

## THE GREEN FIBERS OF 21<sup>ST</sup> CENTURY

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### Abstract (10 pt)

The organic approach is a “whole system” aiming agriculture as well as production and recognizing the close relationship between all stages of production starting from the soil and reaching the final consumer. Global Organic Textile Standard aims to define quality assurance requirements for eco-textile covering the entire production cycle, from harvesting raw materials to manufacturing and labeling and unify the various existing standards to provide the ultimate consumer confidence and credibility related to an environmentally and socially responsible manufacturing process including finishing, labeling, packaging, quality assurance and documents keeping.

Of all the organic fibers/fabrics on the market today, organic cotton is by far the most popular. The certificated organic cotton is free from any substances and practices potentially harmful to the environment.

Bamboo fiber is a biodegradable textile material. Bamboo grows faster than any other plant in the world, making it one of the most sustainable products in existence. Bamboo fiber is considered a "natural, green and eco-friendly fiber the new type of fiber of 21<sup>st</sup> century."

**Key words:** 4-5 keywords (10 pt)

### 1. The Organic Textile Standards

With more and more companies entering on the organic market, it seemed increasingly important for all to get on the same page about what we meant by “organic” and enlighten ourselves as consumers as well as producers.

Despite this obvious need for clear requirements and labeling, there was a surprising amount of confusion within industry producers about organic textile labeling and certification. The answer to this confusion is: certification. And yet, organic textile certification has been around in various forms for decades across the globe. The problem however has been lack of consistency and collective agreement on standards. Germany had one set, Japan another, USA yet another and so on. However with the textile industry being extremely global in nature, it quickly became apparent that separate standards were a problem.

We have to agree that globally accepted certification is very important in terms of differentiating products from one another, but also because it can be used as vehicle for increasing producer accountability and consumer awareness. This is how the Global Organic Textile Standard (GOTS) appeared. First launched in late 2006, GOTS certification standards are the product of an International Working Group on Global Organic Textile Standards that began in 2002 with the common purpose of establishing global standards for textile certification that could then be implemented (and enforced) internationally. The main bodies represented in the working group include: Organic Trade Association (OTA) from the USA, Japan Organic Cotton Association, Soil Association (SA) of England from England, International Association of Natural Textile Industry (IVN), Germany.

In 2006, the 4 organizations came to agreement on the global standards and released version one of the GOTS. In 2008, an international working group meeting then agreed upon a licensing system and logo. In May 2008, Version two of the GOTS was released. The GOTS is now accepted the leading set of criteria in the field of organic textile processing.. The logo helps consumers readily identify genuinely certified garments/apparel/textiles much more easily and efficiently (hooray GOTS!).

Yet the GOTS International Working Group (IWG) is NOT a certifying body. They set the standards, and then certification is left to approved certifying bodies. Currently there are a handful of accredited organizations/companies that are approved by IWG. Names and contact

details of all approved certifiers are listed on the GOTS website. Besides the technical requirements, a certifier must be approved by the IWG for GOTS certification, must agree to cease using their own standards and must fully adopt the GOTS. As a result, the certifiers: Control Union Certifications (formerly Skal International), EcoCert, ETKO and ICEA have dropped their own established standards and introduced to their clients the GOTS certification scheme.

International Working Group on Global Organic Textile Standard was formed in 2002 at the initiative of the main standardization bodies in the environmental field in order to unify the various existing standards and draft standards which have caused confusion among market participants and consumers, representing an obstacle for international trade of organic textile products.

Global Organic Textile Standard (GOTS) aim is to define requirements to ensure the organic quality of textiles, from the harvesting of the raw materials and social responsibility to the manufacturing and labeling process in order to provide credibility to the ultimate consumer.

According to the Global Organic Textile Standards:

Products sold, labeled or presented as "organic" or "organic - in conversion". 95% or more of the fiber content of products - excluding non-textile accessories - must be certified organic origin or in "conversion period" (identified and labeled as specified in these standards). Up to 5% of fiber content can be non-organic origin, including regenerated and synthetic fibers, as defined. The remaining difference can not contain the same conventional fiber materials contained in the organic portion of the same product.

Products sold, labeled or represented as "made with x% organic materials" or "made with x% organic materials in conversion" not less than 70% of fiber content of the product - except accessories - must be of organic origin certified or "in conversion period" (identified and labeled as specified in these standards). Up to 30% of fiber content in the product may be composed of non-organic fibers, fibers can not be GMOs. The remaining difference can contain a maximum of 10% recycled or synthetic fibers, as defined. Exceptions are socks, leggings and sports articles that may contain a maximum of 25% recycled or synthetic fibers. The remaining difference can not contain the same conventional fiber materials contained in the organic part of the same product (ie, no mixture).

Also there are a number of prohibited substances and additives restricted at all stages of production of organic textiles.

## **2. Organic cotton fibre**

The organic cotton is cotton which is grown without any harmful pesticides, herbicides, insecticides or artificial fertilizers. According to the Organic Trade Association (OTA), conventional cotton uses approximately 25% of the world's insecticides and more than 10% of the pesticides.

Cotton is much demanded fiber because of the soft texture and breathable nature that make it a very wearable fiber. In addition, the arrangement of the cellulose gives cotton a good degree of strength, durability and absorbency. [1]

Of all the organic fibers/fabrics on the market today, organic cotton is by far the most popular. Cotton fiber is the fabric of life in many farming families in Asia, Africa and South America. Globally, more than 50 million farmers grow it, but many receive a low price for their product, or find it difficult to compete with cotton producers in developed countries.

Organic cotton is grown using methods and materials that have a low impact on the environment. Organic production systems replenish and maintain soil fertility, reduce the use of toxic and persistent pesticides and fertilizers, and build biologically diverse agriculture. Third-party certification organizations verify that organic producers use only methods and

materials allowed in organic production. If all the cotton produced was grown organically, it would reduce the use of insecticides by 25 percent.

Transgenic cottons, containing Bt genes, are not allowed to be used for the production of organic cotton – the general reason is that this technique is not natural. [2]

Organic cotton is no longer boring since that organic cotton with color can be grown these days, and organic cotton can be colored with eco-safe dyes, too. Organic cotton can be used to make clothing and home furnishings.

Naturally colored cottons have always existed in nature. Native peoples have used their short fibers for hand spinning and weaving. Modern plant breeders have used them as a source of desirable plant characteristics such as disease and pest resistance. The fiber itself has never been improved and has not been spinnable with modern textile machinery.

Cotton was grown in the Americas at least 4500 years ago. In contrast to the Old World cottons grown for animal feed, New World cotton was domesticated for its fiber and medicinal uses. Bearing lint in tones of gray, brown, tan, and white, cottons were selected from the tropical wilds.

Cotton in shades of brown through rust and tan currently grows in the places of original domestication including Peru, Ecuador, Central America, Mexico and Southeastern USA. The lint from these plants is used to make special garments. The short coarse fibers require both more skill and patience to spin by hand into yarn.

An extensive research and development program started in 1982 and using traditional plant breeding techniques has developed several unique varieties which have been granted Plant Variety Protection status as machine spinnable naturally colored cottons. The textile industry has demonstrated the utility of these fibers and is now using them in many products.

Due to relatively low yields per acre and the research and development, the cost of current color grown cottons varieties are higher than traditional white cotton. This does not mean however, that the finished textile product is expensive.

The costs of dyeing cotton, both economically and environmentally, can be very high especially in countries with strict pollution standards. In the US, it costs approximately \$2.00 a pound to dye a dark brown yarn. This includes the actual cost of the dyestuff, energy, water, and toxic dye waste disposal. This expense is completely eliminated when using color grown cottons and even with higher initial cost of the fiber, the price of producing yarns is competitive. It is evident that using currently available color grown cottons varieties for colored yarns is both ecological and economical. The cost advantage will only improve in the future when new and improved varieties of this type of cotton with higher yields and superior fiber qualities are available.

### **3. Organic bamboo fibre**

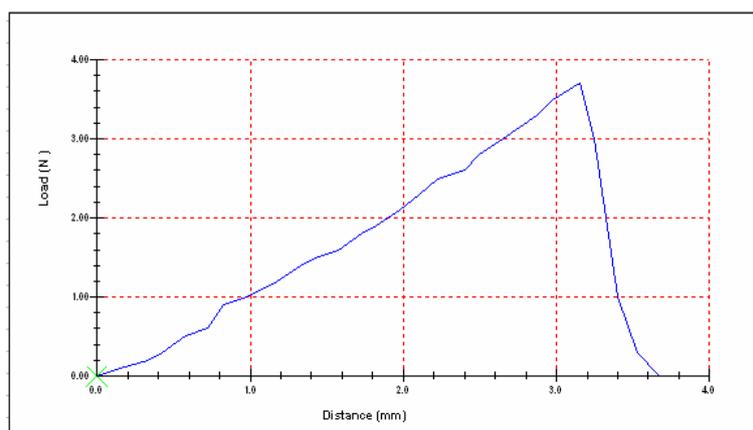
Bamboo is a type of grass. Organic bamboo yarn is made from the pulp of that grass. The thin fibers, or strands, are spun into the yarn during the organic bamboo production process. Bamboo yarn is durable, holds color well and feels cool against the skin. Many fabric manufacturers add this plant to their cotton material or create a separate line of organic bamboo fabric.

Bamboo grass takes about three to five years to reach maturity. There is no need for pesticides while growing the grass, it regenerates on its own and consumes a lot of nitrogen, which can help with pollution. After reaching maturity, the plant can be harvested and new grass will grow within a few months and can be harvested again. All in all, this is an extremely eco-friendly plant!

Organic bamboo fabric is made from the pulp of bamboo. The pulp is separated into thin fibers that are spun into yards or woven into cloth which is easily dyed and made into garments.

Because bamboo fabric has excellent wicking properties, it is a perfect choice for fabric in garments that will be worn close to your skin like workout clothes or undergarments. Bamboo is commonly woven with cotton in order to make it cost effective to produce as well as to allow for more stability and color variations.

Among the advantages of bamboo fiber are: no chemicals required for growing, very few insects prefer this as a food source, therefore no pesticides required, bamboo is a dense thicket, very few weeds will be found in a Bamboo grove, therefore herbicides are not required, yearly harvest is possible, compared to Wood (Tencel is a wood pulp fiber) has a much shorter growing time, no heavy machinery is needed for harvesting or for turning the soil, it is renewable and biodegradable, provides source of income for geographically isolated rural communities, encourages passing on of cultural heritage and traditional methods of agriculture, strong fiber with good tenacity (figure 1) a luster like silk but more economical, easily dyed.



**Figure 1.** Organic bamboo tenacity \*

Because of the distinctive characteristics of bamboo fiber, such as its natural antibacterial and biodegradable properties, high moisture absorption capacity, softness, brightness as well as UV protective characteristics, bamboo textile products have started to edge into the textile market. With its high moisture absorption capacity, breathability and fast drying behavior due to its unique microstructure, bamboo fiber ensures comfort in various applications. Currently, regenerated bamboo fiber is used in apparels including underwear products, sport clothes, t-shirts and socks. It is preferred in summer clothes, especially in garments for pregnant ladies and children to protect them from UV radiation. Its natural antibacterial nature makes it suitable for hygienic products and sanitary materials such as sanitary napkins, absorbing pads, masks, mattresses, bandages, surgical clothes, food packing bags etc. Since chemical additives are not needed to obtain antibacterial characteristics, such products are not believed to cause skin allergies. Moreover, regenerated bamboo fiber is used in home furnishings such as towels, bathrobes, bedding sets, blankets and curtains.[3]

#### 4. Conclusion

Bamboo grows quickly, requiring few farming inputs and no pesticides. When compared to other fibres such as cotton, it is far more sustainable. Cotton requires huge amounts of water and extensive use of pesticides – that pollute the environment. Bamboo takes up more greenhouse gasses and releases more oxygen and does not need replanting, or fertilisers and its roots are very good at stabilising erosion prone soil.

Physical properties of bamboo yarn including breaking tenacity and elongation at break decrease as the yarn becomes thinner (table1). These results are consistent with the results

obtained in industrial researches [4]. As expected, the elongation values of organic bamboo yarn are relatively small.

**Table 1** Various physical parameters of the fibres

	<b>ORGANIC COTTON</b>	<b>COLOR GROWN COTTON</b>	<b>BAMBOO</b>	<b>BAMBOO-COTTON MIX (50%)</b>
<b>Dry tenacity, cN/tex</b>	<b>20 – 24</b>	<b>8 – 17</b>	<b>14 – 28</b>	<b>4-7</b>
<b>Wet tenacity, cN/tex</b>	<b>23 – 27</b>	<b>8 – 16</b>	<b>14 -23</b>	<b>7- 14</b>
<b>Elongation at break , %</b>	<b>8 – 16</b>	<b>5 – 10</b>	<b>3 - 5</b>	<b>2-7</b>

This plant produces natural and eco-friendly fiber without any chemical additives. More importantly, bamboo fiber is a unique biodegradable textile material. As a natural cellulose fiber, bamboo fiber can be 100% biodegraded in soil by micro organisms and sunlight. The decomposition process does not cause any pollution in the environment. "Bamboo fiber comes from nature and completely returns to nature in the end". Bamboo fiber is praised as "the natural, green and eco-friendly new-type textile material of the 21st century".[5]

## 5. References

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\* The yarns were tested for tenacity and elongation at break on a SATRA STM466