

ALTERNATIVE PLANT FIBRE LANDSCAPE ANALYSIS

BETWEEN TRADITION AND INNOVATION

FIBRAL
Global Plant Fibre Association

Foreword by UN Trade and Development & SouthSouthNorth

The world's material systems are at a crossroads. Plastic pollution, dependence on synthetic fibres, and climate-related disruptions to agriculture are converging pressures that demand not incremental adjustments but structural change. In response, the search for resilient, low-impact materials has moved from the margins to the centre of debates on industrial development, trade, climate action and rural prosperity. Alternative plant fibres, rooted in centuries of cultivation and ecological knowledge, offer a compelling part of this transition. Yet their potential has long remained fragmented, confined to smallholder farms, artisanal workshops, cottage industries and niche markets without the collective voice, market visibility or institutional support needed to compete at scale. Supporting these fibre value chains within a coherent circular bioeconomy is therefore essential, both to diversify future materials and to enable developing countries to participate more fully in emerging markets for sustainable materials.

This report by FIBRAL arrives at a decisive moment. Through the UK–UNCTAD Sustainable Manufacturing and Environmental Pollution (SMEP) Programme*, we have supported entrepreneurs in Uganda and Kenya who are demonstrating what is possible. Using agricultural waste from crops primarily cultivated for food, they are extracting spinnable fibres from banana pseudostems and transforming pineapple leaf residues into textile-

grade materials. In regions where these crops are widely grown and large volumes of organic agricultural waste are generated, they are beginning to build supply chains that link rural producers to international markets. These initiatives signal a broader industrial transition that, with the right enabling environment, could contribute to more diversified and resilient trade in sustainable materials.

Plant fibres matter for three interconnected reasons. First, they offer renewable and biodegradable alternatives to high-impact materials such as polyester and conventional cotton, with its well-known environmental impacts, and in some applications can also substitute plastics. Within UNCTAD's framework, natural plant fibres are recognised as non-fossil materials capable of replacing plastics in certain functions without introducing new chemical hazards. Second, they create income and enterprise opportunities in rural areas by turning agricultural residues that would otherwise rot or be burned into valuable economic resources. Third, when cultivated regeneratively and processed responsibly, plant fibres can contribute to climate resilience, soil health and biodiversity, outcomes that many national circular economy, bioeconomy and climate strategies aim to achieve.

What FIBRAL is building, a pre-competitive platform where producers, processors, designers, buyers and researchers converge around shared data, best practices and advocacy, is precisely the type of sector infrastructure alternative fibres have long lacked. Markets do not shift on potential alone. Trade governance, investment flows and procurement decisions require credible evidence, transparency and a coordinated industry voice. By illuminating the landscape of plant fibre systems, this report helps provide that foundation. It lays the groundwork for stronger partnerships, more informed policy choices and

more inclusive value chains capable of supporting the responsible growth of this emerging sector. We commend FIBRAL's commitment to open knowledge and invite actors across the textile and fibre value chains to engage with its findings.

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* *The Sustainable Manufacturing and Environmental Pollution (SMEP) Programme is funded by UK International Development through the UK Foreign, Commonwealth and Development Office (FCDO) and implemented in partnership with UN Trade and Development (UNCTAD), SouthSouthNorth and Pegasys International. More on SMEP here: www.smepprogramme.org*



Sustainable Manufacturing and
Environmental Pollution Programme



Foreword by The Sustainable Angle | Future Fabrics Expo

We are witnessing a growing awareness build around our toxic dependency on synthetics, and the negative environmental impacts associated with these petrochemical-based materials. Regulatory measures on microplastic emissions and bans on single-use plastics around the world signal a shift in our material landscape. At the same time, increasing pressure on resource-intensive production systems—whether in conventionally farmed monoculture cotton, or the demands placed on forests for wood as a feedstock—has encouraged a broader conversation about diversification. In this context, there is a renewed interest in exploring how alternative plant fibres can complement existing natural materials, contributing to more regenerative and resilient fibre systems overall.

Recent years have seen an increasing recognition of plant fibres as positive, low-impact materials, with relevance across a variety of industries and multiple value chains. Alongside this awareness, we have seen a surge in research and start-ups in the material innovation space, intent on providing nature-positive, sustainable solutions and inspiring a growing interest amongst the industry professionals we work with.

The FIBRAL Alternative Plant Fibre Landscape Analysis is therefore very timely—it provides a detailed examination of this currently underexplored category of fibres, offering

valuable insights into the globally diverse array of crops and produce in this space.

The Future Fabrics Expo welcomes the opportunity to platform and support the communication of this important report to the industry, which raises awareness of the current state of the plant fibre market, persuasively outlining benefits and future opportunities for the sector. The report consolidates foundational knowledge and data, bringing much needed clarity to misconceptions regarding the provenance, extraction methods and processing routes, and reveals the social and environmentally beneficial impacts of an extensive variety of plant fibres. The importance of this knowledge and disseminating education is critical in creating awareness and stimulating industry demand around these alternative plant fibres.

FIBRAL's mission, and the aims of the report align with that of our work at the Future Fabrics Expo—researching, educating and connecting the industry with sustainable material suppliers and innovators to action positive, sustainable change. The plant fibres examined here all play an important role in supporting biodiversity, mitigating climate change, and offer the potential to contribute to much needed diversification of the global fibre basket, while spreading supply chain risk.

The report provides key insights into how small-producers and industrial systems can work together; by 'joining dots' and aggregating suppliers, they can deliver scale and regenerative benefits together, realising the potential of plant fibres within the circular bioeconomy to strengthen rural livelihoods, and deliver measurable benefits for climate, human and planetary health.

Amanda Johnston Chief Design Officer, Future Fabrics Expo



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Citation

Bohne, S., Bintley-Bagot, T., Garay, R., Charpentier Alfaro, C. (2025). Alternative Plant Fibre Landscape Analysis, Reimagining Traditional Fibres. FIBRAL - Global Plant Fibre Association.

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Graphic Design: Fiona Fung

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Executive summary

Executive summary

Across the globe, thousands of plant species can provide natural fibres, many used for millennia in textiles, tools, construction, and art—deeply embedded in cultural heritage and linked to sustainable livelihoods. While their ecological availability and functional diversity are high, commercial production remains largely concentrated in cotton and, to a lesser extent, jute, flax, and coconut fibres.

Yet, this landscape is beginning to shift. As governments and companies adopt bioeconomy strategies and ambitious sustainability targets, industries from textiles and construction to automotive and pulp & paper are seeking biobased, low-impact feedstock alternatives. This presents a significant opportunity for the plant fibre sector to scale, innovate, and advance sustainable industrial practices.

Plant fibres hold significant potential to contribute to climate resilience, circular material systems, and rural livelihoods. Recognised by the UN General Assembly in 2023 as drivers of sustainable development, they support land restoration, enhance ecosystem resilience, and create rural employment when integrated into regenerative agricultural systems. Strategic investment can therefore advance climate and development objectives while fostering long-term rural economic resilience.

To fully realise this potential, however, several interrelated structural, operational, and environmental challenges must be addressed. Decades of limited investment have left processing infrastructure underdeveloped, slowed

innovation, and resulted in limited data and transparency. This has created a difficult starting point for emerging companies, which now face persistent challenges in reaching economies of scale. As a result, production costs remain high, demand is constrained, and the sector struggles to attract the level of investment needed for growth. At the same time, climate change is placing growing pressure on yields and fibre quality, underscoring the need for resilient production systems.

FIBRAL was created to help address these systemic challenges by strengthening pre-competitive collaboration across the plant fibre ecosystem. By convening stakeholders, supporting joint research, generating open-access data, and promoting best practices, we aim to reduce fragmentation, improve transparency, and build the evidence needed to unlock investment and sustainably scale the sector.

Key takeaways

- Global policies and climate goals demand a shift to renewable materials and circular approaches requiring large amounts of sustainable biomaterials. Responsibly produced plant fibres offer a scalable, nature-based solution that can strengthen rural livelihoods and climate resilience.
- To date the sector remains relatively small at 5.9 million MT and USD 3.8 billion (excluding cotton), but is expected to grow to 8 million MT by 2035. The strongest opportunities are in applications where plant fibres have clear technical advantages (e.g. filtration) and sectors with low entry barriers such as insulation, packaging, composites, and heavier textiles.
- Industry growth is less limited by the potential of alternative plant fibres, but by environmental challenges and structural barriers—such as outdated machinery, low market demand, and regulations built for conventional materials.
- Reimagining traditional plant fibres requires connecting Traditional Ecological Knowledge with modern innovation to unlock their full value as nature-based solutions and contributor to rural development. Small-producer and industrial systems have complementary strengths; when intentionally connected, they can deliver scale, quality, and regenerative outcomes together.
- What is needed is a collective voice across natural fibre systems, with alignment and collaboration among producers, innovators, and markets. Joint R&D, open technology transfer, shared best practices, and transparent data will be critical to enable sustainable scaling and long-term competitiveness.

About FIBRAL - Global Plant Fibre Association

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FIBRAL was founded in 2022 under the name *Fibral Material Alliance*. The initiative began when Dr. Carmen Hijosa and Riikka Juva from Ananas Anam, Hannes Schoenegger and Stephanie Walter from Bananatex®, Ricardo Garay from Regenerate Fashion and Sandra Bohne joined forces with a shared vision: to create a collective voice for plant fibres in the rapidly emerging field of biomaterials.

What started as a small collaboration quickly evolved into a global voluntary network. Over the past years, FIBRAL has connected more than 150 organisations and individuals across 25 countries, creating space for exchange, collaboration and mutual support within the plant fibre community. Operating without a formal budget or institutional structure, the network has functioned primarily as an informal platform linking companies, researchers and practitioners who share an interest in advancing plant fibre materials.

As the sector has grown, it has become increasingly clear that the industry has reached a level of maturity where stronger coordination and representation are needed. To support the next stage of development, the network will now evolve into a formal global association.

Under our new name, **FIBRAL – Global Plant Fibre Association**, we will act as a facilitating platform bringing together producers, processors, manufacturers, buyers and academia on a pre-competitive basis. By strengthening coordination and partnerships, building the evidence base

on plant fibre production and impacts, and increasing visibility for the sector, we aim to help de-risk public and private investment in the plant fibre ecosystem. In addition, FIBRAL intends to develop voluntary best-practice guidance on fibre quality and sustainable production, build capacity through technical workshops, and facilitate dialogue between producers and international markets to better align practices with market requirements.

Through this work, the association aims to empower producers to scale sustainable practices and positive impact, while enabling buyers to source with greater confidence—accelerating the adoption of plant fibres as nature-based materials within a circular bioeconomy.



Abaca fibre drying, Costa Rica, source: Wilhelm G. Clasen

Goal and scope of this report

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Goal of the report

This report traces the current landscape of plant fibre systems, from their cultural and ecological foundations to their production pathways, market dynamics, and future potential. It examines how different fibre systems operate, where they are produced, and the social, environmental, and economic impacts associated with them. It is intended for producers; industry partners in the textile, automotive, construction, and pulp & paper sectors; as well as researchers, and investors. The report aims to improve transparency and support informed dialogue while providing clear insight into the opportunities, constraints, and pathways for responsible growth. It establishes a baseline for more detailed market analysis as the industry continues to evolve.



This report celebrates plant fibre's enduring legacy while establishing a new narrative that recognises their cutting-edge contributions to the biobased circular economy.

– Carmen Hijosa, Co-Founder, FIBRAL & Founder and Chief Creative and Innovation Officer at Ananas Anam

The report also aims to address gaps of information often seen in industry discussions:

- Fragmented information about plant fibres and confusion around definitions, extraction methods, and their distinctions from man-made cellulose and biosynthetics.
- The need to bridge traditional and industrial approaches and demonstrate that heritage and progress are not only compatible—they can be mutually reinforcing.
- The need for greater insight into the range of plant species that can supply fibres and biomass for circular, resource-efficient systems.
- The lack of data on material availability, market potential, and the role of these resources in regeneration and carbon sequestration.

Scope

The scope of the report covers 36 plant fibres—excluding cotton—that are cultivated and harvested worldwide for industrial and artisanal use. We also list the largest producers of these fibres within and outside of our member network. This list is by no means exhaustive, and the report does not aim to rank fibre types, make value judgments, or recommend specific producers. The report also gives an overview of associated social and environmental impacts of fibres but does not attempt to provide comprehensive life cycle assessment; instead, it points to available knowledge and highlights key data gaps.

The analysis draws on public data, interviews, roundtables, and targeted data collection. The primary focus is on Tier 4 activities: cultivation, extraction, and processing of plant materials into raw fibres.¹ This stage is especially

significant as it represents the greatest part of the natural fibres' heritage and traditions, as well as their labour intensity and environmental impacts. While the analysis does not cover downstream processing and product specifications in depth, it highlights key applications and industries where plant fibres are increasingly relevant, including textiles & fashion, automotive, construction, and pulp & paper.

Respect for Indigenous Peoples, Local Communities and their knowledge and traditions

In this report, we discuss traditional plant fibre practices and knowledge of Indigenous Peoples. It is important for us to acknowledge that this is a difficult topic due to the colonial history and that most of our authors and the founding team of FIBRAL come from the Global North. In presenting both ancient and modern fibre practices, this report seeks to explore synergies without claiming ownership or authority over traditions that are not ours. Indigenous knowledge belongs to the communities who hold and protect it, and is inseparable from its cultural, spiritual, and territorial contexts. References to traditional practices are made with respect and with the aim of honouring their contributions. This work does not seek to generalise, simplify, or instrumentalise such practices, nor to suggest they can be replicated without community consent and participation. We acknowledge the risks of reproducing colonial patterns and therefore approached these sections with awareness and sensitivity.