

Sustainability & fashion

- The case of Bamboo.

Bethina Elverdam Nielsen

Listaháskóli Íslands
Hönnunar- og arkitektúrdeild
Fatahönnun

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Bethina Elverdam Nielsen
Leiðbeinandi: Sóley Stefánsdóttir
Vorönn 2013

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Designers have a key role in this development by increasing the opportunities for sustainable consumption and production.

Bamboo textile has recently been given great exposure as a sustainable fibre from the industry. And it has been praised as the natural and eco-friendly textile material of the 21st century. However, in most cases bamboo fabric is processed by chemical means.

In this essay some of the conflicting messages that can be found regarding the sustainability of bamboo made fabrics will be addressed, by giving an outline of the technical background and processes of manufacturing bamboo.

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Introduction

As a fashion student, entering my last semester, with the ambition of working in the fashion industry after graduation, I have been given the time to explore a subject that lies close to my heart: Sustainability in the fashion industry. It is a discussion that is current in society and has been accelerating for some years now.

Sustainability and fashion are two seemingly contradictory concepts as fashion is all about change and sustainability is all about preservation, but the fashion industry has to develop towards sustainability like all other resource intensive industries in the world. It is now estimated that humans are using resources equivalent to 1.5 planets and still increasing.¹ At the moment bleaching, dying and printing processes used in the fashion industry, place clothing manufacturing on an equal level with petro-chemical production.²

„At least 8,000 chemicals are used to turn raw materials into textiles, and 25 percent of the world's pesticides are used to grow non-organic cotton. This causes irreversible damage to people and the environment, and still two-thirds of a garment's carbon footprint³ will occur after it is purchased.“⁴

Designers have a key role in this development by increasing the opportunities for sustainable consumption and production. There are textile specialists and fashion designers who work to encourage the industry to develop responsible methods for the production of clothes. Some designers do this through the use of recycled materials, whereas others

¹ *World footprint: do we fit on the planet*, Global footprint network, 14/05/2012, seen jan. 2013, http://www.footprintnetwork.org/en/index.php/GFN/page/world_footprint/

² Cotton alone consumes 24% of the world's total pesticides, despite using only 2.2% of the world's cultivated area. [...] processing wool requires the use of solvents, chemicals and detergents. Most synthetic fibres rely on petrochemical sources, contributing to the depletion of fossil fuels. Fabric and fabric dye processes use toxic chemicals associated with harmful emissions. The textile industry is said to produce the largest amount of wastewater of any industry, which is typically discharged into the environment. Quinn, Bradley, *Textile futures; fashion, design and technology*, Berg publishers, 2010, p. 109+281.

³ Carbon footprint: The impact of a certain activity on the emission of CO₂ into the atmosphere. A carbon footprint is defined as: The total amount of greenhouse gases produced to directly and indirectly support human activities, usually expressed in equivalent tons of carbon dioxide (CO₂). The carbon footprint is a very powerful tool to understand the impact of personal behaviour on global warming. Most people are shocked when they see the amount of CO₂ their activities create! If you personally want to contribute to stop global warming, the calculation and monitoring of your personal carbon footprint is a good idea. There are many free online carbon footprint calculators on the internet.

Carbon footprint, Green room voice, 15/3/2012, seen jan. 2012, <http://greenroomvoice.com/glossary/carbon-footprint/>

⁴ *Sustainable fashion: an online guide*, fibers, seen nov. 2012, <http://www.fibers.com/main/sustainable-fashion-guide>

favour organic fabrics such as hemp, raw silk and Ingeo⁵. Biodegradable textiles and renewable melt-processable fibres⁶ are popular inorganic choices.⁷

As a fashion designer wanting to start a company that is not part of the problem, but part of the solution I need to find out where to start. Where do I get information?

I know that one of the most important things within my control is the material I choose. So, where are my limits in use of material? Do I have to limit myself, in the use of elements such as colour, bleaching, and washing methods? And why shouldn't there be limits, if toxins, such as Formaldehyde, are the only methods used to achieve this.

I could decide to go all organic in production, using only organic natural fibres in the designs, but do I have to? Is it the most sustainable choice or are there other solutions, in today's technological society?

For fashion designer to source ecologically sustainable textiles can a problematic task. Supplies have been limited, and qualities basic due to the little demand.⁸ Another challenge is the conflicting messages about the materials and the mixture of positive and negative impacts.

Bamboo textile has recently been given great exposure as a sustainable fibre from the industry. And it has been praised as the natural and eco-friendly textile material of the 21st century. However, in most cases bamboo fabric is processed by chemical means.⁹

In this essay some of the conflicting messages that can be found regarding the sustainability of bamboo made fabrics will be addressed, by giving an outline of the technical background and processes of manufacturing bamboo.

It will question whether the product is in fact sustainable? And look into why some apparel companies have chosen solely to use bamboo made fabrics?

But first I will start by going through what sustainability means for a designer?

Sustainability in fashion

Sustainability in general

In the 1987 report of the World Commission on Environment and Development there is an expressed concern about the „accelerating deterioration of the human environment and natural resources.“ and the consequences that this deterioration will have for economic and social development.

⁵Ingeo is a bio plastic that is made up of long molecular chains of the polymer polylactide. It is derived from naturally occurring plant sugar. Using Ingeo results in 60% less greenhouse gases than the oil-based PET or PS plastic it replaces. The fibres are industrially compostable.

From plants to plastic, Natureworks, seen Dec. 2012,

http://www.natureworkslc.com/~media/The_Ingeo_Journey/EcoProfile_LCA/HowItsMade/NatureWorks_How_Ingeo_is_Made_poster.pdf

⁶„Poly(lactic acid) (PLA), the first melt-processable synthetic fibre produced from annually renewable resources, combines ecological advantages with excellent performance in textiles.“

Overview of Poly(lactic acid) (PLA) fibre, Ebsco Host Connection, 11/2009, seen dec. 2012.

<http://connection.ebscohost.com/c/articles/52443754/overview-poly-lactic-acid-pla-fibre>

⁷ Bradley, p. 109.

⁸ Black, Sandy, *Eco-chic: the fashion paradox*, Black dog publishing, 2008, p. 130.

⁹ Ibid. , p. 132.

The Brundtland Commission of the United Nations expresses that: “sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs.” And that this should be a guiding principal for all organisations and enterprises, either private and Governmental.¹⁰

What is sustainable fashion?

When thinking about sustainable fashion or ‘green’ fashion, it is common to think of the sixties linen cloths, natural colouring and tie-dye, and to many it seems odd that a manufactured material can be sustainable. But the industry has come a long way and today there are manmade materials such as the corn-based Polylactic acid or PLA, which are considered natural because they are produced from natural renewable resources.¹¹

„Sometimes choices are not as obvious as they seem. For ex. a cotton fabric may be chosen over a similar polyester fabric because of biodegradability. Yet if the polyester fibres used are made from recycled soda bottles and the cotton fibres come from an agricultural area in which pesticides and much irrigation (water) are required, perhaps the polyester fabric should be favoured even though it is made from limited resource (petroleum). Another example is rayon. This fibre is processed from a naturally occurring and renewable material – trees, which are biodegradable. While this fibre is an environmentally friendly product, it is not completely eco-friendly because the use of acid is required in its production, which could escape into the air or surface water. Also when mixed with landfill materials, the fibres may not degrade quickly. In addition the harvesting of trees to provide wood pulp may be criticized if overharvesting occurs.“¹²

There are people who believe that you don’t need to constrain the technical and social innovation by letting ethics and responsibility inform your design decisions. „Design mindfulness involves a determination to: think about the consequences of design actions before we take them and pay close attention to the natural, industrial, and cultural systems that are the context of our design actions.“¹³

When evaluating a products green characteristic, all aspects, from production to disposal should be examined. Terms like ex. “eco-friendly“ suggest that conservation of energy, environmental safeguards, and waste minimization, has been evaluated through out the process of the product. Only few finished products please all criteria, so the more environmentally friendly the process has been, the greener the product is said to be.¹⁴

¹⁰ General Assembly, United Nations, 16/12/1999, seen jan. 2013.

<http://www.un.org/documents/ga/res/42/ares42-187.htm>

¹¹ *Sustainable fashion: an online guide*, fibers, seen nov. 2012, <http://www.fibers.com/main/sustainable-fashion-guide>

¹² Johnson, Ingrid and Allen C. Cohen, *J.J. Pizzuto's Fabric science*, Fairchild books, 9. Edition, 2010, p. 306.

¹³ Thackara, John, *in the bubble designing in a complex world*, The MIT Press, 2005, p. 7-8

¹⁴ Johnson, op. cit. ,p. 307-9.

The case of bamboo as a sustainable fabric

Bamboo fabric is becoming the wonder of sustainable textiles. But is it really all that wonderful?

I was surprised when it came to my attention that bamboo fabric is neither organic nor chemical free, like retailers and the media have been portraying it. Actually it is not even correct to call it Bamboo-fabric, which it is not. The correct term is rayon or viscose from bamboo. At least the type of fabric that all the hype is about. While bamboo itself is a sustainable product there is nothing organic or natural in the process of making it into fibres that can be used for clothing.

There are two processes to make the bamboo plant into a textile: mechanically and chemically.

In the mechanical process „the woody parts of the bamboo plant are crushed and then natural enzymes are used to break the bamboo walls into a mushy mass so that the natural fibers can be mechanically combed out and spun into yarn. This is treated as an eco-friendly manufacturing process. Another mechanical method crushes the woody parts of the bamboo plant into powder, which is mixed with water.“¹⁵

Bamboo fiber product made from this process is sometimes called bamboo linen. Very little bamboo linen is manufactured for clothing because it is more labor intensive and costly. It is largely used in towels and sheets.

Either mechanical process is more labour intensive and costly than the chemical process, so they aren't used very often.

„Chemically manufactured bamboo fiber is a regenerated cellulose fiber similar to rayon or modal. Chemically manufactured bamboo is sometimes called bamboo rayon because of the many similarities in the way it is chemically manufactured and similarities in its feel and hand. Bamboo fiber is chemically manufactured by cooking the bamboo leaves and woody shoots in strong chemical solvents such as sodium hydroxide and carbon disulfide in a process also known as hydrolysis alkalization combined with multi-phase bleaching. This is basically the same process used to make rayon from wood or cotton waste by products.“¹⁶

The 'Occupational Safety & Health Administration' has reported Carbon Disulphide has the ability to cause coronary heart disease, organic brain damage, peripheral nervous system decrements, neurobehavioral dysfunction, and ocular & auditory effects all

¹⁵ Mass, Ed, *Bamboo Textiles: Green, Luxurious and Practical*, natural life magazine, seen dec. 2012, http://www.naturallifemagazine.com/0904/bamboo_textiles.htm

¹⁶ Das, Dr. Subrata, *Bamboo: 21st century eco fiber*, Fiber2fashion, seen jan. 2013, <http://www.fibre2fashion.com/industry-article/3/269/bamboo-21st-century-eco-fiber-application-in-towel-sector3.asp>

depending on the amount of exposure. At lower exposure it can cause headaches, malaise, severe eye, skin and mucous membrane issues as well as vomiting and muscle weakness.¹⁷ With both mechanical and chemical process, the slurry that's created from the bamboo is extruded through a Spinnerette (a shower head-like device) to create the fibre.¹⁸

Regenerated cellulose fibres

Rayon or viscose as it is mostly named in Europe is not a new invention, and the thought that this type of textile, which has a chemically intense history, could now be a fibre with a strong sustainable story is incredible to many.

Rayon was the first manmade cellulosic fibre invented in 1884, but the term 'Rayon' was first used in 1924. Regenerated cellulosic fibres such as rayon are now referred to as 'first generation' manufactured fibres, whereas synthetics represent the 'second generation'. The products of recent development in the last two decades, such as microfibers, which have refined the technology and performance of previous processes and fibres, are called 'third generation' fibres.¹⁹ In 1884, a French chemist, Hilaire de Charbonnet, Comte de Chardonnay, patented an artificial silk that was a cellulose-based fabric known as Chardonnay silk." However it was a very flammable fabric and was removed from the market.

British inventors, Charles Cross, Edward Bevan, and Clayton Beadle came up with a safe method of making artificial silk, in 1894. This became known as viscose rayon.^{20 21}

Though the process of making rayon from wood or cotton is old, a method for using bamboo wasn't developed until 2003.²²

Most rayon made today uses the viscose process, which dates to the early 1900s.

This process can be made more or less environmentally friendly, all depending whether the chemicals are captured and reused.²³ I will return to this later on.

„The reason the viscose process is thought to be detrimental to the environment is based on the process chemicals used. Though sodium hydroxide is routinely used in the processing of organic cotton, and is approved by the Global Organic Textile Standard (GOTS), carbon disulfide can cause nervous system damage with chronic exposure. And that “chemical bath” to harden the threads? Sulfuric acid. These chemicals do not remain as a residue on the fibers – the proof of this is that almost all of the viscose produced can be (and often is) Oeko Tex certified (which certifies that the finished fiber has been

¹⁷ *Occupational safety and health guideline for carbon disulphide*, United States Department of Labor, seen jan. 2013. <http://www.osha.gov/SLTC/healthguidelines/carbondisulfide/recognition.html>

¹⁸ Mass, Ed, *Bamboo Textiles: Green, Luxurious and Practical*, natural life magazine, seen dec. 2012, http://www.naturallifemagazine.com/0904/bamboo_textiles.htm

¹⁹ Modal, Cupro and Lyocell are some of the fibres included.

²⁰ *The history of fabric*, Inventors, seen jan. 2013. <http://inventors.about.com/library/inventors/blfabric.htm>

²¹ Black, p. 146.

²² *Bamboo and the FTC*, O Ecotextiles, 19/08/2009, seen jan. 2013. <http://oecotextiles.wordpress.com/2009/08/19/348/>

²³ Mass, Ed, *Bamboo Textiles: Green, Luxurious and Practical*, natural life magazine, seen dec. 2012, http://www.naturallifemagazine.com/0904/bamboo_textiles.htm

tested for any chemicals which may be harmful to a person's health and contains no trace of these chemicals.)

The problem comes in disposing of these process chemicals: the sodium hydroxide (though not harmful to humans) is nevertheless harmful to the environment if dumped into our rivers as untreated effluent. Same with carbon disulphide and, certainly, sulphuric acid. Oeko Tex certifies only the final product, i.e., the fibres or the fabric. They do not look at the production process, which can be devastating.²⁴

The recovery of these solvents in most viscose factories is around 50%, which means that the other 50% goes into the environment.²⁵

After the pulp has been made into a viscose fibre it is to be woven into a fabric. In terms of chemical and water use, the environmental burden is devastating if done conventionally.²⁶

The production of making rayon from wood pulp is produced at great social and environmental cost to ex. Borneo's local communities and forests. Rayon mills are causing grave water and air pollution problems in many places while rapidly destroying native rainforests and coastal mangroves.²⁷

Phd doctor in microbiology, Sonali Bhawsar, states in an article on toxic fibres and fabrics, that:

„Carbon disulphide is released into the environment in gaseous form along with other 3 hazardous chemicals. Their combined toxic effects are carried on heart, skin and nervous system. Carbon disulphide poisoning is similar to alcohol intoxication. [...] Carbon disulphide is also emitted from rayon fabric. Ill health effects like nausea, vomiting, headache, chest and muscle pain and insomnia can be observed in people who wear rayon clothing regularly. Other toxicity effects are tissue necrosis, anorexia, polyneuropathy, paralysis, insomnia and parkinson's disease. Chronic toxic effects on aquatic system, death or low growth of plants, shortened life span and reproductive effects in animals are also associated with toxicity caused by rayon factory effluents.“²⁸

So it is not the production process of the fibre that makes this material so 'green'. What then?

Bamboo as a plant

Throughout Asia, bamboo has been an essential part to religious ceremonies and daily life for centuries. It is said to be a mystical plant, symbolizing strength, tenacity and endurance

²⁴ *Eucalyptus fiber by any other name*, O Ecotextiles, 02/03/2012, seen jan. 2013.

<http://oecotextiles.wordpress.com/category/fibers/viscose/>

²⁵ *On bamboo and rayon*, The footprint chronicles, 04/2009, seen jan. 2013.

http://www.patagonia.com/pdf/en_US/bamboo_and_rayon.pdf

²⁶ *Bamboo and the FTC*, O Ecotextiles, 19/08/2009, seen jan. 2013.

<http://oecotextiles.wordpress.com/2009/08/19/348/>

²⁷ *Shop intelligently to help save Borneo's rainforests*, The Borneo project, seen jan. 2013.

<http://borneo.live.radicaldesigns.org/article.php?id=60>

²⁸ Bhawsar, Sonali, *Toxic fibers and fabrics*, Biotech Articles, marts 2011, seen jan. 2013.

<http://www.biotecharticles.com/Toxicology-Article/Toxic-Fibers-and-Fabrics-699.html>

among others. Some of the earliest historical records were written on green bamboo strips. These date back to the 2nd century B.C..²⁹

The species that is used for apparel production grows faster than any other plant. It can grow up to 122 cm per day and quickly reaching heights over 12 meters. Because of this fast growth it is able to deliver far more usable raw material per hectare than any other alternative. The bamboo grass is also self-regenerating, and mostly it will regrow after being harvested. It is today's most renewable source.³⁰

„The earth's natural resources are limited by the planet's capability to renew them. Forests and harvested products are renewable over a number of years or month, provided that exploitation does not exceed regeneration. Fibre crops such as cotton and hemp and those based on cellulose from trees, such as Lyocell, have the potential to strike the critical balance between speed of harvesting and speed of replenishment and to be renewable. In contrast, for fibres based on minerals and oil, there is a gross imbalance between rate of extraction and speed of regeneration (which for oil is around a million years); hence they are described as non-renewable. [.. How renewable the fibre is, ..] often reaffirm preconceived notions of which fibres are 'good' in sustainable terms (assumed to be natural and renewable) and those that are 'bad' (manufactured and non-renewable).“³¹

The cultivation of bamboo needs no pesticides or chemical fertilizers and therefore it is naturally organic. The cotton production uses 16% of the world's insecticide consumption. This is more than any other single crop. And a lot of these chemicals run into our waterways, harming both humans and the natural environment. „In addition, bamboo requires much less land and water (as a ratio to usable fibre produced per acre), than cotton, organic cotton, and other alternative fibres.“ Bamboo requires only natural rainfall, where 15.000 litres of water is needed to grow 1 kg of cotton. The cotton is often grown on arid lands and therefore the water is piped in from what is sometimes a critical watershed.³²

This is the main cause of the Aral Sea disaster:

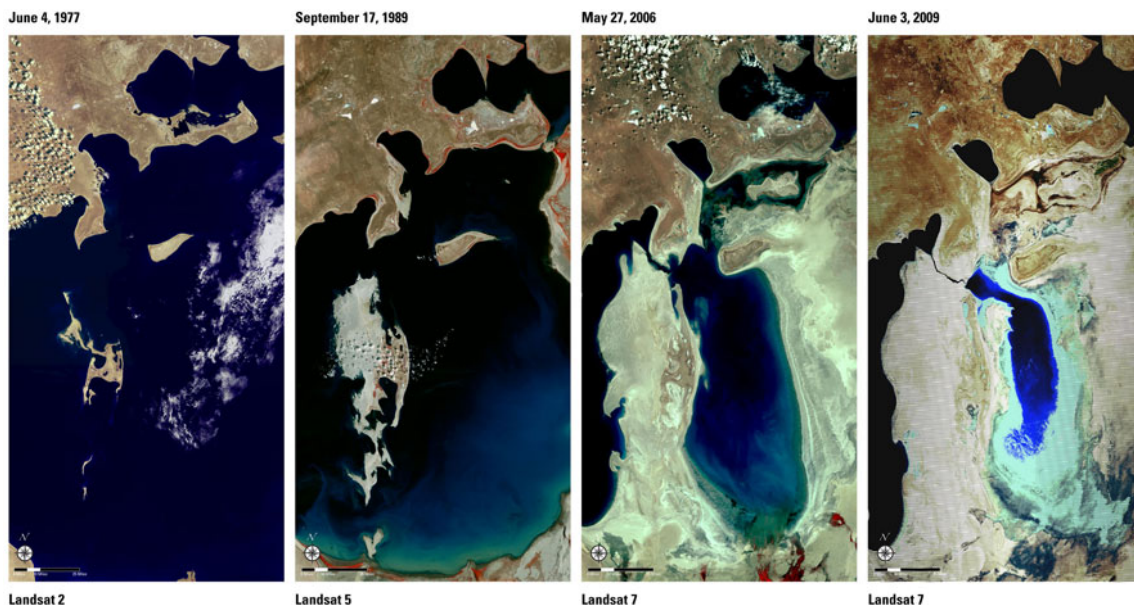
²⁹ Das, Dr. Subrata, *Bamboo: 21st century eco fiber*, fiber2fashion, seen jan. 2013.

<http://www.fibre2fashion.com/industry-article/3/269/bamboo-21st-century-eco-fiber-application-in-towel-sector3.asp>

³⁰ *The foundation room 1.2*, Arbor, seen jan. 2012. <http://arborcollective.com/2010/07/the-foundation-room-1-2/>

³¹ Fletcher, Kate and Lynda Grose, *Fashion sustainability: design for change*, Laurence King Publishing, 2012, p. 14

³² *The benefit of bamboo*, Arbor, 29/10/2012, seen dec. 2012, <http://news.arboreurope.eu/tag/bamboo/>



„The Aral Sea, located in Kazakhstan and Uzbekistan in central Asia, was once one of the largest inland bodies of salty reservoirs in the world and the second largest sea in Asia.“³³

Every year the sea level drops a meter and more land is exposed. The chemical pesticides from the cotton production are concentrated in a crust, and a lethal dust cloud is circulated by the wind, causing health problems for the population and reducing agricultural productivity as a result of the build up of salts in soil and water which eventually reaches toxic levels for plants. „The people in these regions suffer from high levels of anaemia, together with rising levels of tuberculosis, whilst children suffer from liver, kidney and respiratory diseases, micronutrient deficiencies, cancer, immunological problems and birth defects.“³⁴

While all types of cotton cultivation, strip the land of nutrients, the bamboo propagation prevents erosion and adds nutrients back to the soil and in addition, it absorbs more carbon dioxide and releases more oxygen than corresponding stands of trees. There is no machine-based harvesting. The bamboo is hand picked using traditional methods that have a much lower impact on the environment. Neither is the bamboo planted on cleared forestlands; it is sustainably selected from naturally occurring bamboo stands. And the type of bamboo that is used in apparel production, called Moso, is neither a source of food for pandas, nor is it harvested from panda habitat.³⁵

There is a rapidly growing recognition of the ways in which bamboo can serve us as consumers and also help to save the planet from the effects of climate change through its unrivalled capacity to capture carbon.³⁶

³³ *Landsat update: volume 3 issue 4 2009*, USGS, 30/12/2010, seen jan. 2013. http://landsat.usgs.gov/about_LU_Vol_3_Issue_4.php

³⁴ *The aral sea and drought*, Unicef, seen jan. 2013. <http://www.unicef.org/uzbekistan/wes.html>

³⁵ *The benefit of bamboo*, Arbor, 29/10/2012, seen dec. 2012, <http://news.arboreurope.eu/tag/bamboo/>

³⁶ <http://www.bbc.co.uk/news/magazine-17568088>

Because there is such a variety in bamboo species it is more adaptable to different climatic zones. With its more than 1000 different species, it can grow in almost 70% of the earth's land area.

Bamboo is richly available in many country areas where economic development is limited, and can offer a social benefit to those populating those areas. The resourcefulness of bamboo is evidenced by its many ways to be used. Different species are used for different purposes, including food for humans and livestock, textile products, ingredients for Chinese medicines and construction of flooring, fences and roofing. „Through research and development of more ways to utilize bamboo, rural areas are afforded an opportunity to maintain their culture and lifestyle while improving their economic situation.“

Most bamboo comes from China who has had a bad reputation for unfair labour and environmentally destructive practices. Yet, like anywhere else, it depends on the individual situations, people and factories that are producing the materials.³⁷

„The International Network for Bamboo and Rattan (INBAR) is an independent non-governmental organization which was founded in Beijing in 1997. It works in more than fifty countries across Asia, Africa, and South America to develop programs which promote bamboo as a means of combating climate change, achieving environmental stability, and alleviating poverty in the developing world.“³⁸

The ‘closed loop’ system

Renewability alone of raw material does not guaranty sustainability. According to Kate Fletcher and Lynda Grose's book: *Fashion and sustainability*, „Recent claims about bamboo fabrics have been based entirely on the vigorous growth of bamboo grass and its rapid and constant renewability. But the subsequent processing into viscose of cellulose sourced from bamboo has high-impact waste emission to both air and water.“³⁹

The main concern is the use of chemicals during the process of extracting the cellulose from bamboo.

Tencel®, which is a branded name of lyocell fibre, is a fabric made from wood pulp harvested from eucalyptus tree farms. This is also a regenerated cellulose fibre, but processed with a non-toxic spinning solvent in a closed-loop system. Though eucalyptus produces the best quality fibre with the least amount of waste, it is possible to use bamboo, or other sources of cellulose.⁴⁰

In the closed loop process for extraction of bamboo viscose, all chemical solvents are recovered and recycled for further use. The system captures and purifies all water and air used in the process, before returning them to the environment.⁴¹

³⁷ Mass, Ed, *Bamboo textiles: Green, luxurious and practical*, natural life magazine, seen jan. 2013.

http://www.naturallifemagazine.com/0904/bamboo_textiles.htm

³⁸ *Bamboo: a natural source of inspiration*, Green earth news, 28/12/2012, seen dec. 2012,

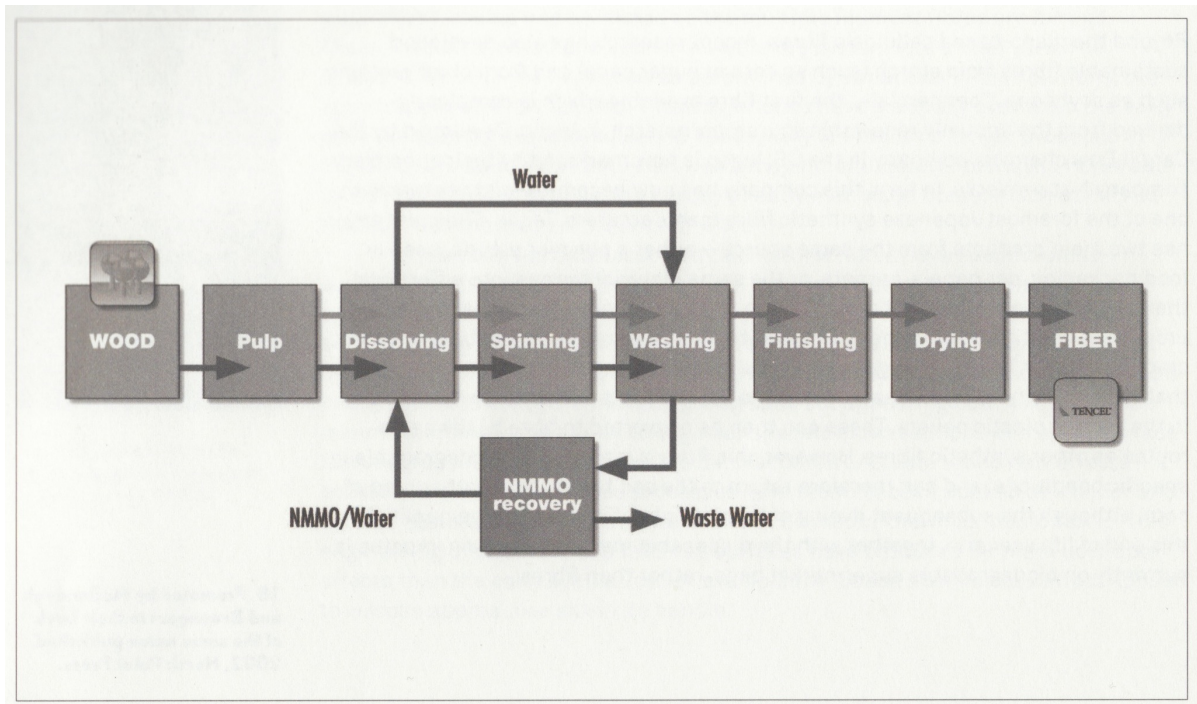
<http://blog.greenearthbamboo.com/>

³⁹ Fletcher, p. 14.

⁴⁰ *Bamboo and rayon*, the footprint chronicals, 04/2009, seen jan. 2013.

http://www.patagonia.com/pdf/en_US/bamboo_and_rayon.pdf

⁴¹ *The benefit of bamboo*, Arbor, 29/10/2012, seen dec. 2012, <http://news.arboreurope.eu/tag/bamboo/>



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If using the processing of Tencel and lyocell fibres, it has to be ensured that it does not apply any of the harmful chemicals that are sometimes used to treat these fibres. „ Some factories use a formaldehyde treatment to avoid pilling and fuzz, but other formaldehyde-free treatments are available and are environmentally preferred.“⁴³

As has been the topic in this essay, messages are often contradictory and confusing. According to the book *fashion and sustainability*, by Kate Fletcher and Lynda Grose that was published in 2012; „at present such options as bamboo cannot be processed in the Lyocell manufacturing chain owing to their subtly different chemistry.“⁴⁴ And she has not made any updated statement on her web page. The last bamboo related topic was the somewhat negative post, *Bamboo Shamboo*, from March 2012 where she also refers to the claims of bamboo fabric having antibacterial properties among others. She says:

„There is no evidence for any of these claims. In the case of the assertion about antibacterial qualities, cellulose (the building block of bamboo) has no inherent antibacterial action and there is nothing in the viscose production process that confers this onto fibre.“⁴⁵

But according to Dr. Subrata Das, who has his Ph.D. in textile development, and is currently heading the Consumer Testing Laboratories (India) Limited, Inc., Bangalore:

⁴² Black, Sandy, *Eco-chic: the fashion paradox*, Black dog publishing, 2008, p. 147.

⁴³ *On bamboo and rayon*, the footprint chronicles, 04/2009, seen Jan. 2013, http://www.patagonia.com/pdf/en_US/bamboo_and_rayon.pdf

⁴⁴ Fletcher, p. 16.

⁴⁵ *Bamboo shamboo*, Kate Fletcher, 02/03/2012, seen Dec. 2012. <http://katefletcher.com/bamboo-shamboo/>

„Scientists have found that bamboo contains a unique anti-bacteria and bacteriostasis bio-agent named "bamboo kun". This substance is maintained in the finished bamboo fabric as it is bound tightly to the bamboo cellulose molecule. Bacteria will propagate rapidly in cotton and other fibres obtained from wood pulp, forming bad smell and even cause early degradation of the fibre in some cases. But it will be killed 75% after 24 hours later in bamboo fibre. [...] Bamboo fibre's natural anti-bacterial function differs greatly from that of chemical antimicrobial. The latter often tends to cause skin allergy when added to textile substrate.“⁴⁶

The China Industrial Testing Center (CITC) and the Japan Textile Inspection Association (JTIA) have also showed indications that bamboo viscose based fabrics retain these anti-microbial properties in Studies, But the Federal Trade Commission (FTC) does not acknowledge these studies, but has not provided any scientific evidence to disprove these studies.⁴⁷ In 2009 the commission issued an order against companies who according to the FTC, where false labelling bamboo viscose based apparel, claiming that it was anti-microbial. A violation could result in a civil penalty of up to 16.000 U.S. dollar.⁴⁸

„Until we have bamboo textiles, that are certified organic from farming through manufacturing, there are other options for being confident about the purity of the finished product. One option is to have the finished item certified to the Oeko-Tex Standard 100. This is labeled as: “Confidence in Textiles. Tested for Harmful Substances according to Oeko-Tex Standard 100.“^{49,50}

Certificate stamps

Sourcing fabric manufacturers on the Internet, who produce organic, or in a sustainable way, can be quite a frustrating task.

When searching for fabrics it can be a good help to look if they have been marked with a certificate stamp. That will often guide you as far as the regulations the company works within. There are a lot of certificate stamps out there and you have to do a whole deal of research to know exactly what they stand for and how much they cover.

It is not enough to think you can choose a fabric that is stamped organic. That does not always mean that the whole production of the fabric is organically made, or that it is chemical free.

⁴⁶ Das, Dr. subrata, *Bamboo: 21st century eco fiber*, fiber2fashion, seen jan. 2013.

<http://www.fibre2fashion.com/industry-article/3/269/bamboo-21st-century-eco-fiber-application-in-towel-sector3.asp>

⁴⁷ *the benefit of bamboo*, Arbor, 29/10/2012, seen dec. 2012, <http://news.arboreurope.eu/tag/bamboo/>

⁴⁸ *Maker of rayon clothes barred from deceptive 'bamboo' claims*, FRC 22/10/2009, seen jan. 2013, <http://ftc.gov/opa/2009/10/bamboosa.shtm>

⁴⁹ The list of criteria contains over 100 test parameters for harmful substances to assure that the textiles are not harmful to health.

⁵⁰ Mass, Ed, *Bamboo Textiles: Green, Luxurious and Practical*, natural life magazine, seen dec. 2012, http://www.naturallifemagazine.com/0904/bamboo_textiles.htm

One of the well-known certificate stamps is „The Global Organic Textile Standard“ (GOTS). They:

„Integrate the entire textile processing stages, from the fibre to the finished product: the raw fibre must be organic farming certified and all the manufacturing processes involved must be inspected. The aim of this standard is to guarantee the traceability, the use of chemical friendly with the environment and the consumer's health, to ensure a quality system, a reduction of energy and to respect some social criteria.“⁵¹

On their web site „Global-standard.org“ there is a public database where one can find organic certified manufacturers and retailers. However only fabrics that contain a minimum of 70% natural fibres can be certified with the GOTS stamp.⁵² So „regenerated or man-made fibres like bamboo viscose or Lyocell cannot be certified organic, by GOTS, as they are not ‘natural’“. ⁵³

It has already been explained that Bamboo-viscose and other regenerated cellulose products like Lyocell, can be manufactured in a sustainable manner, so what kind of certificate stamps are good indicators, if buying these fabrics?

I looked into the company „Bamboosa“⁵⁴ who are proud to share with their customers what goes on in their supply chain. They have the following certificates from the OCIA International Organic Certification⁵⁵:



US National Organic program
(NOP)



OCIA International
(IFOAM-accredited)

These certificates mean that the farm, where the bamboo is grown, and the bamboo crops are certified organic. So it is not the actual finished fabric that is being certified.

According to the company profile the next step, which is the processing of the bamboo into viscose, two chemicals are used. One of them being Sodium hydroxide also known as Caustic soda⁵⁶, which is approved for use in textiles under the Global Organic Textile Standards (GOTS). The other chemical is Carbon disulphide where of 74% is recovered and recycled for further use. This is done in the 'closed loop' system.

⁵¹ Gots, Ecocert, seen dec. 2012. <http://www.ecocert.com/en/global-organic-textile-standard-gots>

⁵² www.global-standard.org

⁵³ *What fibres or textiles can be certified as organic?*, Soil association certification, seen dec. 2012. <http://www.sacert.org/textiles/newsandfeatures/articleid/2697/what-fibres-or-textiles-can-be-certified-as-organic>

⁵⁴ Bamboosa makes „bamboo“ womens/mens clothes, baby clothes and accessories. <https://www.bamboosa.com/store/cart.php>

⁵⁵ *Organic certification*, Bamboosa, seen dec. 2012. <http://www.bamboosa.com/checklist.php?PID=65>

⁵⁶ „Caustic soda is a strong chemical but poses no health hazard if used and disposed of properly“ <http://www.bamboosa.com/bamboo.php?PID=63>



After their bamboo has been produced into a viscose, it is certified with the OEKO-TEX 100.

This ensures that there are no chemicals present in the product, at that point in the processing that would be harmful to human health, including that of babies. They have no further certifications past the point of the viscose. But they ensure that the facility where they do dyeing and finishing of fabrics, is working on GOTS certification, meaning that there are no chemicals used that are not approved for use by GOTS.⁵⁷

Good publicity or trying to make a difference

Five Bamboo, an apparel company based in Seattle, convincingly explains in an interview with REVMODO, that they have tackled the environmental challenges of bamboo and created a line of eco-friendly bamboo clothing. It is the five siblings: Zahren, Xteln, Vehro, Rohre and Qxhna Titcomb whom in 2008, founded the company.

earlier, in 2005, they had a sports apparel company called Five Ultimate. But say that along the way, they realized that business could be a great vehicle for change, so the siblings spent more than two years researching bamboo fabric manufacture to find the best eco-friendly techniques. They say that their hope is that, even in a small way, they will shift the apparel industry in a more responsible direction, and educate their customers on the environmental impact of the clothes they wear on a daily basis.

„Our society needs to find a way of living that will allow us to exist and thrive within the ecological limits of our planet. So, we decided to pair our knowledge of the apparel industry with our passion for the environment to create a bamboo clothing company deeply rooted in sustainability.“⁵⁸

Being aware that the majority of the bamboo apparel currently available on the market today is produced via the viscose process, which is chemically intensive and produces harmful by-products, they have their fibre manufactured using the closed-loop Lyocell process. In the interview they explain that by using this closed-loop Lyocell process no harmful chemicals are used, no harmful gases are released, and virtually no waste is created. And though the water consumption in the viscose and Lyocell processes is very similar, it doesn't come near to the impact of growing cotton.

They call the result a Nomo™ Clean Bamboo fibre.

However, 'Nomo™ Clean Bamboo' is a trademark that they themselves have created.

On there web site they explain they have there bamboo fibre made:

„ We use **Nomo™ Clean Bamboo fibres** in our products, and the result is a line of clothing with minimal environmental impact that you'll be proud to own

⁵⁷ *Bamboo processing*, bamboosa, seen dec. 2012. <http://www.bamboosa.com/bamboo.php?PID=63>

⁵⁸ Peters, Adele, *Interview: Five Bamboo's eco-friendly clothing*, Revmoda, 31.08.2012, seen dec. 2012, <http://revmodo.com/2012/08/31/eco-friendly-bamboo-clothing/>

and wear. [...] To make Nomo™ Clean Bamboo fiber, we mix our **raw bamboo pulp with a non-toxic organic solvent solution**. This process of converting bamboo pulp into fiber is called the lyocell process. The organic compound NMMO isolates the cellulose, leaving us with a thick mixture which is sent through a shower head-like fixture (a spinnet) and rendered into filament form. What comes out is our Nomo™ Clean Bamboo fiber. Throughout the lyocell process, the **organic compound is 99% recovered and recycled or reused**. [...] Once we have our Nomo™ Clean Bamboo fiber, it's ready to be spun into thread and woven into fabric. [...] Nomo™ Clean Bamboo products are made with bamboo that is processed with the most cutting edge technology in cellulosic fibres, which has a minimal impact on the environment. We oversee every step of our manufacturing process, ensuring the factories we use offer a safe working environment and fair wages, and comply with all applicable environmental laws and regulations.⁵⁹

The company, Bamboosa also uses the closed-loop system, but in their process, 100% of sodium hydroxide and 74 of the carbon disulphide is recovered and recycled for further use.

In the TENCEL® production process (which is patented by the Lenzig Group) a non-toxic solvent which belongs to the amine oxide family is used. Close to 100% of the solvent is recovered in this production.⁶⁰

There are no other connections to the Nomo™ Clean Bamboo fibres than the company's own statements and pr. based articles on the web.

With nothing to back up their claims of a sustainable product, it has to be questionable whether the trademark lives up to its name or is in fact false advertisement.

Concluding remarks

„The truth is rarely pure and never simple“ –Oscar Wilde.⁶¹

So it turns out that being a sustainable fashion brand, is not just about choosing the right materials, it is also wise to help the consumer in the right direction, because to truly understand how “green” something is, we must look at it from “multiple lenses”: its effect on the soil, air, water, plants, animals, humans, etc.

When looking through multiple lenses at bamboo viscose based apparel production, I think it can provide a green alternative. Its amazing ecological properties at the “crop stage,” the reasonable way in which it's produced if chosen the ‘closed-loop’ system, and the benefits that finished bamboo-based fabrics provide.

But the real task lies in sourcing the right suppliers and acquiring a good basis knowledge about the production procedure.

⁵⁹ *Our bamboo fabric*, Five bamboo, seen dec. 2012. <http://fivebamboo.com/index.php/our-bamboo-fabric>

⁶⁰ *Revolutionary and eco-friendly*, Lenzig, seen jan. 2013.

<http://www.lenzing.com/en/fibers/botanic/sustainability/tencelr/production-process.html>

⁶¹ Wilde, Oscar, *the importance of being earnest: a trivial comedy for serious people*, Act I, 1895.

Today, there are no fabrics that are 100% “green;” organic and transitional cottons require large amounts of land and water; recycled P.E.T. (polyethylene terephthalate) is still a chemically driven, petroleum-based material; and many hemp and bamboo fabrics require a pulping process.⁶² So learning about certificate stamps, and their true meaning is valuable. The research did show that the meanings of words are being bent and misrepresented.

„Even though the manufacturing process may not be where we want it to be yet, the entire process is still usually better than most non-organic fibres and fabrics with all their chemical, synthetic and water-intensive processes in farming through manufacturing.“⁶³

Like John Thackara says in his book, „In the bubble, designing in a complex world“: „If we can design our way into difficulty we can design our way out.“⁶⁴ I think bamboo could be one of the ways of designing us in the right direction towards sustainability.

⁶² *the benefit of bamboo*, Arbor, 29/10/2012, seen dec. 2012, <http://news.arboreurope.eu/tag/bamboo/>

⁶³ Mass, Ed, *Bamboo Textiles: Green, Luxurious and Practical*, natural life magazine, seen dec. 2012, http://www.naturallifemagazine.com/0904/bamboo_textiles.htm

⁶⁴ Thackara, p. unknown.

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