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Term Project Proposal
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Natural vs. Sustainable (in fashion)

It is sometimes assumed that a product is environmentally friendly just because it's produced from naturally occurring resources. While it is often true that natural products are better for the earth and consumer than those produced synthetically, it is far too broad a statement to say that all natural products are inherently sustainable. In order to measure the sustainability of an object, the entire life cycle of the product must be considered, assessing how each part of the process influences the product's overall impact on the environment. The fashion industry is one sector of design, production and consumption that generally neglects to acknowledge its environmental impact. As a fashion designer, I feel convicted to understand my part in the polluting industry I've entered and identify what I can do to improve the ecological and ethical standards. After months of research, I articulated that there is neither one simple solution nor one 'right' way to approach sustainable design. Though materiality is only one sector that influences the sustainability of a product, my current goal is to define how fabrics such as cotton, wool and silk can be sustainably and ethically produced, then begin to source those materials and apply them to my designs.

My call to action towards sustainability was prompted by not being able to trace the source of my materials. I felt a creative gap in my process because I was trying to plan where a garment was going to go without knowing where it came from, or even what it was made of. Initial research began with investigating raw materials, seeking information on how fibers are produced into textiles and assessing what impact that production has on the environment. I wanted to specifically hone in on natural fibers because I was attracted to their direct relationship with the earth. One clearly sustainable aspect of natural fibers is that, whether plant or animal based, they are renewable resources. Fibers that are sourced from the environment are deemed renewable because nature allows them to be replenished through growth or reproduction. These fibers are provided to us as ecosystem services, but not boundlessly. While the renewability of natural fibers is an entirely viable reason to use them over resources that are in limited supply, the material can be abused. This mistreatment occurs in conjunction with synthetic practices or when consumption levels become higher than environments naturally allow. Without respecting the services of these renewable, natural fibers, the use of them can easily become unsustainable.

The fiber that gained the majority of my focus is among the most ecologically impactful¹: cotton. Cotton is a natural, plant-based fiber. It is the second most commonly used fiber (behind polyester), accounting for 40% of clothing overall² and 85% of clothing made from natural fibers³. Cotton serves as a soft, durable and incredibly diverse fiber, able to lend itself to many functions within the textile sphere. Though cotton is a great resource for the benefits it offers to

human use, there are a few major environmental issues with the production of it. Cotton grows best in warm, dry regions, yet requires a lot of water to grow⁴. To supplement this need, the land is irrigated⁵, providing enough water to the crops that is not naturally available. By designating so much water to cotton production, the already dry climates where cotton is grown are experiencing water scarcity⁶. The other main issue taking place in cotton production is caused by the use of synthetic chemicals. All but .2% of cotton is grown using synthetic pesticides and fertilizers⁷. When cotton is produced using synthetic fertilizers, nearly 8 trillion gallons of water per year is required to dilute the fertilizers leached to the water bodies⁸. This substantial reliance on chemicals proves environmentally harmful through water usage in general, but specifically through agricultural runoff: water streams are polluted by the synthetic fertilizers used to grow cotton, causing dead zones in marine ecosystems, as well as soil depletion⁷. Overall, cotton production consumes and pollutes more water than any other part of the apparel industry⁸. The global volume of water use for cotton crop production is 198 Gm³/yr (5 nonillion gallons per year), using equal parts natural rainfall and irrigated water⁵. After the cotton is produced into a textile, extra water is required for bleaching, dyeing and printing. From raw fiber to finished product, 2866 gallons of water is required to produce one pair of jeans and 2720 gallons for one t shirt⁸. While cotton is ecologically taxing no matter how it is produced due to water consumption, there are more sustainable options than the current, conventional methods. GOTS certified organic cotton is produced without the use of any synthetic chemicals; this alternative process eliminates the risk of water pollution, saves energy, and reduces water consumption⁷. By forgoing the use of synthetic fertilizers, organic cotton production avoids this water usage altogether. By choosing alternative methods of bleaching and dyeing, or by skipping any sort of color treatment, water and synthetic chemical use can also be prevented. Though the water consumed by cotton production would have to drastically decrease for even organic cotton to be deemed entirely sustainable⁹, as the second most commonly used textile in the world, ending the use of it is not realistic or necessary. As cotton continues to be grown, organic methods of production will hopefully increase. In order to reduce water usage to a more sustainable amount, consumption levels of the resource must decrease, meaning the demand for the product it becomes must lower. Decreased demand is available as a solution to preventing environmental damage, but the success of it is contingent on consumers' willingness to shift their own habits.

With a clear distinction of the issues behind conventional cotton production, it's fairly simple to understand why organic methods are more environmentally amiable. As I moved on to study other natural fibers, the line between which fiber production is and is not sustainable proved to be much more difficult to draw. When considering animal based fibers, for example, the treatment of the animals producing the fibers has to be taken into account, but also the land where they reside. This requires a careful examination of the ecological relationship between animals and their environments, complicating the task of designating any sort of organic or eco label to the textiles. Wool, alpaca and cashmere are amongst the most commonly used animal based fibers. Generally, these fibers function to provide warmth in garments and can produce similar effects, despite differing sources. Though the textiles created from these fibers might be alike, their environmental impacts are quite diverse. The most severe problem occurring

amongst both wool (from sheep) and cashmere (from goats) is overgrazing. Sheep, goats and alpaca survive by eating, or grazing on grass. Grazing is generally beneficial both to the animal and land; the animal receives the nutrients it needs while releasing nutrient-rich waste to the soil and controlling weeds¹⁰. The services these animals provide reduces the need for synthetic pesticides and chemicals, clearly functioning as a benefit to the environment. The conflict with grazing arises when land is being grazed past its' carrying capacity. Sheep and goat are eating more than can be replenished by the land, resulting in weakened soil and eventually, desertification¹¹. Out of the three fiber producers, cashmere goats are causing the most environmental harm. Overgrazing is occurring in part due to excess livestock, but also because when goats eat, they pull grass from the root instead of grazing on top of it¹²; this slows the growth of the grass and propels the desertification process. In addition, it takes three to four years for a goat to produce enough hair to make one sweater¹³. In comparison, an alpaca can produce enough wool for four to five sweaters in just one year¹⁴. As with cotton, all three of these animal based fibers could be more responsibly produced by lowering consumption. Overgrazing occurring with sheep and goats would not be a problem if the demand were lower and less animals required. But again, this problem can only be solved in conjunction with an agreeable market. To meet the needs of current demands, the most environmentally friendly option is to use alpaca as an alternative to cashmere and, when applicable, wool.

Aside from the environmental influence of textile manufacturing, there is an ethical standpoint to consider pertaining to how the animals providing the fibers might be harmed in the process. While my main focus and priority in textile production is environmental impact, I do value the importance of respecting animal well-being and will take measures to demonstrate that respect, whenever possible. In wool production, many farmers have resorted to a method called mulesing; this technique involves painfully removing strips of skin from around the breech area of sheep¹⁵. Farmers mules sheep as a preventative measure against parasitic infections that nest within wrinkles of their skin. Unfortunately, there aren't many options that are both ethically sound and functionally effective at avoiding the infection. Chemical treatment can be used to avert from mulesing, but that then poses environmental risk of pollution¹⁵. I hope that environmentally sustainable alternatives to mulesing will continue to be explored. However, when faced with the decision, I will most likely choose to value environmental benefit over animal welfare.

Similar to wool, silk can be sustainably produced, but faces an ethical dilemma without an obvious solution. Silk production is innately environmentally friendly as it doesn't require the use of any synthetic chemicals or treatments. Silk is created from one continuous strand of saliva produced by silkworms; the saliva hardens into a cocoon to protect the silkworm during metamorphosis¹⁶. Conventionally, silk producers boil the cocoon to easily unravel it, but this poses harm to the silkworm. Alternatively, silkworms will eventually escape their cocoon naturally, breaking the continuous strand into multiple pieces that are still functional as silk thread. This natural process appears to be more humane than boiling the silkworms, creating a textile referred to as peace silk¹⁶. However, moths mate after emerging from the cocoon and reproduce hundreds of eggs; silk farmers often can't supply enough food to the entire population

of silkworms and they die shortly after birth¹⁷. In retrospect, neither method is ethically ideal, but both can still be determined environmentally sustainable.

The research I completed exposed me to many exciting options of achieving sustainable design, but also instilled the notion that in reality, some decisions may not actually be as environmentally or ethically beneficial as they appear. It can be comforting to know that I am working with a material produced without harming the sheep whose wool I'm using, or that I'm saving water by choosing organic cotton, but the true environmental impact of these decisions can't be accurately determined through accounting for the physical materials of the product alone. Whichever way a designer chooses to approach sustainability, they must understand the process in which their product undergoes, recognize the value of each part of the product's life span, and decide which of these parts they might value more than others. For the first garment that I produce, all of my materials will be sourced with the knowledge that I've gained on which materials and methods have low environmental impacts and high ethical standards. I plan to make a coat, a type of garment that requires the use of multiple types of fabrics and resources. I project being able to utilize the different functional benefits offered by cotton, wool and silk, integrating each of them into the coat in ways that capitalize on their various weights and textures. I expect for the sourcing of each type of material to be a different, enlightening experience, exhibiting the differing availabilities currently offered of each fiber. The physical design of the garment will reference the silhouette of a traditional, tailored coat; this familiar shape will allow for the materials to be the highlight of the piece in a way that a more radical design might not. Though this project will not track the entire life cycle of the components of the product and product itself, I will value elements such as the source location and travel distance of my materials. The product's end of life will be considered, determining how the garment can be disposed of without becoming a pollutant. It is conscientious to assume that the use of every garment will eventually come to an end, but the consumer, designer and environment will all benefit from clothes that are made to last lifetimes. If clothing is designed and made with durable, quality intention, the consumer is able to wear their clothes longer and buy less, the designer produces less but is still compensated for high caliber production, and we are able to live in an environment that can sustain what we yield from it.

Annotated Bibliography

1. R. S. Blackburn, editor. 2009. Sustainable Cotton Production: Introduction. Page 33 in *Sustainable Textiles: Life Cycle and Environmental Impact*. Illustrated Reprint Edition. UK. Woodhead Publishing.

This section of *Sustainable Textiles* provides a general knowledge on the problems encompassing cotton production. Solutions on how to produce cotton more sustainably are presented as the issues are addressed, weighing advantages and disadvantages of different production methods.

2. Arjen Hoekstra. 2005. Introduction. Pages 9-11 in *The Water Footprint of Cotton Consumption of Value of Water Research Report Series No. 18*.

The section of this article introduces the assessment of worldwide water consumption within the production of cotton. Information is provided on the amount of cotton consumed in conjunction with the textile industry and the ecological impact of it.

3. World Wildlife Publications. 2013. Cleaner, Greener Cotton: Impacts and better management practices of *WWF Publications*.

In this publication, the World Wildlife Foundation explains the environmental dangers present within current conventional methods of cotton production. Challenges faced and addressed include labor force, soil erosion, pollution and water scarcity and contamination. Justifications on how current, sustainable methods of production can become more widely practiced among the industry are provided.

4. R. S. Blackburn, editor. 2009. Sustainable Cotton Production: Global Ecological Effects. Page 34 in *Sustainable Textiles: Life Cycle and Environmental Impact*. Illustrated Reprint Edition. UK. Woodhead Publishing.

This section of *Sustainable Textiles* presents cotton as an over consuming resource of water, addressing why this consumption is taking place and what makes it a problem.

5. Arjen Hoekstra. 2005. Introduction and Virtual Water. Pages 9-17 in *The Water Footprint of Cotton Consumption of Value of Water Research Report Series No. 18*.

The specific characteristics of how and why water is being consumed is investigated, including infiltrated rainwater for cotton growth and withdrawal of ground or surface water for production or irrigation. The data exposes the environmental harm that overuse and improper disposal of water is causing.

6. World Wildlife Publications. 2013. Impacts of Cotton. Pages 5-9 of Cleaner, Greener Cotton: Impacts and better management practices of *WWF Publications*.

This section breaks down the dangers cotton production is presenting towards human well-being. Specifically evidence is provided to show how water scarcity is present due to the high volume of water required to irrigate cotton crops.

7. R. S. Blackburn, editor. 2009. Sustainable Cotton Production: Chemicals. Pages 41-57 in *Sustainable Textiles: Life Cycle and Environmental Impact*. Illustrated Reprint Edition. UK. Woodhead Publishing.

The reliance cotton production has on synthetic pesticides and fertilizers is explained; alternative, natural practices are presented, analyzing which practices are the most practical to apply in order to achieve more sustainable cotton production.

8. Arjen Hoekstra. 2005. Water footprints related to Consumption of Cotton Products and Conclusion. Pages 25-32 in *The Water Footprint of Cotton Consumption of Value of Water Research Report Series No. 18*.

The overall consumption of water by cotton production is assessed through global comparisons of water footprints. The data provided determines cotton to be among the most influential water consumers of any produced resource.

9. Global Organic Textile Standard: Ecology and Social Responsibility. 2016. GOTS General Description. <http://www.global-standard.org/the-standard/general-description.html>. (Accessed 30 September 2016)

The Global Organic Textile Standard defines the qualifications for organic textiles worldwide; from the harvesting of fibers to manufacturing of the fabrics and garments themselves, the GOTS tracks the entire supply chain of a product to ensure its sustainable credibility. This certification gives companies accountability that their production is ethically and ecologically focused and provides the consumer with assurance that the product they're purchasing is sustainably produced.

10. Canadian Sheep Federation. 2002. Virtual Toolbox: Grazing of *Canadian Sheep Foundation*. Section 6: 64-76

A general knowledge of grazing sheep is presented, addressing the ecological benefits and how to maintain proper grazing. This information could be applicable to multiple functions of agriculture and livestock, including sheep that are used as wool suppliers.

11. The Nature Conservancy. 2016. A New Horizon for Grasslands. *The Nature Conservancy*. <http://www.nature.org/ourinitiatives/regions/southamerica/argentina/howwework/sustainable-grazing-1.xml>. (Accessed 13 October 2016)

This page explains the issues caused by overgrazing sheep and shows what damage has taken place as a result. The Nature Conservancy is planning with and monitoring wool producers to combat desertification and restore grasslands, working towards preventing overgrazing altogether.

12. National Resource Defense Council. 2011. Soft Cashmere is Hard on the Environment of *Clean by Design*.

The overall environmental impact of cashmere goats is assessed, exposing its' disadvantages in comparison to more sustainable animal fibers. The National Resource Defense Council defines the stress cashmere goats pose to the environment, as well as their slow production rate.

13. Jack Hurd. 2013. Is Cashmere Sustainable?. *The Nature Conservancy*. <http://blog.nature.org/conservancy/2013/04/30/is-cashmere-sustainable/>. (Accessed 13 October 2016)

The fiber and textile production of cashmere is explained, while it is questioned as a viable option to include in sustainable design. The Nature Conservancy indicates what function cashmere holds, where it comes from, how it is used, and whether or not its' consumer value is worth the ecological toll it takes on the environment.

14. National Resource Defense Council. 2011. Alpaca: A Soft, Warm Fiber With a Better Ecological "Padprint" of *Clean by Design*.

This page promotes the use of alpaca hair as an option of achieving sustainable textile production. Many benefits are presented, such as their low maintenance and delicate impact to land.

15. Paull, D., Lee, C., Colditz, I., Atkinson, S. and Fisher, A. 2007. The effect of a topical anaesthetic formulation, systemic flunixin and carprofen, singly or in combination, on cortisol and behavioural responses of Merino lambs to mulesing of *Australian Veterinary Journal*. Volume 85: 98–106.

The method of mulesing is first explained to provide an understand of why it is an inhumane treatment towards animals. Pain levels of mulesed lambs is documented and alternative methods are tested. Though other methods were deemed successful, there has yet to be a solution that is both ethically and environmentally beneficial.

16. Sheryl Ryan. 2014. Why Choose Wild Peace Silk?. *Greenopedia*. <http://greenopedia.com/wild-peace-silk/>. (Accessed 12 October 2016)

This page explains why silk is a sustainable textile and discusses how the fibers form the fabric. Though silk is determined ecologically friendly, different methods of production are compared to question whether or not silk production is ethical.

17. Christian McLeod. The Silk Industry. *PETA UK*. <http://www.peta.org.uk/issues/animals-not-wear/silk/>. (Accessed 13 October 2016)

This article focuses solely on the ethical conflict of silk production; an explanation is provided on why neither of the two methods of silk production are entirely humane towards the treatment of silkworms.