

Ecological Circularity from Soil to Skin: The Case of Tula

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Abstract

The interdependence of sustainable natural materials and environmentally benign production processes underscores the need for regenerative and circular food and fiber systems. It becomes imperative, therefore, to move away from linear systems of extraction that thrive on higher production speeds and quantities of resources, perpetuating the unsustainable use of resources. This calls for the attenuation of the distance between soil and skin. Founded by Rebecca Burgess, Fibershed is a non-profit organization that supports local communities and works towards creating livelihoods and a healthier environment through regenerative agriculture that traverses the entire fiber-to-clothing ecosystem. Veering away from the widespread coupling of fashion with transient trends, Fibershed provides more sustainable ways of approaching clothing choices. Predicated on similar principles Tula is a not-for-profit enterprise in Chennai originating in the organic food space and has now expanded into a dynamic movement to promote soil-to-skin systems and a streamlined farm-to-closet supply chain for small farmer communities that assures them a fair income and ethical work compliance. Prioritizing the use of local resources and transparent production systems, it sources seeds from agricultural universities and traditional seed conservers. It also identifies and encourages local farmers across three Indian states to grow two indigenous varieties of rain-fed, short-staple cotton—*Gossypium herbaceum* and *G. arboretum*. Instead of using endocrine-disrupting chemicals, the yarns are dyed with botanical components for their aesthetic and medicinal properties. Tula's commitment to sustainability emerges from its association with and recognition of local human and material resources to forge a vertically integrated soil-to-soil system, underscoring its commitment to improving farm livelihoods through higher financial remuneration, and striving to foster a sense of agency among those from backgrounds of economic disadvantage. Spanning the entire fiber-to-clothing ecosystem, this article enquires into the ways in which a slow and mindful pace enables the re-imagining of sustainable and sensorial apparel by

engendering deep engagement with production processes and reduced intermediation between producers and consumers in decentralized textile economies that build on the resources available within local communities.

Keywords: Tula, Fibershed, soil-to-skin, sustainability, natural dyes, khaddar/khadi

Introduction

Globally, there is an evident increase in small-scale movements and grassroots initiatives emerging from the realization of the inseparability of human life with the earth as a living system. Complex synergies among living creatures, plants, soil, air, and water have resulted in an increasing decibel of voices against the extractive use of the earth as a perceived repository of infinite natural resources. The period from 2010 to 2019 saw the ‘average annual global greenhouse gas emissions at their highest levels in human history’ and that ‘without immediate and deep emissions reductions across all sectors, limiting global warming to 1.5°C is beyond reach’ (IIASA, 2022). This report further states that ‘agriculture, forestry, and other land use can provide large-scale emissions reductions and also remove and store carbon dioxide at scale’ (ibid.). Emerging narratives of the interdependence of sustainable natural materials and environmentally benign production processes highlight the need for regenerative food and fiber systems. In a linear system, each point is like a silo, moving in a unidirectional manner from fiber to landfill. It becomes imperative to move away from extractive systems that thrive on higher quantities and production speeds, leading to the unsustainable use of resources. This calls for an attenuation of the distance between soil and skin.

The Higg Material Sustainability Index¹ introduced by the Sustainable Apparel Coalition as the fashion industry’s most reliable tool, has recently been called out for utilizing a cradle-to-gate approach to assess the life cycle impact of fiber but providing outdated or inaccurate data that does not comprehensively represent the entire fiber production sector (Shendruk, 2022). In contrast, a cradle-to-grave assessment gives a more holistic and focused view of the complete impact of a product’s entire lifecycle in consideration of its environmental and socio-economic costs using a framework that gives a more reliable account of its impact at the end-of-life stage or when it is discarded.

Envisioning regional textile supply chains that enliven community ownership of soil-to-skin processes, Fibershed was developed by Rebecca Burgess, expressing a “vision of change that focuses on transforming fiber and dye systems from the soil up”. (Burgess, 2019, p.7). Founded in California in 2010, it has now expanded to a movement using a soil-to-skin approach to build a sustainable biosphere for consumable products. Fibershed is

‘a geographical landscape that defines and gives boundaries to a natural textile resource base. Awareness of this bioregional designation engenders appreciation, connectivity, and sensitivity for the life-giving resources within our homelands’ (fibershed.com). It is a dynamic and evolving living system that provides resources and opportunities to implement environmentally benign agriculture, encourages local manufacturing, and connects end-users to textiles, drawing from resources and local labor sourced from a “region no larger than a 300-mile footprint” (St. Pierre, 2019, p.39). At a macro-level, Fibershed refers to non-profit organizations that aim to support local communities for better livelihoods and a healthier environment. At a micro-level, the purpose is to create fabric through a vertically integrated soil-to-skin system of locally grown regenerative crops, followed by fiber extraction, yarn conversion, dyeing with plant-based extracts, and spinning and weaving by hand, thereby traversing the entire fiber-to-clothing ecosystem. Veering away from the widespread coupling of fashion with changing trends, Fibershed provides solutions to more sustainable ways of approaching clothing choices. This article inquires into the ways in which a slower pace of fashion fosters sustainability by recognizing the value of local human and material resources as well as benign agricultural systems.

Methods

A search for similar organizations in India revealed two references in South India, of which Tula/Tūla, a non-profit organization in Chennai, was identified as the appropriate focus for this study based on situational convenience. Secondary data was accessed online through the Tula website as well as gray literature from reputed publications. This data was supplemented by an in-person visit to Tula. The prime interviewee was Ananthasayanan, aka Ananthoo—one of the key co-founders of Tula who facilitated further connections with nodal coordinators of activities related to farming, spinning, weaving, and dyeing. Their familiarity with vernacular languages in three regions—Marathi in Maharashtra, Tamil in Tamil Nadu, and Malayalam in Kerala, as well as general proficiency in English were instrumental in facilitating this study, supplemented with the observation of farmers, dyers, and weavers in their work environments. The apparel range in khadi developed and retailed by Tula has been assessed and cross-referenced with existing literature in terms of its aesthetics and attributes of sustainability.

Genesis of Tula

The need for an alternative approach to agriculture arose in 2007 during the course of discussions among a group of expatriates comprising close friends, on the agricultural predicament in India as a fallout of the Green Revolution (1967-1978) associated with

the introduction of high-yielding seed varieties, spiralling use of fertilizers, mechanized farming as well as overall degradation of the agro-ecosystem including the 'loss of soil fertility, erosion of soil, soil toxicity, diminishing water resources, pollution of underground water, salinity of underground water, increased incidence of human and livestock diseases, and global warming are outcome of the negative impacts of over adoption of agricultural technologies by farmers' (Saidur, 2015). Another concern was the agrarian crisis of farmer and agricultural laborer suicides, particularly in the cotton-growing regions of India, with one of the attributed reasons being the cultivation of Bt (*Bacillus thuringiensis*) cotton. Moreover, cotton accounts for 40 percent of global textile production and uses more pesticides and insecticides than any other single major crop. Inspired by the work of environmental activist and organic farming scientist G. Nammalavar (1938–2013), known for his work on spreading ecological farming and efforts to preserve indigenous seed varieties, the core group concluded that saving water and improving soil health and farmland ecosystems through organic farming can offer sustainable solutions to several ecological, climatic, and human health-related issues.

The deep-rooted concern to address the existing skew in the agricultural sector led to the genesis of Tula, a Sanskrit word that means both 'cotton' and 'balance'. Its logo depicts the astrological sign of a pair of scales, indicating a state of equilibrium. As a social enterprise, Tula is committed to reviving soil fertility, increasing organic farming, and saving indigenous seed varieties. Tula's first initiative was in the organic, sustainable food space through volunteer-run, non-profit organic outlets in Chennai called reStore, with the mission of restoring environmental health and farm livelihoods. Tula provides small-scale, marginal farmers with indigenous seeds to boost production and sales of locally grown organic produce using traditional Indian farming methods and regenerative cropping methods that promote soil health and biodiversity. The farmers largely follow two principles: to grow crops without chemical pesticides and insecticides and to contribute a portion of the harvested heirloom seeds to an indigenous seed bank. This reciprocity helps maintain the unique provenance of the crops. Each season, local farmers who are willing to cultivate crops and fruit using sustainable and regenerative farming practices are enlisted. This venture led to Organic Farmers Market (OFM), a community-based cooperative in Chennai where freshly delivered organic produce from local farmers is made available in local neighborhoods. Both reStore and OFM enabled the revival of the sustainable agriculture supply chain, where awareness, not commerce, is the cornerstone activity. Co-founder of reStore, OFM, and Tula India, Ananthasayanan is of the opinion that a direct relationship of trust with farmers and consumers makes

organic certification unnecessary. Moreover, the expense incurred by this certification may restrict the participation of small-scale farmers. However, a rigorous system is maintained by reStore and OFM to assure the organicity of foodgrains.

Soil-to-skin systems

Even though India had 3.35 lakh (one lakh is equal to one hundred thousand) hectares of land used for cotton cultivation in 2021 (Textile Excellence, 2022), there are still debates about how unsustainable cotton cultivation is in general and about the transgenic strain of Bt cotton with insect-repelling toxins made through genetic engineering, mostly against several bollworm species (Jha, 2018). Archaeological evidence proves that domesticated cotton grown in the Indus valley included two organic short-staple, old-world diploid species, *Gossypium herbaceum* and *G. arboretum*, both producing ‘spinnable fibers from epidermal outgrowths of the seed coat’ (Lee and Fang, 2015). Cotton has the quality of morphological plasticity, which enables it to adapt to local climates and geographies (Fibershed, n.d.). Short-staple cotton is characterized by its fiber length not exceeding one inch and coarseness. Abjuring genetically modified and hybrid crops, synthetic fertilizers, and policies that decouple farmer decisions from market demands, practices of ‘interconnecting people, processes, and environment’ (Hethorn and Ulasewicz, 2008), the philosophy of Tula encompasses the sourcing of seeds from agricultural universities apart from traditional seed conservers and identifying and encouraging local farmers in the states of Tamil Nadu, Karnataka, and Maharashtra to grow two indigenous strains of rain-fed, short-staple cotton—*herbaceum* and *arboretum*, colloquially referred to as *desi* (indigenous) cotton.

The Tula initiative started with approximately 30 farmers in Tamil Nadu, which has increased to almost 100 farmers across the three states, each with less than one acre of land, from whom reStore initially used to purchase millets. These farmers were then asked to grow the local varieties of rain-fed, short-staple cotton, including Karunganni or its improved varieties in Tamil Nadu, Jayadhar in Karnataka, and cotton strains such as AK-07, PA-255, and PA-812 in Vidarbha, Maharashtra. Tula identified local farmers who are familiar with ancient Indian farming methods, including particular strains of cotton in each region as well as those who may have saved some original, regenerative seeds. Seed resources in agricultural universities like Panjabrao Deshmukh Krishi Vidyapeeth in Akola, the Central Institute for Cotton Research in Nagpur, Shetkari Nyay Andolan Samiti in Yavatmal, Mahatma Phule Krishi Vidyapeeth in Rahuri, Maharashtra, and Tamil Nadu Agricultural University in Coimbatore, Tamil Nadu, support sustainable agriculture. This includes the use of indigenous methods of interspersing While regenerative farming

further the idea of organic farming by omitting chemicals, it actually replenishes the soil and surrounding nature (Farra, 2020). Financial viability being the only way of encouraging farmers to adopt the cultivation of native cotton, “Tula buys over 200 quintals annually and also pays a higher price for naturally-grown cotton than Bt cotton” (Burgess, 2019, p.146). Its objective of supporting ecological agriculture of indigenous cotton and foodgrains through mixed cropping practices has enabled sustainable livelihoods for those associated with its supply chain.

Plant-based natural dyeing

Once harvested, cotton fibers are not subjected to bleaching or other chemical dyeing processes, which are among the major sources of environmental contamination in the textile industry. Estrogenic and anti-androgenic compounds found in GM cotton, as well as chemical washing agents, dyes, and chemical surface finishes used in the textile supply chain, are endocrine disruptors proven to impact health—including that of young children—and cause several types of endocrine-related cancers and inter-generational DNA damage to humans and wildlife (Burgess, 2019, p.31). The increase in global demand for natural dyes can be attributed to their therapeutic usage and other food, textiles, agriculture, engineering, and medical applications (Habib, et al., 2021). While yarn-dyeing with different natural dye recipes varies across regions, the advantages of renewable sources, convenient extraction and purification, mild dyeing conditions, and the lack of effluents make it a sustainable alternative to chemical dyeing (Mohanty, Chandramouli and Naik, 1987). *Manjistha*, also known as Indian red madder (*Rubia cordifolia*), has a red rhizomatous base and roots that yield a red pigment widely used as plant dye. In India’s Ayurvedic tradition, it is recognized as an astringent, diuretic agent, blood purifier, remedy for anemia and jaundice, as well as curative for hyperpigmentation and leprosy. Velvelam bark (*Acacia leucophloea*) is another natural colorant for cotton dyeing that creates multiple tonal effects from pink to brown, facilitated by bio-mordant extracts. Due to its inherent low flammability, Velvelam acts as a firebreak. The Wedelia (*Wedeliatrilobata* L.) shrub, which produces green hues, has the potential to cure amenorrhea, flu, and inflammation, while Tecoma (*Tecoma stans*) produces yellow hues and also has antioxidant, analgesic, and antimicrobial attributes. Its extracted oils are essential ingredients in herbal formulations for liver ailments and healing wounds. Alkanet root bark (*Alkanna tinctoria*) contains the colorant Anchusin, which produces a range of purple and lavender hues to create a range of grey-violets when iron is added to the Alkanet dye bath. It has strong dye fastness with cotton, silk, and wool. It is also used in the treatment of external skin wounds and is swallowed for diarrhea and gastric ulcers. Tints and tones of blue are produced by the cyclotide-bearing

butterfly pea (*Clitoria ternata*). It is a traditional Ayurvedic medicine that has a soothing impact on the nervous system and psychological state, which explains its traditional use as a memory enhancer, nootropic, antistress, antidepressant, and sedative agent. Its leaves are traditionally recommended for the treatment of bites by venomous animals and reptiles, as well as arthritis, skin diseases, and ear ailments. The fruit of Annatto (*Bixa orellana*) yields *Rubia tinctorum*, a red-orange pulp used for fabric dyeing. It has high antioxidant properties and minerals that rejuvenate the skin, improve digestion, control diabetes, and strengthen the bones. Dyeing with palash or tesu flowers (*Butea monosperma*) produces a range from deep orange to pink, which, when used with alum as mordant on pure cotton, retains color fastness for some washes and has good perspiration fastness. It also has Ayurvedic health benefits, including healing wounds and relieving swelling and pain.

Eschewing endocrine-disrupting chemicals and metallic mordants for fixing natural dyes on textile fibers, Tula uses only yarns and fabrics dyed with botanical components, including flowers, leaves, bark, and roots of specific plants, for their aesthetic, medicinal, and curative properties. This includes, among others, eco-friendly alternatives such as myrobalan, annatto, and other natural ingredients. The exploration of these traditional plants in terms of their dye-yielding qualities and fiber qualities is important in the fabrication of textiles with curative efficacy. Though organic colorants from plant sources are eco-friendly, benign for the skin, and do not cause dye deposition even during the washing process, their inherent disadvantage is their fragile bond with textile fibers, leading to weak color fastness properties, difficulty reproducing exact hues, and a lack of standardization in color recipes and methods. To address this, Tula associates with Wrukshatone, an eco-friendly dyeing enterprise in Erode specializing in the elimination of mordants, chemicals, and other auxiliary materials during the textile making process.

Spinning and weaving

Due to climatic vagaries such as droughts and floods, cotton cultivation may take place in one region while processing and weaving may be undertaken in another. Pre-spinning activities on the harvested cotton bolls are followed by spinning on the *Ambar charkha*—a modern version of the traditional hand-operated spinning wheel that reduces the time and labor of hand-spinning undertaken predominantly by women and also increases output. This underscores its relevance as an instrument of empowerment for women in circumstances of adversity. Spinning is undertaken in Gandhigram near Dindigul in Tamil Nadu, Gram Seva Mandal in Maharashtra, and Gadag in Karnataka. With the reduction in manual labor, efficiency has increased as the number of hanks²

made daily by each person has increased to 15-20 hanks per day. The yarns are then dyed with plant extracts grown on organic farms. Weaving on pit looms and hand-operated frame looms takes place in Gandhigram near Dindigul, Tamil Nadu; Janapada Seva Trust in Karnataka; Narayan Khadi Bhavan in West Bengal; as well as Ponduru and Srikakulam in Andhra Pradesh. Built on the tenets of the Gandhian ideology of self-sustenance, Khadi/khaddar³ according to Mahatma Gandhi (1941), is a symbol of the unity of Indian humanity, its economic freedom, and equality with sustainability at its core. Approximately 2000 meters of khaddar are woven each month for Tula. Bridging the distance between weavers in villages and urban consumer preferences is predicated on the aesthetic qualities of khaddar combined with the imperative of soil health. The appeal of khaddar is not only in the fabric characteristics but also in the narrative that connects with consumers to raise awareness of sustainability, focusing on what Alastair Fuad-Luke refers to as “living well but consuming (much) less” (Fuad-Luke, 2009, p.86). To reduce post-harvest losses and preserve cotton seed quality, improved drying and storage methods are used to ensure seed security for subsequent planting. Tula’s initiatives to mitigate the effects of unsustainable farming through ecological circularity have created a closed-loop production system.

Fashioning an organic wardrobe

Tula’s fibershed wardrobe is a vernacular expression of the natural fiber-to-dye biosphere that articulates the visual ethos of the land through the interconnectedness of small communities of farmers, spinners, dyers, weavers, and tailors. In doing so, it attempts to heal the disjointed relationship between growers and makers on the one hand and users on the other. Tula’s expansion into fashion reflects the concept of the ‘Slow Food’ movement introduced by Carlo Petrini in 1986, leading to the term ‘Slow Fashion’ coined by Kate Fletcher in 2007, and is marked by considered, transparent processes for alternate clothing options. Developing apparel at a slow and mindful pace, incorporating socially beneficial and ecologically practical processes, has been a natural progression. Tula has a small in-house team that designs a range of garments in plant extract-dyed khaddar sewn on manually operated machines and hand-finished under its eponymous label, retailing from its flagship store in Chennai. It also participates in exhibitions in Bengaluru, Delhi, Hyderabad, Mysuru, and Pune. At ‘The Earth Collective’ event 2022 in New Delhi, it was observed that repeat buyers primarily include expatriates and discerning consumers with a penchant for organic clothing with clean silhouettes, sparse details, and a pared-back look in natural-dyed hues ranging from cream and eggshell, avocado greens and olive, earthy browns and caramel, ash and smoke grey, and hues of muted blue and old rose pink. These include tailored apparel for men and women such

as shirts, kurtas (tunics), and bandis (gilets) of different lengths in XS to XXL sizes, as well as sarees, accessories, and fabric yardage. A range for infants and older children is also available. The patterns of stitched apparel are quintessentially based on the principles of zero waste or minimal waste. New ideas on waste reduction in recent years involve a number of design-for-sustainability concepts. Determining the elimination or reduction of fabric waste at the fabric cutting stage, fashion designer Timo Rissanen, a pioneer of zero-waste pattern design, suggests that it is the responsibility of designers to 'design it out of the system' (Rissanen and McQuillan, 2015). Rissanen characteristically designs garments by modifying conventional patterns to eliminate or reduce fabric waste to a minimum through a 'jigsaw-puzzle approach' which involves remodeling the shape and size of pattern pieces so that they adjoin each other. Patterns of traditional Indian garments, notably the blouse, kurta, churidar pajama, and salwar, are compositions of basic geometric shapes, namely the rectangle, square, circle, and trapezium, using the direct drafting method (Narang and Jha, 2013).

The Tula team comprises two in-house designers as well as volunteer designers who work pro bono. About ten women trained in sewing make the garments at their respective homes. Home-sewn clothing items have an allure that is reminiscent of a slower life prior to the fast pace of consumerism. Besides the emotional pull that this quality evokes among consumers, the garments embody a minimalist aesthetic. While design minimalism may not automatically imply heightened sustainability, the 'minimalist' approach to waste reduction embedded in the design and production processes throughout the supply chain makes the Tula garments a more sustainable choice. This aligns with the philosophy of sustainability exponents Kate Fletcher and Lynda Grose (2012), who predicted that the 'immaterial aspects of fashion will become more celebrated as raw materials become scarcer. The material components of fashion will be treated with greater reverence and respect for the same reason'. Avoiding the cycle of seasonality associated with fast fashion, Tula's collections epitomize slow fashion that expresses mindfulness and enables the re-imagining of apparel that deeply engages with production processes and slow lifecycles, thereby "connecting personal and environmental realities that can enable mutual thriving'" (Thompson, 2022, p.81). As each item touches several lives and improves the livelihoods of those involved at each stage, the act of purchasing a Tula garment not only connects the wearer to the fields but also gives the consumer 'a sense of contentment knowing that almost 8–10 livelihoods have been supported' (personal communication with Ananthasayanan). Whether employee or volunteer, all the associated persons are in consonance with the organizational ethics and embedded values. In keeping with its environmental commitment, Tula's soil-to-skin initiative has found resonance with design institutes

and led to student internships. Interns bring a fresh approach to design with their knowledge of fashion trends. Design graduates with similar interests and commitments to sustainable fashion have also joined Tula. Volunteers subscribing to the organizational ideology evince interest and actively participate in different aspects of its supply chain.

Discussion and Conclusion

One of the imperatives of the UN's Sustainable Development Goals is to achieve soil health and sustainability through plant processes and soil processes by the year 2030 (Lal, et al., 2021). This aim is emblematic of a broader global emphasis on the identification, adoption, and contextualized integration of more sustainability-focused products and systems. In the context of this collective agenda, the case of Tula comes to represent more than a singular example. Rather, it becomes symbolic—beyond regional or national boundaries—of the possibilities for sustainable fashion futures. Starting as a not-for-profit initiative, Tula has now expanded into a dynamic movement that presents an alternative set of prospects for small farmer communities to grow cotton interspersed with diverse crops as part of a streamlined farm-to-closet supply chain that assures them a fair income and ethical work compliance. In reference to the “Slow + Design” symposium in Milan in 2006, Hazel Clark (2008) argues that understanding slow or more sustainable perspectives on fashion needs to include approaches to transcend its own focus and include higher levels of experience with a view to the future. In resonance with this line of thinking, Tula supports and nurtures a community-based apparel value chain connecting natural fibers sustainably with people and products. Since its inception, it has associated with organizations with distinct capabilities to create a symbiotic ecosystem of communities with a cumulatively heightened work-to-income potential. In so doing, the approach taken by Tula reinforces Kate Fletcher's (2018) position that ‘fashion and sustainability are about ecological integrity, social equality, and a sense of human flourishing’. This is achieved by forging a capacity-conscious relationship with the land and restoring ecological function to regional landscapes, sensitizing people to the nature of local economies in the process. Indigenous knowledge and traditional skills are brought into alignment for the production of organic food grains by exemplifying the principle of circularity. This sense of consonance extends to the mindfully-made, climate-beneficial khaddar apparel subsequently produced. A value chain of this nature thereby becomes a living example of alternative approaches to fashion that emerge from a sustainable and ethical space. Linkages between regenerative agriculture and fabric characterize Tula's ‘farm-to-closet’ philosophy, emulating natural systems to produce both food and fiber and, in doing so, embracing ‘interdependence with local microclimates, cycles, and nested systems’ (Dunlap, cited by St Pierre, 2015, p.39).

It embodies the fibershed ethos where reconfiguring regional cultivation systems can replenish rather than deplete the soil, extending to sustainable clothing while empowering the local matrix of farmers, spinners, weavers, dyers, and tailors through higher financial remuneration. In this way, wider links with community groups are forged, geared towards sustainable livelihoods and the food-to-fashion supply chain. Transcending the linear past-to-present orientation of felt needs, Tula adopts a more forward-looking approach through its focus on circularity and anticipatory needs with their present-to-future orientation.

Tula's commitment to sustainability emerges from its association with and recognition of local human and material resources to forge a vertically integrated soil-to-skin system, expressing its commitment to improving farm livelihoods through higher financial remuneration, and providing economically disadvantaged people with agency. Yet, despite its capacity to foster sustainable livelihoods, Tula faces challenges that stymie its growth and proliferation beyond the local level. Where mass production and economies of scale have long dictated market forces, the principles embodied by Tula are not just anomalous but antithetical to prevailing commercial systems. The benefits of natural farming and local economic empowerment notwithstanding, the lack of public awareness of fibershed organizations poses constraints to their growth. In this context, it becomes necessary to examine, understand, and put in place the appropriate pulleys and levers to increase awareness of the attributes and value systems of the label Tula that differentiate it from others in the same price bracket. The task at hand is to provide more than just a hyperlocal niche for sustainable apparel and facilitate the mainstreaming of what is presently seen as 'alternative'. To this end, the transfer and communication of information regarding soil sciences and concomitant systems can both facilitate and be facilitated by an enhanced understanding of current realities. Such an undertaking implicates a wide web of stakeholders, including researchers, policymakers, producers, and the populace, all working in conjunction to anchor a new paradigm of production. Symbolizing the essence of this paradigm, Tula continues its endeavor to transform the cotton value chain and realize Gandhi's historical vision of khadi as a path to *swaraj*⁴, while simultaneously distinguishing itself as a fiber of the future.

Notes

1. The Higg Materials Sustainability Index (Higg MSI) is a trusted tool used by the apparel industry to measure and evaluate the environmental impact of materials. The designers and product developers can use the Higg MSI to calculate and compare

the cradle-to-gate impact of different materials, like textiles, plastics, metals, and leather.

2. One hank is 768 meters in length.
3. Largely home-spun, khadi also known as *khaddar*, is a hand-spun and hand-woven fabric with historical association of patriotism during India's freedom struggle.
4. Swaraj meaning self-rule is built on the tenet of self-reliance.

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