The signature look of denim is created from the indigo dye, most of which is synthetically made and imported from China. Stony Creek Colors is hoping to change that with its line of bio-based dyes that are non-toxic and sustainable

STONY CREEK COLORS

Blue jeans – they're simple, comfortable, and the average American probably has at least a dozen or so tucked away in their closet. But few actually put much thought into the making of these favorite threads. Indigo dye is used on cotton yard to create that one-of-a-kind denim cloth, and typically around 3-10 grams of the dye is needed per pair of blue jeans.

PHASE III SUCCESS
Over $1 million in private investment to scale up crop production; successful sale of bio-based product into industrial markets.

AGENCIES
USDA

SNAPSHOT
Situated outside of Nashville, TN, Stony Creek Colors has commercialized a completely new agricultural value chain to develop indigo and other bio-based colorants used to dye textiles and decrease the United States' reliance on imported dyes synthesized from toxic chemicals.

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Plant-derived indigo was replaced by a synthetically produced form about 100 years ago and the production left the United States, so the global textile industry relies on China to supply a steady stream of synthetic indigo. Synthetic indigo production depends on petroleum and coal tar derivatives, such as benzene, formaldehyde, and sodium cyanide. The chemicals used to make it are not only toxic for the exposed workers and the environment, but harmful to the wearer as well. The demand for blue jeans, however, is not declining anytime soon and this has led one small Tennessee-based business to rethink the entire operation.

Stony Creek Colors is on a mission to transform the entire fashion industry by providing a means to grow natural, cost-effective indigo and other bio-based dyes here in the United States. They're starting right in their home state of Tennessee. The company was founded in 2012 after realizing that a scalable and consistent source for natural dyes did not exist. Founder and President Sarah Bellos knew if she wanted to make domestic sustainable clothing at volumes needed for tangible environmental and social impact, she would literally have to invent a process that would enable that end result.

The company has been supported by the USDA in part through a Small Business Innovation Research (SBIR) grant. A successful Phase I SBIR project was immediately followed by a Phase II effort, which is wrapping up this year. To Bellos' surprise, the project has not only realized her original goals, but has injected this region with new life at a time when most farmers are still reeling from the tobacco industry decline.

Currently, Stony Creek has contracted with 10 local farmers to grow natural indigo

Natural indigo dyed cotton yard

"We are positioning indigo as a replacement for tobacco and as a way for farmers to keep high value crops on their land here in the Southeastern U.S.," says Bellos. "Even our factory is a former tobacco factory and we're outfitting it with all new equipment for indigo. We're working to develop new production methods for farmers to make indigo low risk and high reward, while we invest in chemical processing methods to compete head to head with synthetic indigo."

The company's business model integrates the entire crop value chain: Stony Creek Colors contracts with local farmers to grow the indigo plants. Stony Creek produces and delivers the seed, while the farmer plants and maintains the crop. After it is grown, Stony Creek agriculture operators harvest the biomass and deliver to the chemical operators at their processing facility. Currently, the company has contracts with 10 local farmers over 30 acres as well as a purchase agreement with Cone Denim, a premier denim manufacturer based in North Carolina. By replacing its synthetic indigo with Stony Creek's natural indigo for dyeing denim, Cone Denim is returning to its roots, as the natural indigo was used 100 years ago when the company was formed.

"The commercialization aspect of the SBIR program was important for us," explains Bellos. "It allowed us to look at the needs of the marketplace. What are the barriers in producing plant-derived indigo at a volume and consistency required by the industrial marketplace? Can scaling-up a bio-based replacement to the synthetic indigo used today bring this type of chemical manufacturing back to the United States? Can we produce a better product than the imported synthetic indigo, and what future R&D, capital investment, and farmer capacity is required to get us to full replacement? All of these questions needed to be answered."

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SARAH BELLOS
PRESIDENT

In addition, Bellos explains how SBIR funding has helped her company focus on research & development and innovating new methods for extracting colors from plants. Stony Creek Colors is focused on agricultural scale-up, for which they've already raised over $1 million to help fund, and the actual method of chemical dye extraction and how to get the most out of a plant alongside how to get a plant to produce the most. In addition, the market validation is something they are constantly analyzing, along with the best way to get these products into the commercial marketplace and prove that customers will want them.

For now, Stony Creek's goal for the next five years is to produce 17,000 acres of indigo in the U.S., which could potentially translate to replacing 2.8% of synthetic indigo dye globally. While keeping the pedal to the floor on natural indigo scale-up, Stony Creek is exploring means of extracting valuable chemical colorants from both sawmill and food waste to expand its product line and make use of factory processing capacity during the non-indigo season.

"Indigo used to be a major cash crop in the United States in the 1600s and 1700s, and has sustainable agriculture benefits for farms beyond just cash," says Bellos. "Building markets for new crops for farmers, reducing agricultural production risk, and developing safe clean chemical manufacturing techniques that can exist right within our communities – that's really where we want to see the domestic chemical industry headed. Bio-based chemicals manufacturing holds the promise of re-shoring chemical manufacturing but creating the entire value chain takes massive coordination and dedicated researchers, farmers, investors, lenders, and customers. In the long run, its better for our planet and our economy and worth the effort!"

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