



Regenerative Agriculture, a Sustainable Ethical Way to Help Transform the Textile and Fashion Industry

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Abstract

The fashion industry is one of the biggest contributors to global pollution. As sustainability is becoming an important topic for both agriculture and the textile sector, there is an increasing market demand for plant-based fibers production. Diversified farming systems, such as agroforestry and regenerative Agriculture, have received considerable attention for their potential to contribute to more environmentally sustainable and socially just agricultural methods, that offers a smart use of water and soil nutrition. They can be a direction for rural development through contributions in agrobiodiversity, livelihood diversity, labor availability and economic growth. In this study, the research methodology was based on a systematic literature review and secondary data collection and analyses. The aim was to investigate initiatives towards sustainable textile fibers cropping, including different species and plantation methods. The results indicate few cases worldwide and suggest cotton as the main experimented specie, generally cultivated with two other ones. They were identifying three methods applied in cotton crops: (1) crop rotation, (2) agroecological intercropping and (3) agroforestry. Results also demonstrates different production challenges, concerning machinery development to mixture crops, ideal species groups, economic viability and process scalability. Forest management methods that can sustain good mixes of tree species need to be designed, promoting rich agrobiodiversity landscapes. Thus, defining, measuring and rewarding good farming practices are the main possible drivers to motivate farmers to change to new approaches towards sustainability in textile fiber production. Further

investigation is demanded to evaluate different species possibilities and cropping maintenance, as well as addressing public policies and coordinating stakeholders' interests.

Keywords: Regenerative Agriculture; Agroforestry; Textiles Fibers, Sustainability, Cotton and Wool.

Introduction

Regenerative Agriculture” describes farming and grazing practices that, among other benefits, reverse climate change by rebuilding soil organic matter and restoring degraded soil biodiversity – resulting in both carbon drawdown and improving the water cycle (*Burgess et al., 2019*). While Agroforestry is the intentional integration of trees and shrubs into crop and animal farming systems to create environmental, economic, and social benefits. It has been practiced in the United States and around the world for centuries. Agroforestry integrates trees into the agricultural landscape, providing not only food, fiber, fodder, wood, fuel, but also accumulating biomass (*Oliveira et al., 2019*).

As sustainability is becoming an important topic for both agriculture and the textile sector, there is an increasing market demand for plant-based fibers production. Diversified farming systems, such as agroforestry and regenerative of Agriculture, have received considerable attention for their potential to contribute to more environmentally sustainable and socially just agricultural methods, that offers a smart use of water and soil

nutrition. They can be a direction for rural development through contributions in agrobiodiversity, livelihood diversity, labor availability and economic growth. They are currently being promoted in many regions to contribute for food security, climate change adaptation and mitigation (*Oliveira et al., 2019*). The interest in plant fibers for textiles manufacturing has increased in recent years, due to market demands on sustainable processes (*Rieple et al., 2010, Pal R., 2014 and Pal R., 2018*). Both agricultural and textile industries has experienced social environmental issues linked to unhealth workers conditions, water and soil pollution and biodiversity loss, characterized by the intense use of chemical products and natural resources (*Nagendra, 2018*). Researchers and practitioners are devoting attention to environmental sustainability, as they face the challenge of achieving a balance between environmental and busi-ness needs (*Caniato., 2012*). In this way, global apparel brands have developed their own eco-matrices for product develop-

ment. Accordingly, with Romeiro (*Romeiro.,1998*) sustainable agriculture has three long-term goals: (1) quality of life (to satisfy personal, family, and community needs for health, safety and food); (2) environmental quality (to enhance soil nutrition, water, air, and other resources); (3) economics (to be profit-able). Therefore, intercropping and agroforestry are mixed plant species cultivation systems that can potentially reduce pressure on land and water resources by increasing its efficiencies, through exploitation of complementarities between species that may generate higher yields (*Nair PR 1985*).

Regenerative Agriculture describes farming and grazing practices that, among other benefits, reverse climate change by rebuilding soil organic matter and restoring degraded soil biodiversity – resulting in both carbon drawdown and improving the water cycle. Regenerative Agriculture is strongly rooted in providing sustainable, biodegradable, and resourceful materials. With a little help from photosynthesis and soil, ethically sourced fibers and cotton can be created. This in turn provides useable materials for today's fashion brands to utilize. Regenerative agriculture is a relatively new, yet easy concept to understand. It is a type of farming that focuses on sustainability and improving the ecosystem. It's a way of managing land so that it retains its natural resource functions. An example of this is planting perennial crops to reduce soil erosion, as they are able to withstand harsh weather than annual crops can by storing more carbon underground. Another benefit of regenerative agriculture is the reduction in chemical fertilizers and pesticides. This has been achieved by increasing biodiversity on farms, which allows natural predators to control pests and weeds while also boosting pollinator populations that surround crops. Regenerative Agriculture offers the potential to create a new farming future for Africa. The radical transformation of our agricultural systems presents the opportunity to revive ecosystems, amplify biodiversity and improve dietary diversity, positive impacts that will cascade across sectors and create new pathways to more prosperous, resilient and sustainable futures (Moore 2021). It is important to emphasize here that Africa can already be considered a global leader in RA. Results from a recent web analysis indicate that there are over 900 organizations in Africa associated with RA, Agroecology and Conservation Agriculture (the latter of which contains many of the principles that underpin RA) (see Appendix B for a summary of the web analysis). A vast array of existing small-holder farming techniques also embodies regenerative principles. Here we explore four key examples. The cases show how the most successful examples of RA do not stem from the application of a ridged set of techniques and processes, but rather from histories of experimentation and refinement. As argued in Chapter 3.2, it is these processes of experiment and practitioner-led design that should be harnessed to rapidly scale RA. Integrated agricultural practices that draw upon the principles of RA have been implemented in multifarious ways by

subsistence farmers across the African continent. One such example comes from the development of ‘push-pull’ systems in East Africa that offer insight into the uptake of agroecological forms of farming, specifically the harnessing of naturally occurring ecological processes in order to manage pests, weeds and improve soil structure (Khan et al. 2017; Midega et al. 2018). In February 2022, Noble Research Institute defined regenerative agriculture as "the process of restoring degraded soils using practices based on ecological principles." The notion is that farmers utilize a holistic environmentally friendly approach to sustainable food and fibers in one combination. These fibers can later be used by major brands that are turning towards regenerative fashion for their consumers. (Fletcher et al., 2012)

In theory, the process of regenerative agriculture stems from the soil and the carbon in our atmosphere. It’s no secret that industrial farming is a large contributor to overall climate change. Today’s farmers, however, have realized that caring for the soil we plant in, in turn with a little help from photosynthesis can create more valuable crops and other materials. (<https://textileexchange.org/regenerative-agriculture-landscape-analysis/>). Wool and the cotton industry are continuously booming. The results cause more intense cotton and sheep farming which results in damage to the soil, biodiversity, and surrounding areas. According to PETA in regards to wool and its impact on the environment, "Nearly 50% of all of New Zealand’s greenhouse gas emissions comes from the agricultural sector, which includes the wool industry. (<https://thecohub.com/what-is-regenerative-agriculture-sustainable-fashion/#:~:text=Regenerative%20Agriculture%20is%20strongly%20rooted,today's%20fashion%20brands%20to%20utilize>). Despite being developed almost 30 years ago by researchers at the Rodale Institute, California (Francis and Harwood 1985), the term ‘Regenerative Agriculture’ has only recently begun to gain traction amongst practitioners and scholars aiming to address the ever-pressing issues of soil health and erosion, food insecurity and global climate change. Prior to this recent resurgence, RA has been somewhat eclipsed by a series of more established concepts, such as ‘sustainable agriculture’, ‘climate smart agriculture’ and ‘conservation agriculture’, that have taken center ground in stimulating dialogue and promoting alternative pathways to sustainable agricultural futures (Burgess et al. 2019). Agriculture provides the fashion industry with fibers for garment production, these include plant-based fibers such as cotton, hemp and flax and animal-based products such as wool and leather. The link between regenerative agriculture and fashion may not be so clear for most people since most of us see the clothes in the stores and worry about how it looks, but we don’t usually think about how they were produced. We might know the designer or the brand, but we generally don’t know anything else about the brand’s supply chain. (<https://chloridefree.org/en/regenerative-agriculture-and-fashion-the-future-of-the-second-largest-polluter-in-the->

[world/#:~:text=Agriculture%20provides%20the%20fashion%20industry,such%20as%20wool%20and%20leather\).](#)

The fashion industry is one of the biggest contributors to global pollution. Textile manufacturing processes are notorious for their toxic waste production and textile companies have been criticized for not doing enough to reduce that pollution. Over \$500 billion worth of clothing is dumped into landfills each year, and it's only getting worse. The good news though, is that there's hope on the horizon! Regenerative agriculture promises a sustainable future for clothing manufacturing as it has been found to be better at sequestering CO2 than conventional farming methods. (<https://thecohub.com/what-is-regenerative-agriculture-sustainable-fashion/#:~:text=Regenerative%20Agriculture%20is%20strongly%20rooted,today's%20fashion%20brands%20to%20utilize>). Major brands like The North Face, Allbirds, and Patagonia have invested heavily in regenerative fashion. The North Face in particular is hauling out large sums of money for premium organic cotton from regenerative farmers. The new collection is set to launch in Autumn. Textile Exchange's latest report, Regenerative Agriculture Landscape Analysis, provides a landmark framework for the fashion and textile industry to understand, communicate, and invest in regenerative agriculture. January 31, 2022: A landmark report from global non-profit Textile Exchange has highlighted that a transition to regenerative agriculture is fundamental to the long-term health of the fashion and textile industry. As brands face an increasing risk from disruptions to fiber production from climate impacts and biodiversity loss, regenerative agricultural approaches can play a key role in helping farmers develop more resilient systems, bringing immense social and environmental benefits to the industry and beyond. But with interest in regenerative agriculture fast gaining momentum, there is no one-size-fits-all approach, and the concept is nuanced. Brands are looking for a comprehensive analysis of this growing opportunity, as well as a roadmap to engage meaningfully. Sponsored by Kering, J. Crew Group (J. Crew/Madewell), and Cotton Connect, Textile Exchange has developed the Regenerative Agriculture Landscape Analysis to be the first report that gives the fashion and textile industry a framework and toolkit to credibly understand, implement and describe the benefits of work in this space. Regenerative Agriculture is strongly rooted in providing sustainable, biodegradable, and resourceful materials (<https://textileexchange.org/regenerative-agriculture-landscape-analysis/>).

Cotton made in Africa (CmiA) and Regenerative Agriculture

How small-scale farmers manage their cotton fields has a significant impact on soil health, the climate, and biodiversity. Recognizing this, the Cotton made in Africa standard began incorporating sustainable agricultural practices into its requirements many years ago. Now falling under the term regenerative agriculture, these practices

not only promote soil fertility but also help to protect the climate and the environment (<https://cottonmadeinafrica.org/en/regenerative-agriculture/>)

Statement of The Problem

The global fashion industry is responsible for 10% of all anthropogenic carbon emissions each year. The greenhouse gas (GHG) emissions are mainly due to the intensive use of energy in the production, manufacturing and transport of garments. In addition, most of the clothes we buy – especially fast fashion – are produced in countries essentially powered by coal (e.g., China, India and Bangladesh). As a result, the carbon footprint of each product is higher than the ones produced in countries powered by renewable energy (<https://chloridefree.org/en/regenerative-agriculture-and-fashion-the-future-of-the-second-largest-polluter-in-the-world/#:~:text=Agriculture%20provides%20the%20fashion%20industry,such%20as%20wool%20and%20leather>). Moreover about 60 to 65 percent of the clothes we wear is made of polyester. Synthetic fibers such as polyester, acrylic and nylon are composed by plastic, in other words, they come from fossil fuels. Which means that its production emits more GHG than natural fibers. In fact, it's estimated that it takes about 700 million barrels of oil every year to produce the polyester in our clothes. Carbon emission is not only problem with synthetic fibers. As mentioned, polyester is a plastic, and this material is causing ocean pollution. As a matter of fact, a report released by the International Union for Conservation of Nature (IUCN) estimates that 35% of all microplastics in the ocean came from washing synthetic textiles (<https://chloridefree.org/en/regenerative-agriculture-and-fashion-the-future-of-the-second-largest-polluter-in-the-world/#:~:text=Agriculture%20provides%20the%20fashion%20industry,such%20as%20wool%20and%20leather>).

Justification

Agriculture provides the fashion industry with fibers for garment production, these include plant-based fibers such as cotton, hemp and flax and animal-based products such as wool and leather. Therefore, for the fashion industry to reduce its impact on the environment, fibers must also be produced sustainably, and this can be done through regenerative agriculture. While consumers are paying more attention to regenerative agriculture as it applies to our food supply, not much discussion has been generated around fiber crops, which make up a huge swatch of arable land in the United States, especially cotton. The US is the world's largest exporter of cotton. Over the 2019-2020 season, the US produced nearly 20 million bales of cotton, worth about \$7 billion (<https://modernfarmer.com/2022/08/sustainable-fashion-regenerative-agriculture-fiber/>).

Objectives

The goal of this report is to provide an overview of the “landscape” of opportunities for textile, apparel, and footwear brands to engage in the growing field of regenerative agriculture. To create impression that Regenerative Agriculture is a sustainable, ethical way to help transform the textile and fashion Industry.

METHODOLOGY

The methodology of this study consisted in two phases. The first, defined through a systematic literature review, combining the topics of “regenerative agriculture/agroforestry”, “plant fibers”, “cultivation”, “textiles” and “sustainable fashion”, search at Web of Science platform. After that, articles were selected considering the relevance of the contents. The second, was consisted in date base search in reports and documents analyses, within different organizations and institutions, such as Textile Exchange, to map examples of more sustainable cultivation methods, aiming the production of natural fibers for textile manufacturing. (*Elseify et al., 2019*)

RESULTS AND DISCUSSION

Sustainability has become one of the key factors for long-term business success (*Macchion et al., 2015*) and one of the strategic focal points of organizations (*Franca et al., 2017*). A sustainable business model aims at improving the economic, environmental, and social effectiveness integrated (*Geissdoerfer et al., 2017*), requiring a holistic approach to resource consideration and addressing the needs of partners and customers (*Amit et al., 2017*). To achieve sustainable development, organizations can innovate their products, processes and services (*Kantola et al., 2017*). These innovations are decreasingly accomplished solely due to their internal research and development activities, but they are increasingly looking outside their boundaries to other actors with whom they can collaborate (*Broman et al., 2017*).

The textile industry is one of the world’s largest industrial sectors in terms of volume, with rapidly growing global demand driven by increases in population and average income (*Hurmekoski et al., 2018*). In the textile and apparel industry, environmental impacts start at the initial stage of production itself and can be grouped under categories such as raw material production, where chemicals toxic in nature is used in growing cotton. Next is the stage of textile manufacturing, dyeing and finishing where chemicals and solid wastes arising from yarn manufacturing of natural fibers are released in water (*Khandegar et al., 2013*) (*Nguyen et al., 2014*). Therefore, common environmental practices for achieving sustainability can include organic-fiber usage, material recycling or reuse, technology implementation (including clean technology

and information technology), product certificates, green processes and product design, green manufacturing and logistics, and product traceability.

The sustainable raw materials driver contemplates the development and adoption of different types of environmentally-friendly raw materials such as organic cotton, hemp, flax, jute, bamboo and recycled fibers (*Magnuson et al., 2017*). Fair-trade labeling, code of conduct initiatives, internal and social auditing, and looking beyond first-tier suppliers are attempts to improve sustainability within the social dimension (*Magnuson et al., 2017*). Corporate social responsibility programs are implemented in firms to improve the living standard of workers and their families as well as contribute to local communities and the economy (*Maccarthy et al., 2012*). The focus has shifted from sustainability of internal processes and products the brand sells to sustainability of all the process, inside the company and in the whole supply chain that creates the product (*Khurana et al., 2016*). And education to ensure consumers are fully cognizant of the impacts of their purchasing and consumption decisions (*Bocken et al., 2016*).

One such strand of work coming out of sustainable fashion is focused on alternative business models, built around the purchasing and selling of fewer higher value and higher quality clothes. With her concept of ‘Slow Fashion’, the designer and academic Fletcher (*Fletcher et al., 2010*) argues that to be sustainable, fashion requires a wholesale shift in our relationship with clothing. The connection to ‘better rather than more’ ideas from industrial ecology is through the belief that value and quality can be increased by paying workers fair wages, generally improving working conditions and emphasizing the use of renewable materials by designers, aiming to drive a road map for sustainability, based in the development of processes, products and services more responsible (*Fletcher et al., 2012*). Thus, with the demand for more ecofriendly, biodegradable and renewable materials, the interest in vegetable fibers has increased (*Khurana et al., 2016*).

Designing A Regenerative Design Process

In light of the above discussion, we may begin to imagine how to build a process of co-design for RA in Africa. We propose that this might happen at two levels. The first level must start with farmers, allowing them to design their own agricultural systems through ongoing forms of experimentation informed by validated stores of knowledge. The second needs to occur at the policy level, being informed by wider ecological mapping and landscape dynamics that feed into environmental planning. – Any process of designing locally contextual RA must first involve developing a qualitative understanding of a farming community’s world through interviews and workshops with farmers, allowing them to set their own priorities and actions. This may include investigating local assessments of on farm and wider ecological health, evaluations of

causality behind agricultural practices, and what is being done in anticipation of ever shifting environmental and socioeconomic conditions.

CONCLUSION

Results show different production challenges, concerning machinery development to mixture crops, ideal species groups, economic viability and process scalability. Forest management methods that can sustain good mixes of tree species need to be designed, promoting rich agrobiodiversity landscapes. Thus, defining, measuring and rewarding good farming practices are the main possible drivers to motivate farmers to change to new approaches towards sustainability in textile fiber production. Further investigation is demanded to evaluate different species possibilities and cropping maintenance, as well as addressing public policies and coordinating stakeholders' interests. Hence, a transition to regenerative agriculture is fundamental to the long-term health of the fashion and textile industry.

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