studied and standardized. Hemp varieties suitable in Colorado may not be suitable for clay soil in South Texas. State extension agencies must develop robust breeding programs to develop varieties suitable to a particular climate and soil. Texas A&M AgriLife Research is breeding varieties suited to Texas that are heat and drought-tolerant and will meet the regulative requirements. According to Russ Jessup, a hemp breeder at Texas A&M, the goal is to release 20 to 50 or more hemp lines by 2024.

Industrial applications

Hemp is a bast fiber rich in cellulose. Depending on the variety, cellulose content may vary between 50 and 85%. Both in terms of fiber chemistry and agronomy requirements, there is some similarity between cotton and hemp. In arid regions where cotton is the dominant crop, hemp attracts due attention. However, marketing and value realization aspects are slowing the hemp drive. While its medicinal applications are well understood, more research is needed in processing hemp fiber, its marketing needs and cost-benefit aspects.

Green manufacturing interests should push hemp into the advanced textiles sector. Hemp, being a cellulose-rich fiber, has high strength, durability and favorable chemical characteristics. Research shows that certain varieties of hemp can have strength as high as 800 MPa (megapascals) which is almost twice that of cotton fibers. Its shrinkage is less than cotton enabling its applications in fashion and industrial textiles.

Hygiene textiles such as wipes are dependent on their absorbent core, but they are single-use and are often made of synthetics. "These single-use textiles have disposal problems, so the industry is looking toward biodegradable raw materials," says Ramakrishnan Govindan, professor of Fashion Technology at the Kumaraguru College of Technology in Coimbatore, India. "With high volatility in the cotton market, it is time that industry looks toward bast fibers like hemp and other unconventional fibers like banana fibers."

Govindan's laboratory has been exploring alternative fibers to develop sanitary napkins and home textile products. Sanitary pads made with alternative fibers have been found to have higher absorption of bodily fluids. Hemp can be a viable alternative fiber for developing home textiles like carpets, kitchen mats and so on, but more research is needed for their use in hygiene applications.

Lifecycle assessment (LCA) and information on Best Available Technologies (BAT) for the hemp industry have not been subjects of focus so far. "We see increased interest from some European-based fashion retailers to work with fiber suppliers that are BAT compliant," says Buddhi Weerasinghe, senior project officer at BluWin. It is important for the hemp industry to initiate projects that investigate LCA and BAT to make inroads into some fashion products as well as single-use hygiene and medical textiles.

The way forward

While hemp has opportunities, the industry has several barriers that need to be overcome. These include agronomy, processing, warehousing and marketing. State agriculture experimental stations must breed suitable high-yielding varieties which can produce uniform hemp within stipulated THC levels. The machinery needed to process hemp fibers, web laying and bonding technologies must be standardized to move toward a singular shared goal. Research laboratories in states that focus on hemp should work on applied research projects and outreach to producers and stakeholders. But all this will need state-level funding and resources.

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