



Preferred Fiber & Materials Market Report 2019



Foreword from La Rhea Pepper

At Textile Exchange, our Mission is to **inspire** and **equip** people to accelerate sustainable practices in the textile value chain. We focus on minimizing the harmful impacts of the global textile industry and maximizing its positive effects.

Textile Exchange is proud to bring you the Preferred Fiber and Materials Market Report 2019. This report, along with our annual [Organic Cotton Market Report](#), measures the production of fiber and materials with improved social and environmental impacts – what we call Preferred.

Together, these in-depth reports focus on the industry's supply side, analyzing production volumes, availability and emerging fiber trends.

Within these pages, you'll read that fiber production has more than doubled in the last 20 years and is expected to increase to 145 million metric tons by 2030 if business as usual continues. As you'll see, included in this production increase are more responsible – or preferred – options for almost all fiber categories, but the volumes are still quite low in comparison to the conventional counterparts.

We have the solutions. Now is the time to **accelerate the growth of preferred fiber and materials** – this is a critical step to reducing the footprint on the planet that is being left by fiber and material production.

I've said it before and I'll say it again, if we are serious about shifting from a fossil carbon-based sector to a circular one, we need to embrace innovations that reduce and reuse waste, and regenerate farmland.

Textile Exchange is taking this need for a transformational shift seriously. Under a new strategic direction that we're calling "[Climate+](#)," Textile Exchange will be the driving force for urgent climate action with a goal of 35-45% reduced CO2 emissions from textile fiber and material production by 2030.

Just as this report is a culmination of more than thousands of farmers and companies taking action to create positive change, the "+" in Climate+ is a symbol indicating that Textile Exchange cannot do this alone; it will take you - each and every person in their respective companies - to commit to transitioning fiber usage to a preferred option to help us achieve this goal.

For years, Textile Exchange has promoted practices, standards, and resources that benefit the climate. Adopting the Climate+ Strategy is a way to bring the urgent priority of climate, biodiversity, and carbon to the heart of our work with preferred fibers and materials. As a convener for significant change, we have seen first-hand what an industry of change-makers can do when they pull together. An example of this work can be seen in the success of

the Recycled Polyester Commitment that encouraged brands and retailers to publicly commit to accelerating their use of recycled polyester by 25 percent by 2020 – a goal that was achieved in 2018, two years earlier than expected

Textile Exchange not only encourages companies to accelerate their use of preferred fibers, but as you'll see in our soon-to-be-released Material Change Index (MCI), the largest peer-to-peer comparison initiative in the fashion industry, we acknowledge and honor companies that recognize the importance of integrating a preferred fiber and materials strategy into their business practices. The MCI tracks the apparel and textiles sector's progress toward more sustainable materials sourcing, aligns with global efforts like the Sustainable Development Goals and the transition to a circular economy, and will be a key tool for measuring the success of our 2030 Strategy: Climate+.

Will you join us in **Creating Material Change** through the acceleration and growth of Preferred Fiber and Materials?



La Rhea Pepper
Managing Director,
Textile Exchange

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Welcome to the 2019 Preferred Fiber & Materials Market Report

At Textile Exchange we inspire and equip people to accelerate sustainable practices in the textile value chain. With a goal of increasing the adoption of preferred fiber and materials we believe a transition to feedstocks that minimize harm and maximize the positive impacts on people and planet will provide a meaningful contribution to the Sustainable Development Goals and delivering on “the world we want”.

Improving the sustainability credentials of textile feedstocks requires both innovation and systemic thinking when it comes to business models and technologies that result in a fairer and more sustainable world. There will be multiple pathways to reaching our vision and there will not be “one fiber fits all”. A diverse portfolio approach will enable us to collectively leverage the positive attributes of different fiber programs and enable us to create a regenerative and circular textile industry.

Embracing diversity and recognizing the contribution of many fiber and materials programs and initiatives is the approach we have taken with our Preferred Fiber & Materials Market Report. Our ambition is to showcase leadership and innovation in a way that inspires everyone and catalyzes change. There are exciting opportunities within both virgin and recycled fibers and materials.

We are grateful to all contributors this year – not only for your valuable insights to our report but also for your bold and brilliant contributions to the sustainability of our industry. We invite our readers to explore them all and decide how you can best contribute to the feedstock challenge!

A final point I'd like to make is the importance of building common ground. We are a diverse and global community, yet despite our differences there are some things we all value, such as safe water, clean air, health and community. The Paris Agreement gave us science-based targets for decarbonization, and the Sustainable Development Goals give us a global agenda to unite behind. Recognizing our inter-dependencies and the finite resources we must share will no doubt dominate the next decade of our industry – it's our number one job.

We have ten years to meet the Sustainable Development Goals. In 2030, how will we be celebrating our contribution to a better world?



Liesl Truscott

Director of European & Materials Strategy,
Textile Exchange

Key findings

GLOBAL FIBER MARKET OVERVIEW

Global fiber production doubled over the last 20 years to 107 million mt in 2018 and is expected to reach 145 million mt in 2030.

Read more about the global fiber market in this report [here](#) and about the increasing uptake of sustainability standards, traceability innovations and impact credits [here](#).



Global preferred cotton production increased from 10 percent in 2013/14 to 22 percent in 2017/18.

Read more about the different virgin cotton initiatives and the recycled cotton market in this report [here](#).



With the United States Farm Bill, the year 2018 was an important year for hemp.

Read more about other plant-based fibers such as flax, hemp and innovations with regard to the use of agricultural residues in this report [here](#).



Responsible Down Standard (RDS) certified farms increased to 6,011 in 2018.

For the first time, global production volumes for Downpass and Traceable Down Standard (TDS) certified down are available. Read more about preferred down, the different preferred down standards and their number of certified sites in this report [here](#).



Responsible Wool Standard (RWS) certified sites increased from 7 in its launching year 2016 to 322 in 2018.

A Draft Responsible Mohair Standard has been launched in April 2019 and Textile Exchange launched the Responsible Cashmere Round Table (RCRT) in March 2019. Read more about preferred wool initiatives in this report [here](#).



The fashion industry can play a key role in meeting the UN Sustainable Development Goals (SDGs) - important UN initiatives for fashion launched in 2018/19.

Read more about the SDGs, the new UN initiatives and the new online platform TextilesforSDGs.org launched by Textile Exchange in 2018 in this report [here](#).



Global leather production sits around 7 million mt. Interest in Responsible Leather and leather alternatives is growing.

In 2018, the Responsible Leather Round Table (RLRT) was launched. Read more about preferred leather and 18 innovative leather alternatives in this report [here](#).



Global manmade cellulosic fiber (MMCF) production increased from 5.9 million mt in 2014 to 6.7 million mt in 2018.

With an annual growth rate of 15% between 2017 and 2022, lyocell is expected to be the fastest growing MMCF. Read more about preferred MMCFs and 15 MMCF innovations in this report [here](#).



Market share of recycled polyester increased from 8% in 2008 to around 13% in 2018.

Compared to 16% in 2017, this is a short-term decline mainly caused by the China Waste Ban. The market shares of other recycled synthetics and biosynthetics are still low. Read more about synthetic fibers in this report [here](#).



Breakthroughs in development of fibers based on CO₂ and in recycling fiber blends announced.

Read more about 4 innovators working on using CO₂ to produce fibers, 6 innovators working on fiber blend recycling and further news and innovation with regard to other manmade fibers [here](#).

2018 Global fiber market

The big picture

In 2018, global fiber production was around 107 million mt. Fiber production has more than doubled in the last 20 years and is expected to reach 145 million mt in 2030 if business as usual continues. This equals an increase of more than one third compared to today's fiber production volume in the next 10 years.

Synthetic fibers have dominated the fiber market since the mid 1990s when they overtook cotton volumes. With around 66.6 million mt of synthetic fibers, this fiber category made up approximately 62 percent of the global fiber production in 2018.

Polyester had a market share of around 51.5 percent of total global fiber production. More than 55.1 million mt of polyester was produced in 2018.

Cotton is the second most important fiber in terms of volume. With around 26.05 million mt it had a market share of approximately 24.4 percent of global fiber production in 2018/19.

An increasingly important fiber category is **manmade cellulosics fibers (MMCFs)**

Source: Textile Exchange compilation based on: CIRFS email correspondence, IVC website, Tecnon Orbichem published by Marc Quartz on Atlas and their press releases, The Fiber Year data published by Oerlikon at ITMA 2019, Fiber Organon and Textile Outlook International 2011, cited by Bhosale and Jadhav 2014 on texnote.blogspot.com, Lenzing data based on The Fiber Year and own estimates, ICAC, FAO, cn-down, DNFI based on IWTO and own estimates. Recycled natural fibers such as recycled cotton, recycled wool, recycled down and others are not included in this overview and would have to be added. The year 2018 includes the estimates for the cotton production of the ICAC calendar year 2018/19 to make it consistent with other reports. MMCFs and synthetic fibers volumes include staple fiber and filament. Please note that the percent market shares may differ to other sources because the Textile Exchange Global Fiber Market Overview includes other-plant, other wool, down and silk - all fibers which are often not included in other global statistics. In general all global figures are estimates.

with a global production volume of around 6.7 million mt and a market share of around 6.2 percent in 2018.

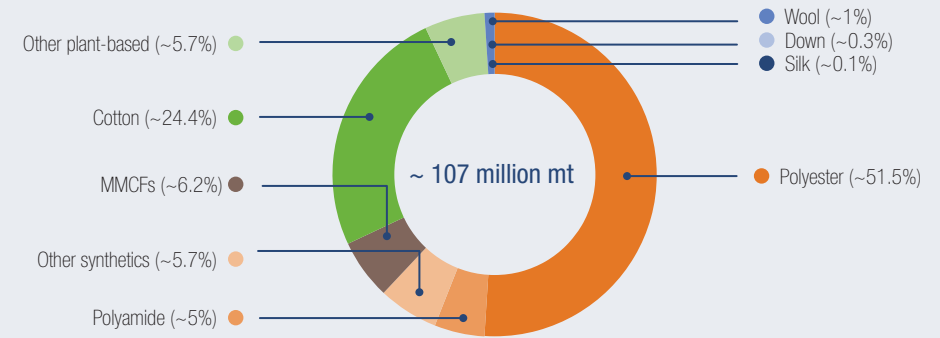
Wool had a market share of around 1 percent with a global production volume of a little over 1 million mt.

Other plant-based fibers including jute, linen, hemp and others had a market share of about 5.7 percent.

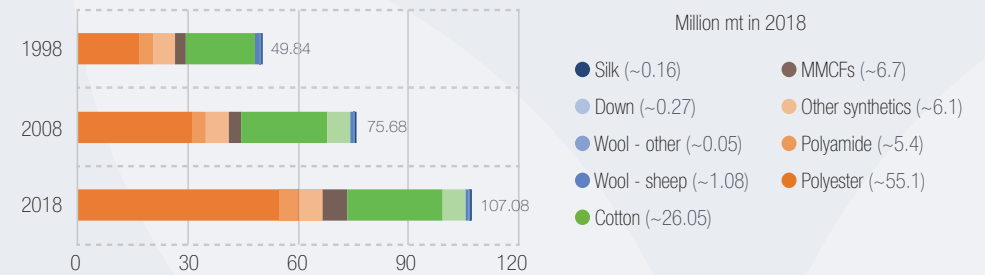
Silk and **down** had market shares of less than 1 percent.

The growth in fiber production has significant impacts on people and planet. There is a growing awareness of the urgent need for the more responsible use of resources and for decoupling growth from resource consumption. Innovation towards a circular economy and more responsible resource use can be seen in almost all fiber categories, however volumes are still low. Accelerating such initiatives will help to reduce the overall fiber footprint on the planet.

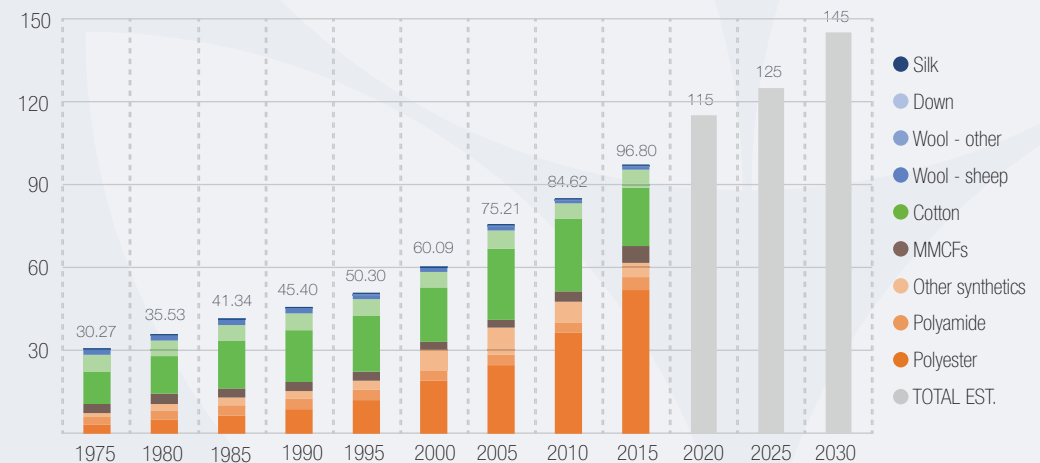
GLOBAL FIBER PRODUCTION IN 2018



GLOBAL FIBER PRODUCTION (MILLION MT)



GLOBAL FIBER PRODUCTION (MILLION MT)



Plant-based Natural Fibers

Cotton



Photo: SEKEM

Virgin Cotton

Global preferred cotton production⁽¹⁾

From the niche to a market share of 22 percent in 2017/18, preferred cotton is gaining ground.

With a production of around 26.7 million mt in 2017/18, cotton had a share of around 24.3 percent of the total fiber market⁽²⁾.

The market share of preferred virgin cotton increased from five percent of the total cotton production in 2012/13 to 22 percent in 2017/18. This equals an increase in global production volume of preferred cotton from 1.4 million mt in 2012/13 to 6 million mt in 2017/18⁽³⁾.

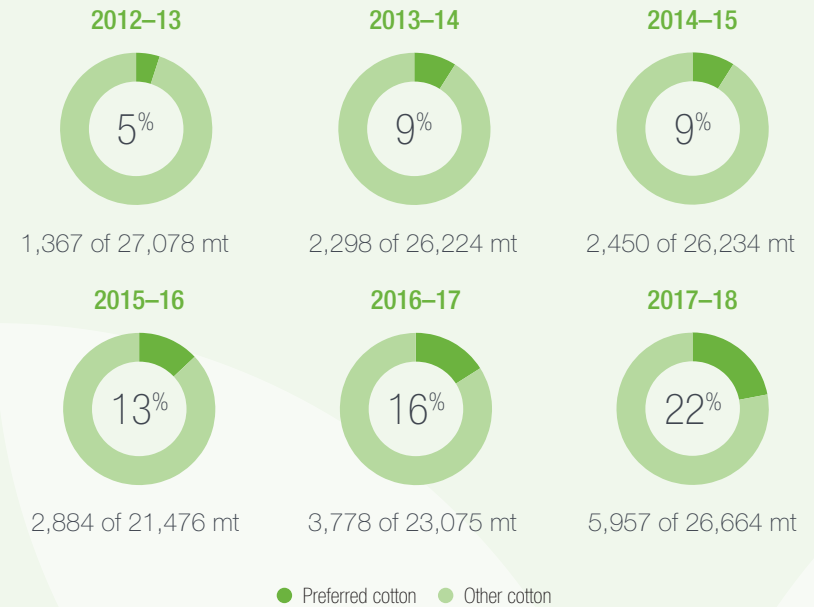
The preferred cotton figures reported here include ABRAPA, BASF e3, Better Cotton Initiative (BCI), Cleaner Cotton, Cotton made in Africa (CmiA), Fairtrade, Fairtrade Organic, Field to Market, ISCC, myBMP, Organic, REEL Cotton, Regenerative Cotton and Transitional Cotton. Field to Market and Regenerative Organic Certification (ROC) cotton production in 2017/18 was still zero

and figures for Transitional Cotton were not available in 2017/18. The preferred cotton options included here align with all virgin cotton options included in the 2025 Sustainable Cotton Challenge (see more on page "[Commitments to Preferred Cotton](#)")⁽¹⁾.

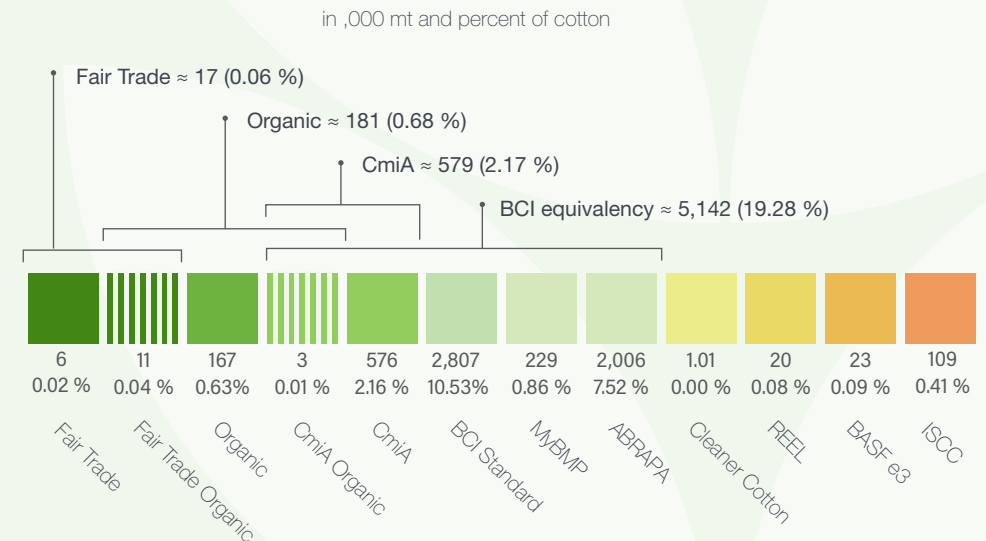
All BCI cotton, including its equivalents ABRAPA, CmiA and myBMP, made up around 19 percent of all cotton in 2017/18 and thus the large majority of the 22 percent of preferred cotton in 2017/18. The BCI Standard, without equivalents, accounted for 10.53 percent, the Brazilian standard ABRAPA for 7.52 percent, CmiA for 2.17 percent, and MyBMP for 0.86 percent of all cotton in 2017/18. BCI aims to increase its market share to 30 percent of the global cotton production by 2020.

All other cotton programs together, including BASF e3, Cleaner Cotton, Fair Trade, ISCC, organic⁽⁴⁾ and REEL cotton, had a combined market share of 3 percent of all cotton in 2017/18.

MARKET SHARE OF PREFERRED COTTON ('000)



PREFERRED COTTON FIBER PRODUCTION IN 2017-18 6 million MT



Tip: How to find out more about the different cotton programs.

Check out the Textile Exchange [Sustainable Cotton Matrix](#) to learn more about the specific programs and what they cover.

(1) These figures do not include recycled cotton. Please see the chapter "Recycled Cotton" for more information on recycled cotton. (2) ICAC-Cotton: World Statistics 2019 and Textile Exchange compilation of total global fiber volume data (see "[Global Fiber Market](#)"). (3) ICAC-Cotton: World Statistics 2019, standard owner data received by mail or from their publications; compilation by Textile Exchange - overlaps of standards excluded. (4) This includes organic cotton certified to bioRe.

Virgin Cotton

A closer look at the preferred virgin cottons⁽¹⁾

ABRAPA cotton production increased from 753,608 mt in 2012/13 to around 2 million mt in 2017/18. This equaled a market share of 7.52 percent of all cotton grown in 2017/18. Around 75 percent of all ABRAPA cotton was accounted for as BCI in 2017/18.

The **BASF e3** cotton production was around 22,852 mt in 2017/18. This equaled 0.09 percent of all cotton produced in 2017/18.

Better Cotton Initiative (BCI) cotton production including equivalents increased from 665,789 mt in 2012/13 to 5.142 million mt in 2017/18. The BCI Standard made up 54.59 percent of all BCI cotton produced in 2017/18. The remaining 45.41 percent of BCI cotton was produced according to the BCI equivalents ABRAPA, Cotton made in Africa and myBMP. BCI including equivalents represented 19 percent of all cotton production in 2017/18.

Cleaner Cotton production increased from 258 mt in 2012/13 to 1,006 mt in 2017/18. This equaled 0.004 percent of all cotton produced in 2017/18.

Cotton made in Africa (CmiA) production increased from 144,909 mt in 2012/13 to 578,562 mt in 2017/18. This equaled 2.17 percent of all cotton produced in 2017/18 and equaled approx. 37 percent of all cotton production in Africa in 2017/18. Almost all (97 percent) of the CmiA produced in 2017/18 was also accounted for as BCI equivalent.

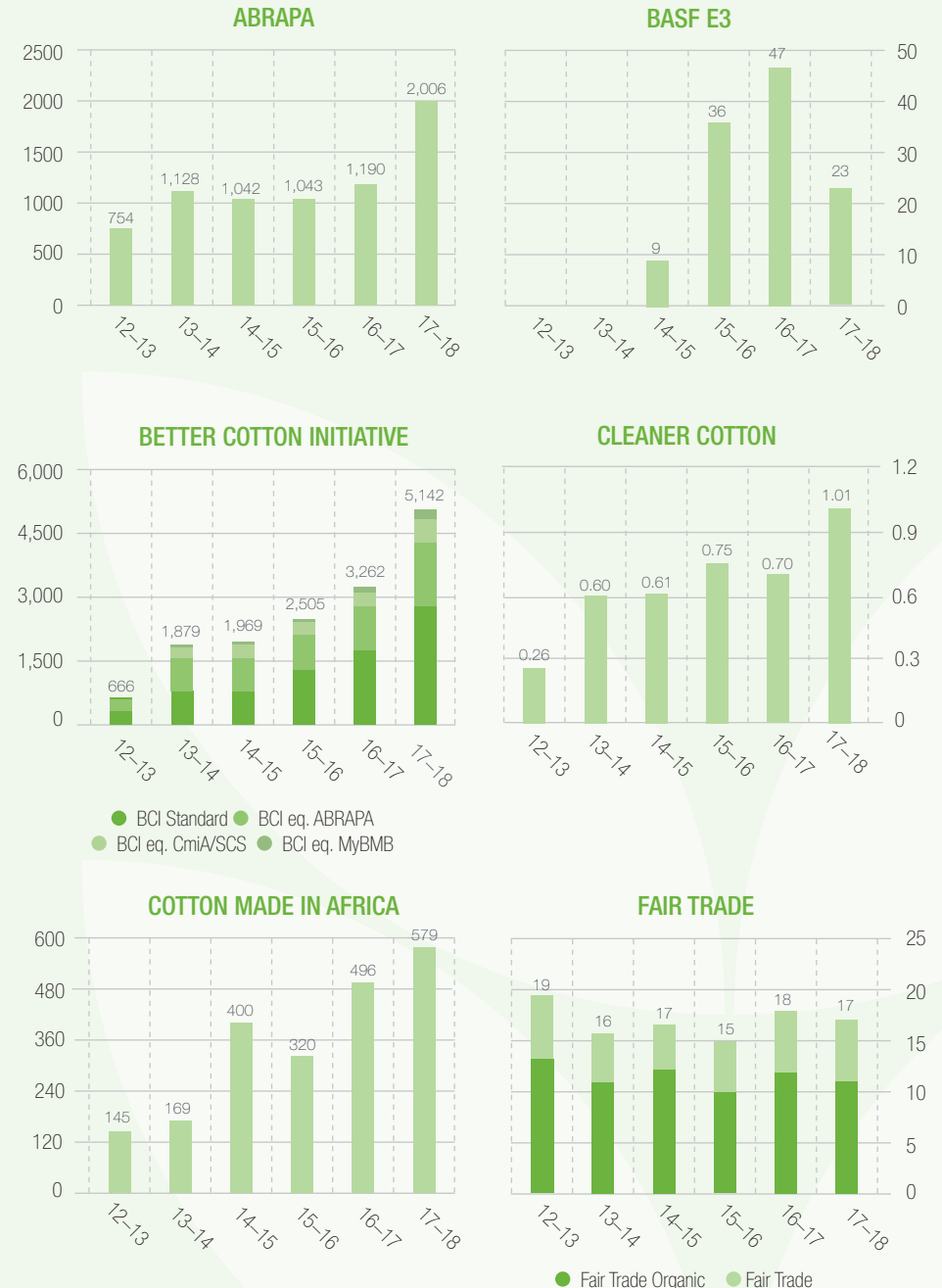
Fair Trade cotton production reached 16,906 mt in 2017/18. This equaled 0.06 percent of all cotton produced in 2017/18.

Fairtrade Organic cotton production was around 11,000 mt in 2017/18. 65 percent of all Fairtrade cotton in 2017/18 was also certified to an organic standard.

Tip: How to find out more about the different cotton programs.

Check out the Textile Exchange [Sustainable Cotton Matrix](#) to learn more about the specific programs and what they cover.

The production volume of preferred cotton is growing (in '000 metric tons).



(1) The data are based on information from the standard owners which we have received through email correspondence or from their websites. The production volumes reported here include the total volume produced per standard including equivalents and overlaps with other standards.

Virgin Cotton

A closer look at the preferred virgin cottons⁽¹⁾

Field to Market certified cotton was not yet produced in 2017/18.

ISCC cotton production was 108,575 mt in 2017/18. This equaled 0.41 percent of all cotton produced in 2017/18.

myBMP cotton production increased from 54,000 mt in 2013/14 to 229,281 mt in 2017/18. This equaled 0.86 percent of all cotton produced in 2017/18. myBMP is also accounted as BCI equivalent.

Organic cotton production increased from 107,243 mt in 2012/13 to 180,871 mt in 2017/18. This equaled a market share of 0.68 percent of all cotton produced in 2017/18. The organic cotton production volume includes the organic

cotton that is certified according to bioRe. For more information on organic cotton please see our [Organic Cotton Market Report 2019](#).

REEL cotton production has fluctuated over the past few years with 20,000 mt grown in 2017/18. This equaled 0.8 percent of all cotton produced in 2017/18.

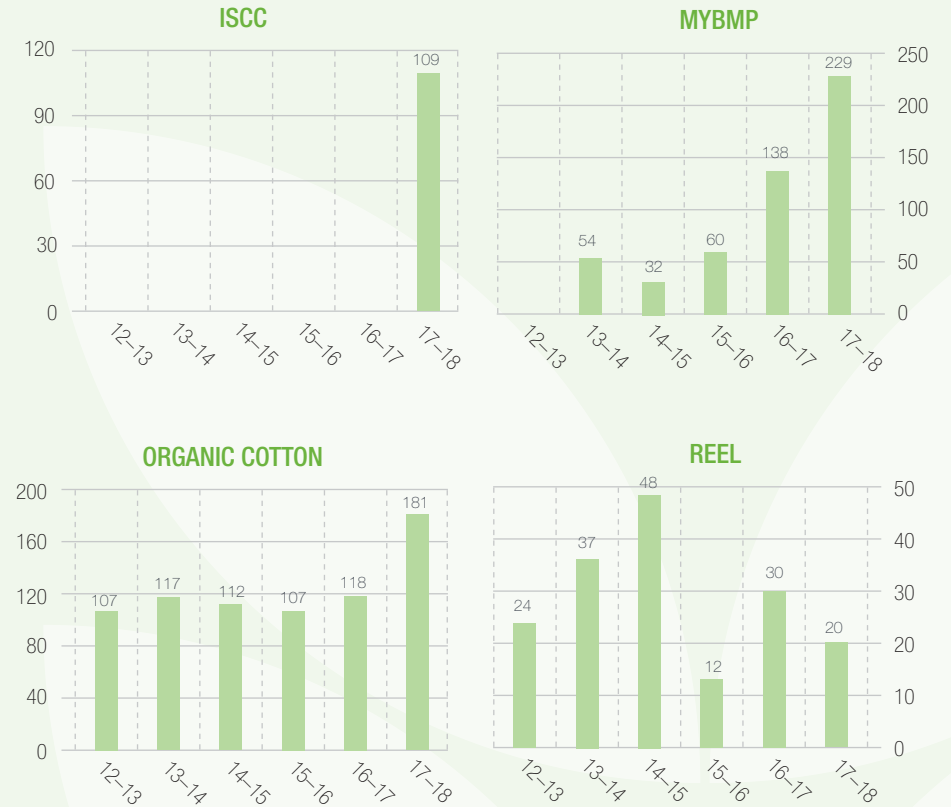
Regenerative Cotton certified according to the Regenerative Organic Certification (ROC) was not yet produced in 2017/18.

Transitional Cotton is the cotton-in-conversion to organic. 44,394 ha of land were in-transition land in 2017/18. For more details, please have a look at the Organic Cotton Market Report.

Tip: How to find out more about the different cotton programs.

Check out the Textile Exchange [Sustainable Cotton Matrix](#) to learn more about the specific programs and what they cover.

The production volume of preferred cotton is growing (in '000 metric tons).



⁽¹⁾ The data are based on information from the standard owners which we have received through email correspondence or from their websites. The production volumes reported here include the total volume produced per standard including equivalents and overlaps with other standards.

Virgin Cotton

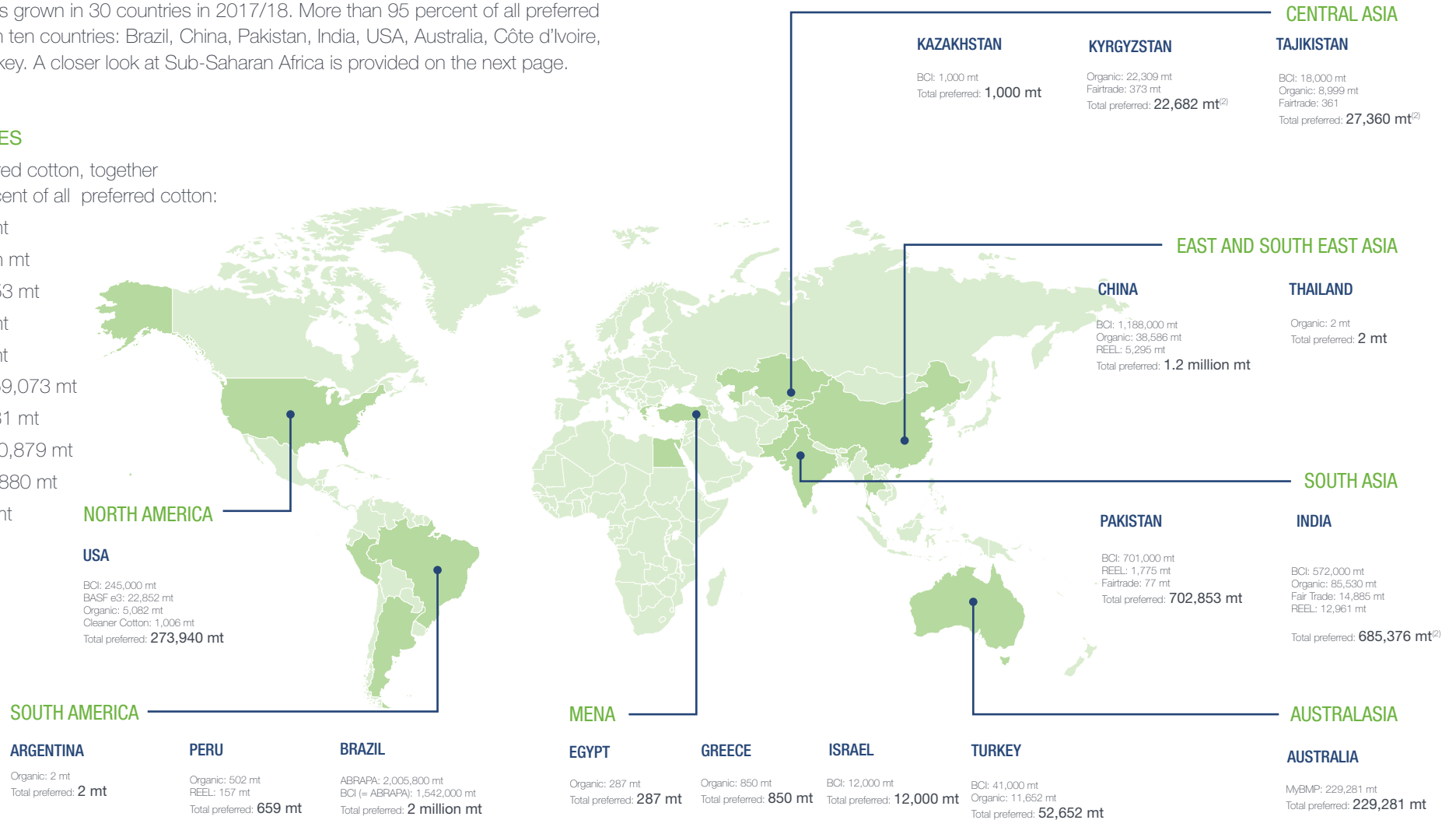
Directory: Where to find preferred cotton across the globe⁽¹⁾

Preferred cotton was grown in 30 countries in 2017/18. More than 95 percent of all preferred cotton was grown in ten countries: Brazil, China, Pakistan, India, USA, Australia, Côte d'Ivoire, Cameroon, and Turkey. A closer look at Sub-Saharan Africa is provided on the next page.

TOP 10 COUNTRIES

by volume of preferred cotton, together producing >95 percent of all preferred cotton:

- Brazil - 2 million mt
- China - 1.2 million mt
- Pakistan - 702,853 mt
- India - 682,555 mt
- USA - 273,940 mt
- Burkina Faso - 259,073 mt
- Australia - 229,281 mt
- Côte d'Ivoire - 140,879 mt
- Cameroon - 106,880 mt
- Turkey - 52,652 mt



(1) email correspondence with cotton initiatives.

(2) As the per country breakdown of Fairtrade Organic cotton was not available to the report production team at the launch of the report, this figure may include cotton that is certified to both, Fairtrade and organic, and thus a double-counting of this figure is possible. The total volume of preferred cotton per country would not change much though, as the share of Fairtrade Organic cotton compared to the total amount of preferred cotton is rather low.

Virgin Cotton

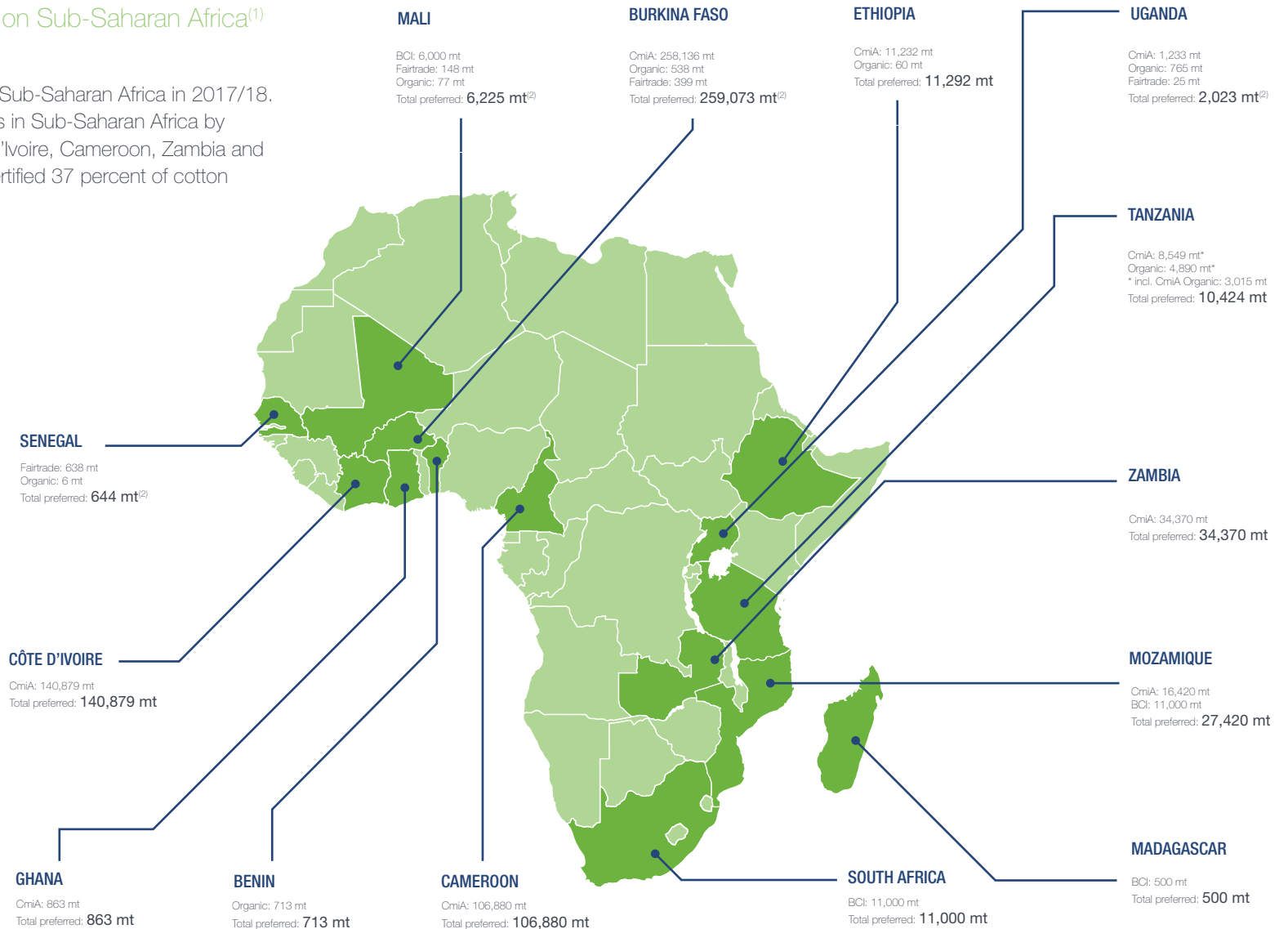
Preferred Cotton Directory: Spotlight on Sub-Saharan Africa⁽¹⁾

Preferred cotton was grown in 14 countries in Sub-Saharan Africa in 2017/18. The top 5 preferred cotton producing countries in Sub-Saharan Africa by volume in 2017/18 were Burkina Faso, Côte d'Ivoire, Cameroon, Zambia and Mozambique. Cotton made in Africa (CmiA) certified 37 percent of cotton production in Africa in 2017/18.

TOP 5 SUB-SAHARAN COUNTRIES

by volume of preferred cotton:

- Burkina Faso - 259,073 mt
- Côte d'Ivoire - 140,879 mt
- Cameroon - 106,880 mt
- Zambia - 34,370 mt
- Mozambique - 27,420 mt



(1) email correspondence with cotton initiatives.

(2) As the per country breakdown of Fairtrade Organic cotton was not available to the report production team at the launch of the report, this figure may include cotton that is certified to both, Fairtrade and organic, and thus a double-counting of this figure is possible. The total volume of preferred cotton per country would not change much though, as the share of Fairtrade Organic cotton compared to the total amount of preferred cotton is rather low.

Virgin Cotton

Supporting the transition to preferred cotton

There are a number of initiatives supporting the transition towards preferred cotton. Collaboration and information are key for a successful uptake of preferred cotton.

Examples

Textile Exchange held the first Regional Organic Cotton Round Table in China in March 2019 in collaboration with CottonConnect. In September 2018, the first Regional Organic Cotton Round Table for West Africa was organized in Koudougou, Burkina Faso in collaboration with Catholic Relief Services (CRS), USDA and SICOT. Further round tables have been held in Izmir focusing on Turkey, Egypt and Central Asia as well as the Global Organic Cotton Round Table held during the Textile Exchange Conference each year.

The **C&A Foundation** in partnership with the Brazilian NGO ESPLAR and World-Transforming Technologies (WTT) launched the program “Meaningful Innovation for Family Farming - Sustainable Cotton Challenge” at the end of 2018. The goal is to support simple innovations that can help smallholder organic cotton farmers to increase their overall productivity and living standards.

The **Chetna Coalition** (ChetCo) was formed in 2013 with a shared vision to

pilot a novel and highly collaborative sourcing model for ethical fashion. In 2019, the coalition published its first Chetna Coalition Brand Impact Report.

Cotton 2040 launched **CottonUp**, a new “Guide to Sourcing Sustainable Cotton” in June 2018. This guide provides practical information and resources to either start sourcing sustainable cotton or increase volumes.

CottonConnect is an enterprise with a clear mission to transform the cotton industry for good. In August 2019, Primark announced the expansion of its collaboration with CottonConnect to train 160,000 cotton farmers in more environmentally friendly farming methods by 2022.

Organic Cotton Accelerator is a multi-stakeholder initiative focused on creating a prosperous organic cotton sector which benefits everyone —from farmer to consumer. A recent project launched in 2019 is the Organic Cotton Traceability Pilot (see more in chapter on Traceability).

The **Organic Trade Association** announced the official launching of its Organic Fraud Prevention Solutions program in March 2019 to help companies minimize or eliminate fraud in organic certification both inside and outside of the United States.

The **Partnership for Sustainable Textiles** in Germany launched the “Organic Cotton Sourcing Guide” in January 2019 in collaboration with C&A Foundation, Organic Cotton Accelerator and Helvetas.

Project Delta: The aim of this 3-year project (2019 to 2021) is to develop a joint sustainability measurement and reporting framework for different agricultural commodities focusing on cotton and coffee. It is a collaboration between BCI, ICAC-SEEP, the International Cotton Organization and the Global Coffee Platform, funded by ISEAL.

Soil Health Institute (SHI), a USA based nonprofit organization, announced in March 2019 that it will launch “Healthy Soils for Sustainable Cotton,” a continuous engagement project to help USA cotton farmers increase their soil health. The initial pilot program, conducted during 2019, started in two USA states and will expand to another three states in 2020.

Solidaridad, Cotton made in Africa, Danish Ethical Trading Initiative and MVO Nederland launched the new project Bottom UP in June 2019 to promote a sustainable cotton and garment value chain, from Ethiopian cotton to European consumers.

UNIDO, the United Nations Industrial Development Organisation, launched a multi-stakeholder pilot project in Egypt in February 2019, to train cotton farmers on the Better Cotton Initiative's approach to sustainable cotton production. UNIDO is also supporting organic cotton production in Egypt through the project CottonForLife, a private sector initiative of FILMAR.

The **U.S. Cotton Trust Protocol**, a data collection, measurement and verification procedure, was introduced by the Cotton Council in November 2019. It will document USA cotton production practices and its environmental impact. The Cotton Council aims to benchmark the cotton growers' results against its 2025 sustainability goals.

West Africa Organic & Fairtrade Cotton Coalition was launched at the International Cotton and Textile Conference (SICOT) in Koudougou, Burkina Faso in September 2018. This coalition aims to establish reliable market access for tens of thousands of smallholder farmer families in West Africa who are producing organic-fairtrade cotton and other organic crops.

Please see also Textile Exchange's [Organic Cotton Market Report 2019](#) for more information.

Recycled Cotton

A closer look at recycled cotton

The Ellen MacArthur Foundation estimates that less than 1 percent of all clothing is recycled back into clothing⁽¹⁾. At the same time, around 12.5 percent of the global fashion market has made a public commitment to circularity by signing the Circular Fashion System Commitment⁽²⁾.

The recycling of cotton is one approach towards a more circular textile industry. Recycling of cotton can either be done mechanically or chemically. Please note that chemically recycled cotton is covered in the chapter on manmade cellulose since the end result is a “manmade cellulosic”, not a “cotton”.

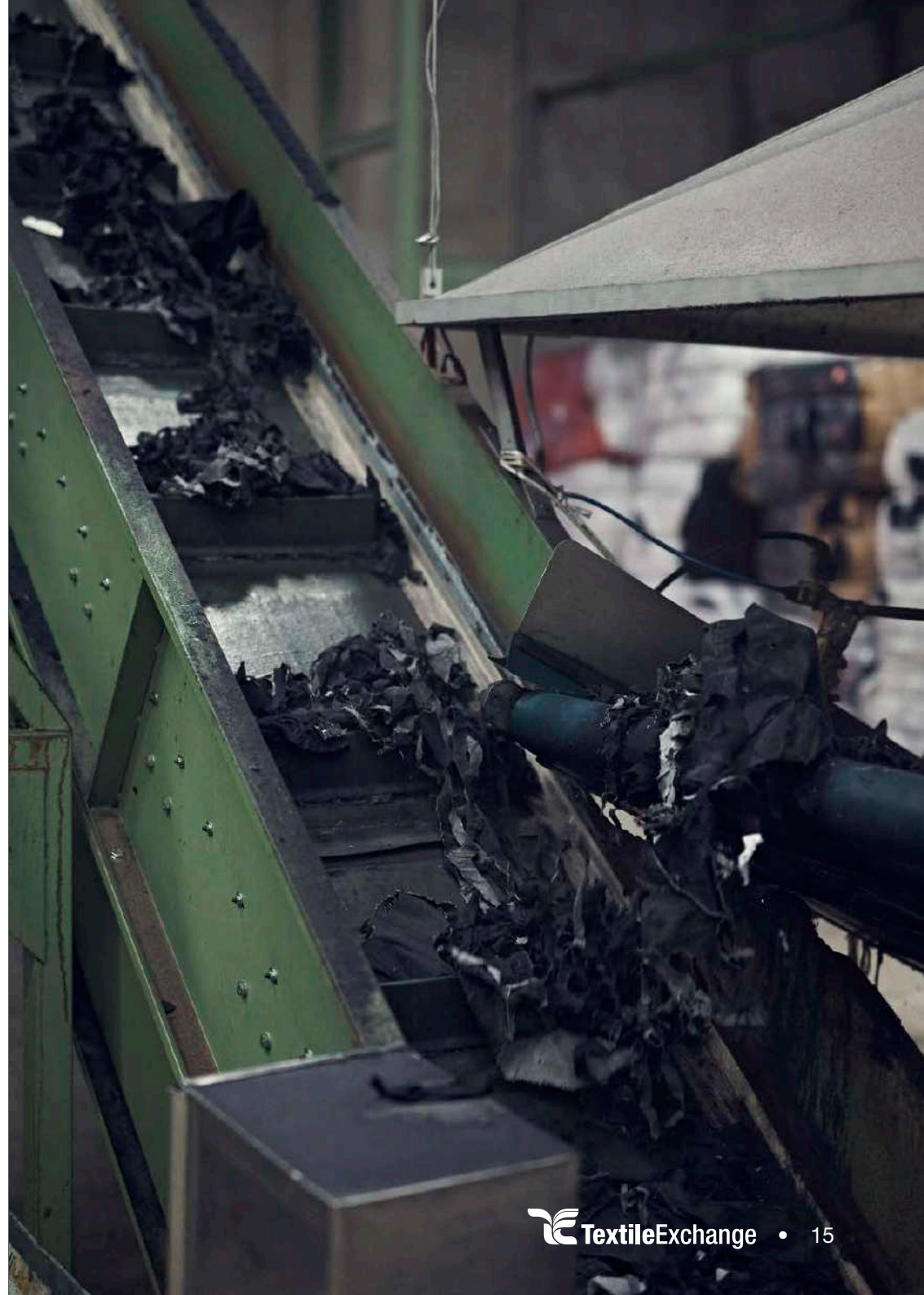
Collaboration is key in order to increase the transition to recycled cotton. A number of initiatives are working to support this goal.

Examples

The **Alliance for Responsible Denim** brought together representatives from the entire denim value chain in a pre-competitive collaboration to make the denim industry smarter and cleaner. Circle Economy, Made-By, and the Amsterdam University of Applied Sciences joined forces to convene the Alliance for Responsible Denim (ARD) and drive the project forward. Circle Economy led the post-consumer recycled (PCRD)

working group, with the ambition to stimulate the adoption of PCRD in the market and grow demand. Over 20 brands were trained on post-consumer recycled denim and standardized PCRD fabric briefs were developed according to their needs. These briefs were translated by 10 global denim mills, 2 yarn suppliers and 4 recyclers into 40 PCRD styles, with a recycled content of 7% - 40%, for the participating brands to integrate into their collections.

Textile Exchange supports recycled cotton by providing information through market reports and the Material Snapshot, the 2025 Sustainable Cotton Challenge, and focus sessions at its annual conferences, amongst other approaches. Textile Exchange has also joined the Cotton Recycling Pilot as a knowledge partner.



Recycled Cotton

Supplier updates

Transitioning to a circular economy is key in order to minimize the impacts of the textile industry. The following suppliers of recycled cotton contribute to this mission.

Examples

Artistic Milliners is a Pakistan based company producing post-consumer recycled cotton.

Belda Lloréns is a Spanish yarn manufacturer offering recycled yarns branded EcoLife®.

Geetanjali Woollens is an Indian company that has been offering products made from 100% post-consumer textile waste for 40 years (more in the [Q&A](#)).

Hilaturas Ferre has developed its **RECOVER** range of yarns and threads which are produced with 100 percent recycled fibers. These yarns contain a high percentage of mechanically recycled cotton, which is blended with recycled polyester from PET bottles.

Martex Fiber offers **Eco2cotton®** which stands for recycled fiber made from pre-consumer fibers and clippings which are sorted by color and blended with acrylic, polyester or other fibers.

Takihyo, a Japanese company, launched Takihyo's Circular System in 2019, which aims to eliminate the concept of waste. It includes two projects: a partnership with The New Denim Project (TNDP) that mechanically recycles pre/post-consumer cotton materials into upcycled denim and cotton in Guatemala and the No Waste project that mechanically recycles pre/post-consumer natural fiber based materials in Thailand. It also aims to minimize carbon footprint impact by offering these closed loop systems in two different regions.

Velener Textil GmbH has won the Discover Natural Fibres Initiative (DNFI) Innovation in Natural Fibres Award for 2018. Its **WECYCLED®** system addresses the issue that 30 percent of yarn used in weaving mills, knitting mills and garment making remains unused. The pre-consumer recycled fibers are blended with virgin cotton into new yarn.

Tip: How to find suppliers of recycled cotton.

Check out the [Textile Exchange database](#) for a list of RCS and/or GRS certified suppliers.



Photo (right): Takihyo

Commitments to Preferred Cotton

Examples

The commitments of brands and retailers are key to accelerating the preferred cotton market.

2025 Sustainable Cotton Challenge

52 major brands and retailers and 3 suppliers have pledged to achieve 100 percent more sustainable cotton⁽¹⁾ by 2025 through the 2025 Sustainable Cotton Challenge as per August 2019. Examples are adidas, C&A, IKEA, H&M, and Levi's. The progress towards this commitment is measured through the Corporate Fiber and Materials Benchmark (CMFB). A list of all companies is provided on the website where all brands/retailers and suppliers can [submit commitments](#).

Commitments to Organic Cotton

There are a number of brands which have publicly committed to use 100% organic cotton. Examples are EILEEN FISHER, Mantis World, Nudie, SkunkFunk, and Stella McCartney.

Commitments by the German Partnership for Sustainable Textiles

The Partnership members have jointly agreed to use at least 35 percent sustainable cotton by 2020, with 10

percent of the total volume being organic cotton⁽²⁾. The aim is to increase the proportion of sustainable cotton to 70 percent by 2025, with 20 percent being organic cotton⁽²⁾.

Cotton Pledges Against Forced Labor

312 companies have signed the Uzbek Cotton Pledge as per April 2019, committing to end the practice of forced labor in the cotton sector in Uzbekistan. More information [here](#).

70 companies have signed the Turkmen Cotton Pledge as per July 2019 to end government-sponsored forced labor in Turkmenistan's cotton sector. More information [here](#).

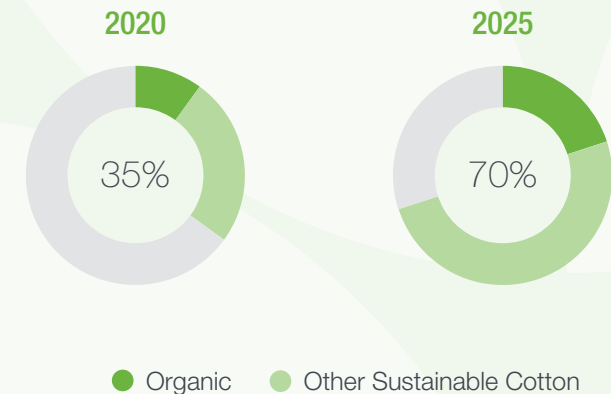
Circular Fashion System Commitment

As of July 2019, 90 companies representing 12.5 percent of the global fashion market have signed the Circular Fashion System Commitment, a call to action by the Global Fashion Agenda. The companies have committed to take action on one or more of four immediate action points - one being to increase the use of post-consumer recycled fibers⁽³⁾. Post-consumer recycled cotton is one of the fibers contributing to these targets.

NUMBER OF COMPANIES THAT SIGNED THE 2025 SUSTAINABLE COTTON PLEDGE



PARTNERSHIP FOR SUSTAINABLE TEXTILES - SUSTAINABLE COTTON TARGET



(1) These initiatives include, *ABRAPA, *BASF e3, Better Cotton Initiative (BCI), *Cleaner Cotton, Cotton made in Africa (CmiA), Fairtrade, *Fairtrade Organic, *Field to Market, *ISCC, *myBMP, Organic, Recycled cotton (that is certified to an independently verifiable standard such as the Global Recycled Standard (GRS) or the Recycled Claim Standard (RCS), *REEL Cotton, *Regenerative Cotton and *Transitional Cotton. *Denotes initiatives being Benchmarked starting in 2019.
 (2) This includes GOTS, NATURTEXTIL IVN, OCS, the bioRe Social & Environmental Standard and all the organic standards forming part of the IFOAM Family of Standards.
 (3) Global Fashion Agenda - Commitment Website, accessed on 15 September 2019.



Other Plant- Based Fibers

Photo: Scot Nelson - Public Domain Picture

Other Plant-based Fibers

Flax, hemp, and beyond

Other plant-based fibers include a diversity of vegetable fibers such as jute, kenaf, coir, flax, sisal, ramie, kapok, abaca and hemp. It is estimated that more than eight million households are involved in the production of these other natural plant-based fibers⁽¹⁾.

With a global production volume of around 6 million mt, the market share of these other plant-based fibers was around 5.7 percent of the total global fiber production volume in 2018⁽²⁾.

Jute had the largest market share of all other plant-based fibers with around 50–60 percent⁽³⁾. Similar to hemp, flax and ramie, it is a bast-fiber. Jute is used to make twines, ropes, matting, and packaging materials but also for home textiles such as curtains and carpets.

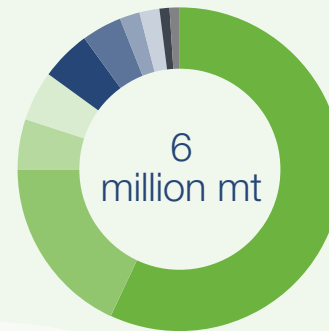
Coir had the second largest market share of other plant-based fibers with around 20 percent⁽³⁾. Coir is the fiber extracted from the husks of coconuts. It is used to produce home textiles such as floor mats, doormats, brushes and mattresses.

The global flax fiber and tow production in 2018 is estimated at around 780,554 mt⁽³⁾. Processed flax, also called linen, is used for a variety of products including home textiles and apparel.

Hemp had an estimated global production volume of around 59,817 mt in 2018⁽³⁾. The bast-fiber hemp is used in various industries including home textiles and apparel.

Further plant-based fibers include sisal, hennequen, ramie, kapok and abaca.

OTHER PLANT-BASED FIBERS ⁽¹⁾

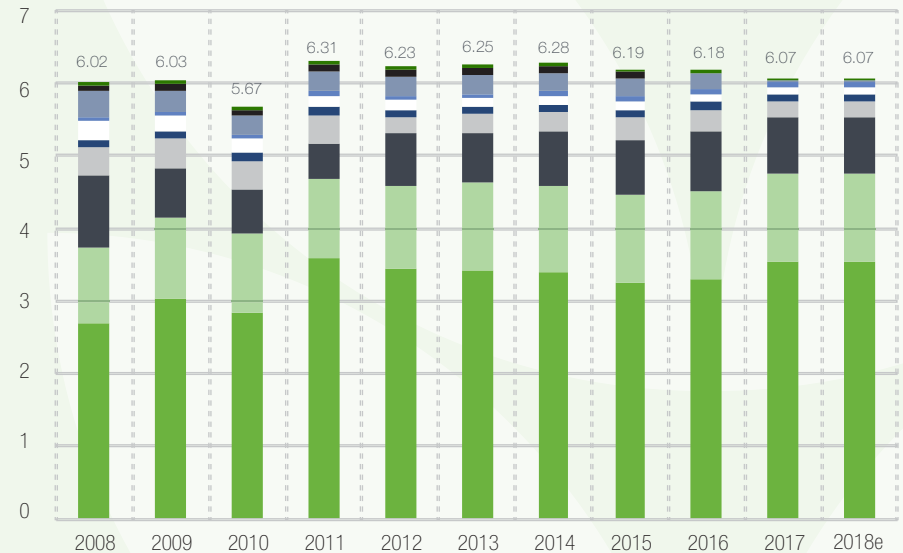


8+ million households

are estimated to be involved in the production of natural plant-based fibers such as jute, coir, flax and hemp.⁽²⁾

- Jute, Kenaf & Allied Fibers
- Coir
- Flax fiber and tow, ex scutching mill
- Other, not specified elsewhere
- Sisal, Hennequen & similar hard fibers
- Bast fibers
- Ramie
- Kapok
- Abaca
- Hemp fiber and tow

OTHER PLANT-BASED FIBER PRODUCTION (MILLION MT) ⁽¹⁾



- Jute
- Coir
- Flax Fiber and Tow
- Sisal
- Manilla
- Ramie
- Hemp
- Other Bast
- Kapok
- Agave

(1) DNFI Website - Natural fibers production reaches 30 million mt, published on 29 July 2017.

(2) Textile Exchange based on FAOStat and total global production volumes compiled by Textile Exchange (see [Global Fiber Market](#)).

(3) based on FAOStat.

Other Plant-based Fibers

Hemp

2018 was an important year for the hemp industry. The **United States Farm Bill**, signed into law in December 2018, makes the growing of hemp in the USA much easier as cannabis with less than 0.3% THC is now considered an agricultural crop rather than a controlled substance. It is expected that the hemp industry will grow as a result of this regulatory change. Hemp for fibers has mainly been grown in China but there are also emerging initiatives in other countries including the USA.

Examples

9Fiber is a USA based company dedicated to delivering innovative, responsible and sustainable solutions to cannabis and hemp biomass waste recycling. The 9Fiber patented solution™ converts unwanted waste material from the cannabis and industrial hemp industries into usable bast fiber and hurd to be used in a wide variety of products including fibers for the textile industry.

Bastcore is a USA based hemp processing company that is working on the development of textile grade hemp fiber.

Circular Systems' Agraloop Bio-refinery is currently developing BioFibre™, fibers made entirely from food crop residues. Oil-seed hemp is one of the feedstocks that can be utilized for

these fibers (more in the [HUB](#)).

Earth Alive Clean Technologies, a leading Canadian Clean-Tech company, announced the launch of the **Clean Fiber Initiative** in 2018, a collaborative research project aimed to improve the production of natural fiber crops in Canada and around the world. Earth Alive currently has hemp trials underway with conventional and organic growers in Canada, and the USA.

Eko-Terre, launched in 2010 by Logistik Unicorp, announced that it will soon introduce a line of hemp-based textile fibers and fabrics. The main goal of this division is to process Canadian hemp straw into fibre.

Hempfortex is a main supplier of hemp textiles. This vertically integrated company uses hemp grown in China and manufactures yarn, knitted and woven fabrics made from hemp.

TS Designs, a USA based t-shirt company, is planning to build a fully transparent and trackable hemp supply chain in the USA for textile-grade hemp processing.

Research is underway into hemp and jute as feedstock for manmade cellulose (see Manmade Cellulosics Chapter) and even biobased leather alternatives (see Leather Alternatives Chapter).



Other Plant-based Fibers

Flax

Around 80–85 percent of the flax used for fibers is grown in Europe. France is the largest producer of flax fibers. European flax is cultivated in a wide coastal band stretching from the South of Normandy in Northern France through Belgium and the Netherlands. Other key flax fiber producing countries are Belarus, Russia, Ukraine, and China. The global flax fiber and tow production in 2018 is estimated at around 780,554 mt⁽¹⁾. A small percentage of flax is certified organic. According to estimates of CELC, the European Confederation of Linen and Hemp, around 0.5 percent of the flax grown in Europe is certified organic⁽²⁾.

Examples

Bast Fibre Technologies Inc is a bast fiber engineering firm based in Canada that develops IP protected enhancements for hemp, flax, and other bast fibers. In 2016, Bast Fibre Technologies Inc. purchased the Intellectual Property and other assets of **CRAILAR Fiber Technologies Inc.**, a company focused on creating processes, know-how and technology to refine flax and hemp fiber for use in textile applications. The enzymatic process developed by CRAILAR transforms flax into soft fibers which are functionally equivalent to manmade cellulose.

Circular Systems` Agraloop Bio-refinery is currently developing BioFibre™, fibers made entirely from food crop residues. Oil-seed flax is one of the feedstocks that can be utilized for their fibers (more in the [HUB](#)).

Depestele Group is a vertically integrated specialist of flax raw material, cultivated in partnership with 650 flax farmers in France, to scutching, hackling, roving and textiles for technical uses. All these steps are certified European Flax®, tracing fibre grown in Western Europe.

JINDI - GOTS certified Zhaosu Jindi Flax Co., Ltd. was founded in 2007 and is one of the major manufacturers of dew-retting and organic flax fiber in China.

Libeco is a Belgian-based company that collaborates with a group of growers of organic flax in France and processes this flax into organic linen products.

TERRE DE LIN is a French cooperative specialized in producing textile flax (linen) from seed to fiber. With 650 farmers and 240 employees, the cooperative produces 15 percent of flax globally.

Van de Bilt is a GOTS certified company based in the Netherlands that contracts flax growers in France and Netherlands to produce fiber flax, processing it with its scutching and heckling lines.



(1) based on FAOStat, 2018 production volume estimated similar to the 2017 figure.

(2) CELC 2019, email correspondence.

Other Plant-based Fibers

Nettle, kapok, and others

There is an emerging interest in the use of plant-based specialty fibers such as nettle, lotus, kapok and others. The use of agricultural residues is also gaining much attraction.

Nettle, kapok, and others

Further plant-based fibers used in the textile industry include nettle, kapok, lotus, and others.

Examples:

FLOCUS™ produces yarn blends and filling made with kapok.

Himalayan Wild Fibers extracts textile fiber from a nettle plant that grows wild in the mountain forests of the Himalayas (more in the [HUB](#) and [Q&A](#)).

Samatao Lotus Textiles extracts the fibers from the lotus plant.

Agricultural residues

The use of crop residues such as rice straw, pineapple leaves, banana tree trunks and sugar cane bark - is another emerging field. Please note that the examples listed here do not chemically dissolve the plants into pulp nor do they depolymerize them. If the same plants are dissolved into pulp, they are listed in the

chapter on Manmade Cellulosic Fibers. If depolymerization is used to process them, they are listed as biosynthetics.

Examples

Circular Systems` Agraloop Bio-refinery is currently developing BioFibre™, fibers made entirely from food crop residues. The Agraloop™ can utilize a range of feed stocks - apart from oil-seed hemp and oil-seed flax - for example rice straw as well as pineapple leaves, banana tree trunks and sugar cane bark can be used. In 2019, Agraloop presented first prototype fibers, yarn, and fabrics (more in the [HUB](#)).

Spinnova is a Finnish R&D company developing an innovative mechanical approach to produce a cellulosic fiber. In the spring of 2019, Spinnova started operations on their industrial scale pilot line in Finland. Spinnova and **Fortum** introduced and showcased the first prototype products made from agricultural residues, namely wheat straw, at the Textile Exchange Sustainability Conference in Vancouver in October 2019 (more about Spinnova in the [HUB](#) and [Q&A](#)).



Animal-based Fibers & Materials



Down & Feathers

Photo: US AID - Public Domain Picture

Virgin Down

Production facts and figures⁽¹⁾

The global down and feather production volume is estimated at around 270,000 mt per year⁽¹⁾.

70–90 percent of the down production comes from China⁽¹⁾. The global down and feather market is highly fragmented with many small and medium producers.

Around 75–90 percent of the down comes from ducks, most other down comes from geese⁽²⁾.

Increasing concerns about the treatment of animals have led to the development of animal welfare standards for down. Key standards include the Responsible Down Standard (RDS), the Global Traceable Down Standard (TDS) and Downpass. These standards award and ensure that there is:

- no live-plucking
- no force-feeding
- broader animal welfare (depending on standard)

Responsible Down Standard

The Responsible Down Standard (RDS) is gaining importance. The number of RDS certified farms increased to 6,011 in 2018, while the number of certified processing sites increased to 904 (from 108 in 2014).

Traceable Down Standard

The number of Global Traceable Down Standard (TDS) certified farms increased from 233 in 2017 to 414 in 2018. The number of certified processing sites increased from 15 in 2017 to 17 in 2018⁽³⁾. More than 273 mt of down have been certified according to the TDS in 2018.⁽³⁾ This is equivalent to an estimated 0.1 percent of the total down production volume in 2018.

Downpass Standard

The number of Downpass certified farms increased from 4,500 in 2017 to 5,185 in 2018. The number of certified processing sites increased from 209 in 2017 to 337 in 2018. Due to a change in the standard system, a comparison with previous years is not possible.

The global Downpass certified down production volume in 2018 is estimated at around 3,053 mt. This is equivalent to an estimated 1.1 percent of the total down production volume in 2018. Out of this, around 2,653 mt are used for Downpass certified bedding, while around 400 mt are used for Downpass certified outdoor and fashion products.



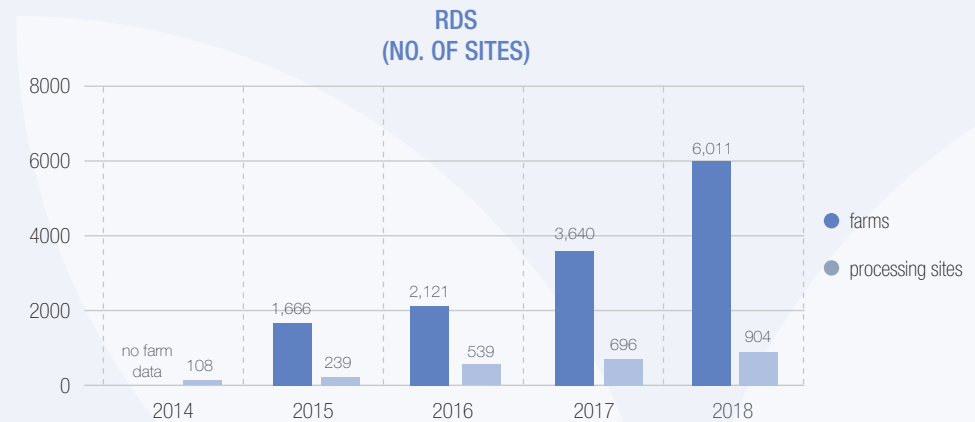
>270,000 mt
of down and feathers
produced globally



70–90%
produced in
China



75–90%
from ducks,
rest from geese



(1) based on figures from cn-down.com and FAO.
 (2) based on FAO database and conversations with industry experts.
 (3) one supply chain did not report the volume of certified down in 2018.

Virgin Down

Directory: Where to find preferred down across the globe

Preferred down was produced on thousands of farms in 13 countries in 2018. Major production regions for preferred down are China and Eastern Europe including Poland and Ukraine.

Tip: How to find suppliers of preferred down.

Check out the [Textile Exchange database](#) or contact NSF or Downpass for a list of certified suppliers.

RDS certified farms:

- China: 4,417 (= 73.48 %)
- Poland: 1,155 (=19.21 %)
- Hungary: 311 (= 5.17 %)
- Netherlands: 72 (= 1.2 %)
- UK: 34 (= 0.57 %)
- Russia: 15 (= 0.25 %)
- Taiwan: 7 (= 0.12 %)

Total: 6,011

Downpass certified farms:

- China: 2,576 (= 49.68 %)
- Ukraine: 946 (= 18.24 %)
- Germany: 616 (= 11.88 %)
- France: 284 (= 5.48%)
- Poland: 263 (= 5.07 %)
- Russia: 190 (= 3.66%)
- Ireland: 146 (= 2.74 %)
- Hungary: 143 (= 2.76 %)
- Australia: 22 (= 0.42%)
- Taiwan: 3 (= 0.06 %)

Total: 5,185

WESTERN EUROPE

UK RDS: 34	IRELAND Downpass: 146	FRANCE Downpass: 284
NETHERLANDS RDS: 72	GERMANY Downpass: 616	

POLAND RDS: 1,155 Downpass: 263 TDS: 243	HUNGARY RDS: 311 Downpass: 143 TDS: 66	UKRAINE Downpass: 946	RUSSIA Downpass: 190 RDS: 15
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EASTERN EUROPE

NORTH AMERICA

US
TDS: 105

TDS certified farms:

- Poland: 243 (= 58.70 %)
- US: 105 (= 25.36 %)
- Hungary: 66 (= 15.94 %)

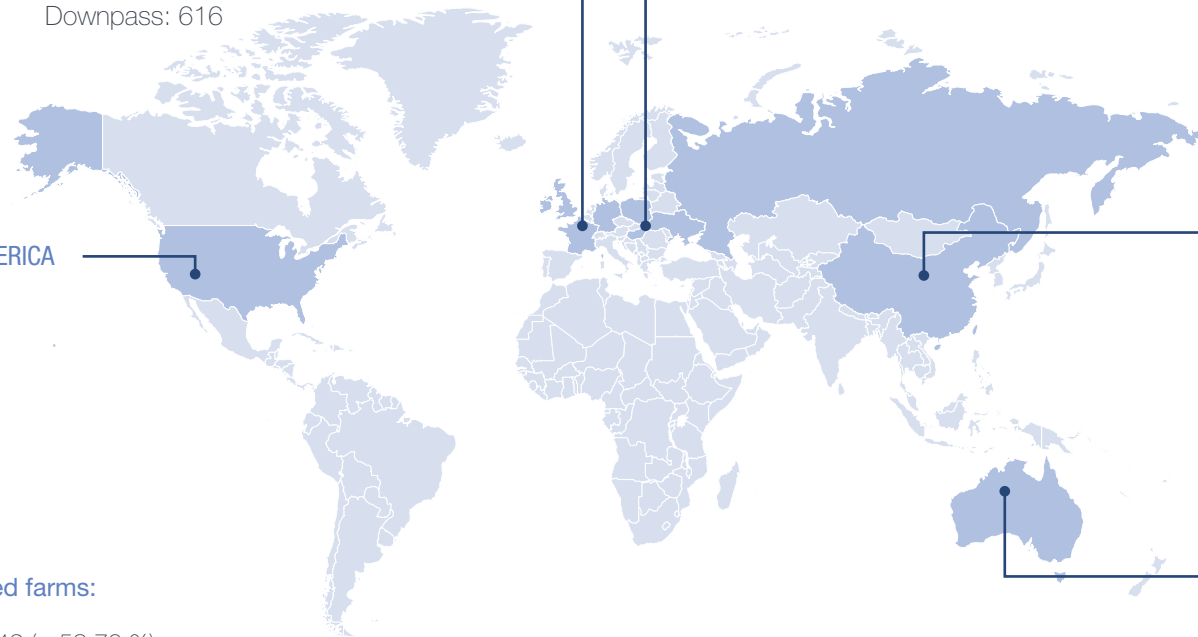
Total: 414

EAST AND SOUTH EAST ASIA

CHINA
RDS: 4,417
Downpass: 2,576

TAIWAN
Downpass: 3

AUSTRALASIA
AUSTRALIA
Downpass: 22



Virgin Down

Key updates

Standard Updates

Responsible Down Standard (RDS)

In July 2019, Textile Exchange released the RDS 3.0. This new version is the result of an in-depth multi-stakeholder review process. It signifies the most substantial revision since the 2014 launch of the standard. Key changes to the standard include mandatory euthanasia for sick or injured birds, mandatory stunning before slaughter, stronger criteria related to handling, record keeping and training of workers, observation of parent farms in industrial goose supply chains and more. You can find more about the review process and new version on the standard's website⁽¹⁾.

Downpass

In May 2019, the member companies of Downpass e.V. decided not to continue with the brand "DOWNPASS 2017", but representing the Zero Tolerance Standard from now on as "DOWNPASS". The expiring modular version will be available as "Downpass 2016" in the transition period. The first version of the Downpass standard was completed in June 2016. A new version of the standard was developed in autumn 2016 in a multi-stakeholder process and valid from

January 2017. The new version stands for the exclusion of feathers and down from live animals, material from foie gras production as well as rearing control. You can find more information on the standard's website⁽²⁾.

Global Traceable Down Standard (TDS)

The TDS has been launched by NSF in January 2015. It is based on the "100% Traceable Down Standard" that Patagonia originally developed as internal standard. Patagonia then approached NSF to refine their internal standard into an independent global down standard. You can find more information on the standard's website⁽³⁾.

Supplier Updates

The number of certified down suppliers is increasing.

Examples

Allied Feather and Down is a USA based down and feather company founded in 1987. Allied is part of the RDS International Working Group and offers RDS certified down. In spring 2019, Allied announced that the 100th brand has joined its proprietary TrackMyDown.com education and supply chain

transparency tool. The tool has originally been launched with five partner brands in 2015.

Downlite is a major USA-based manufacturer of down and synthetic filled bedding products sold to retailers and hotels. Additionally, Downlite supplies down fills to outerwear and sleeping bag brands and manufacturers. Downlite is part of the RDS International Working Group and offers RDS, TDS and Bluesign certified down.

Navarpluma, a down and feather company based in Spain, is part of the RDS International Working Group and offers RDS and recycled down. In September 2019, Navarpluma and Applied DNA Sciences announced a partnership for a DNA based traceability project (see also chapter on Traceability).

Sustainable Down Source is a USA-based company with the vision to be "the most innovative, ethical and solution for your bulk down needs". Sustainable Down Source supports the RDS International Working Group and offers RDS certified down. In June 2019, Sustainable Down Source announced its new QR code based system to trace down through a code on the product hangtags (more in the [Q&A](#)).

Other updates

There are a number of initiatives working towards preferred down. Collaboration and information are key for a successful uptake of preferred down.

Four Paws International is a UK-based international animal welfare organization. In 2014, the organization invited leading outdoor clothing and equipments brands to take on the "Cruelty Free Down Challenge". Today, Four Paws is actively involved in the Responsible Down Standard International Working Group to strengthen the animal-welfare criteria of the standard.

IDFL is the world's largest down and feather testing institute with laboratories in the USA, Europe, China, and Taiwan.

(1) RDS, email correspondence, more info on <http://responsibledown.org>.

(2) Downpass, email correspondence, more info on <https://www.downpass.com>.

(3) NSF, email correspondence, more info on <http://www.nsf.org/newsroom/nsf-global-traceable-down-standard-explained>.

Recycled Down

Key updates

It is estimated that in Germany alone, the bed feather processing industry generates around 950 mt of waste feathers⁽¹⁾. Down recycling is an important approach to reduce resource consumption and address the waste feathers. Recycled down can be from pre- or post-consumer sources.

Recycling of these materials not only helps to divert waste from landfills and low-value pathways but also to save resources such as energy and water used in down production.

Support organization

The **European Outdoor Group** (EOG) published the Recycled Down Sourcing Guide in 2018. This document was originally written in 2015, when recycled down was first significantly mentioned as a potential suitable alternative to virgin down for outdoor applications. However, it then lay dormant for the best part of two years, until renewed interest in the use of recycled materials encouraged the EOG to update and make this document available in the public domain.

Standards

Standards used for recycled down include the Recycled Content Standard (RCS), Global Recycled Standard

(GRS), and the SCS Recycled Claim. Further information on these standards is provided in the chapter on “Sustainability Standards”.

Examples

The USA based company **Downlite** launched a new innovation called Re/charged down in 2017, GRS certified post-consumer recycled down and feathers as part of their Sustainability initiative. Downlite also offers RDS and TDS certified down.

The Spanish company **Navarpluma** offers 100 recycled down branded NEOKDUN® originating from the recycling of bedding/apparel finished products that have reached the end of their product life cycle. It also offers RDS certified down.

Re:Down is a company specialized in the down recycling made from post-consumer products. Re:Down produce a garden fertilizer from feathers that do not make the grade (more in the [Q&A](#)).

Rohdex is a supplier of down certified to RDS and Downpass as well as recycled down certified to the GRS.

Japanese company **Toray** announced a collaboration with Uniqlo in September 2019 to reclaim and recycle down from apparel collected in Uniqlo stores.



Photo (right): NAU

(1) European Down and Feather Association (EDFA)

Commitments to Preferred Down

Examples

The number of apparel, outdoor and home textile companies that have publicly committed to preferred down is increasing every year. Over 40 leading brands and retailers have made public commitments to preferred down.

Examples

All down used by **Arc'teryx** is certified to the Responsible Down Standard (RDS). More information [here](#).

Since fall 2016, all of the down and feathers in **C&A's** products are RDS-certified. More information [here](#).

Columbia has committed to 100 percent RDS certified down and feathers throughout its global line (excluding its Japanese subsidiary). More information [here](#).

All down used in **Deckers** branded products is certified in accordance with the RDS. More information [here](#).

Eileen Fisher is committed to 100% RDS certified down and feathers. More information [here](#).

Esprit ensures that 100 percent of their down and feathers are sourced according to the Responsible Down Standard. More information [here](#).

Gucci's sustainability principles state that the supplier and its sub-supplier ensure that feathers or downs are RDS or TDS certified or that they adopt, maintain and verify a sourcing policy that ensures there has been no live plucking and they don't derive from animals that have undergone force-feeding during the reproductive phase of their lives. More information [here](#).

Starting with its fall/winter collection 2016, **HUGO BOSS** exclusively uses down that is produced without live plucking or forced feeding and has documented origins. More information [here](#).

H&M only accepts down from farms that have been RDS certified and recycled down since 2015. More information [here](#).

100% of the down in **Kathmandu** products is certified under the Responsible Down Standard. More information [here](#).

All down sourced by **Marks & Spencer** must be certified by RDS or TDS standard, or RCS/GRS certified recycled down. More information [here](#).

Norrona only uses down that is RDS certified or recycled. More information [here](#).

From the Fall 2017 product season, all **Patagonia's** virgin down was certified to the advanced certification level of the Global Traceable Down Standard (Global TDS). More information [here](#).

Prana is committed to only source RDS certified down. More information [here](#).

Ralph Lauren publicly committed to 100% Responsible Down Standard or Traceable Down Standard certified down by 2023. More information [here](#).

The North Face started using RDS-certified down in Fall 2015 and since Fall 2016 they have only purchased RDS-certified down. More information [here](#).

From Fall 2017, **Tommy Hilfiger** confirmed that all their down products is certified to the Responsible Down Standard. More information [here](#).

Varner is committed to 100 percent RDS down. More information [here](#).

VF Corporation has the goal to source 100 percent of our goose down in accordance with the Responsible Down Standard (RDS) by the end of 2019. More information [here](#).

Since 2017, 100% of the down sourced by **Volcom** is RDS certified. More information [here](#).



It's exciting to see that the collective use of the RDS across the industry is effectively promoting positive animal welfare conditions and traceability in the down supply chain at such a large scale.⁽¹⁾

James Rogers,
Senior Sustainability Manager,
North Face

(1) [North Face website 2019](#)



Wool

Photo: The New Zealand Merino Company Limited

Virgin Wool - Sheep Wool

Production facts and figures⁽¹⁾

With an annual production volume of more than one million mt, wool is the most used animal-based fiber.

While the global wool production has been declining over the years, the market share of initiatives such as the Responsible Wool Standard (RWS) and ZQ is increasing.

The number of **RWS** certified sites increased from 7 in 2016 to 322 in 2018⁽¹⁾. The 322 RWS certified sites in 2018 included 148 units with supply chain scope. In 2018, 278 farms were certified to the RWS, either individually or as part of a farm group (see next page for details)⁽¹⁾.

Since the RWS only launched in 2016, the market share is estimated at below one percent of the global wool production.

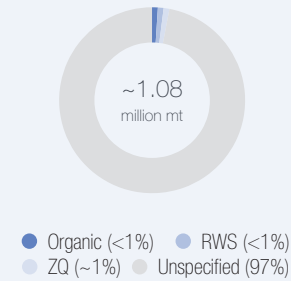
The RWS ensures animal welfare (no mulesing and a broader concept of animal welfare based on the Five Freedoms of animals) and best practices

in the management and protection of the sheep grazing land.

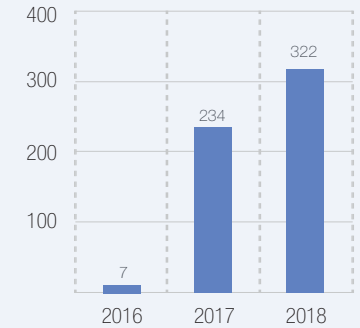
ZQ supplied over 11,000 mt of ZQ certified wool fiber grown under the ZQ certification program (ZQ Merino and ZQ Premium Wool) to partners globally in 2018. This equaled around 1 percent of the global wool production in 2018 and included around 30 mt of ZQ wool sold under the RWS. The ZQ wool was sourced from around 550 ZQ certified growers, including 92 who sold their wool under the RWS⁽²⁾.

Organic wool, while niche, is fairly well established. Organic wool makes up less than one percent of the global wool production⁽³⁾.

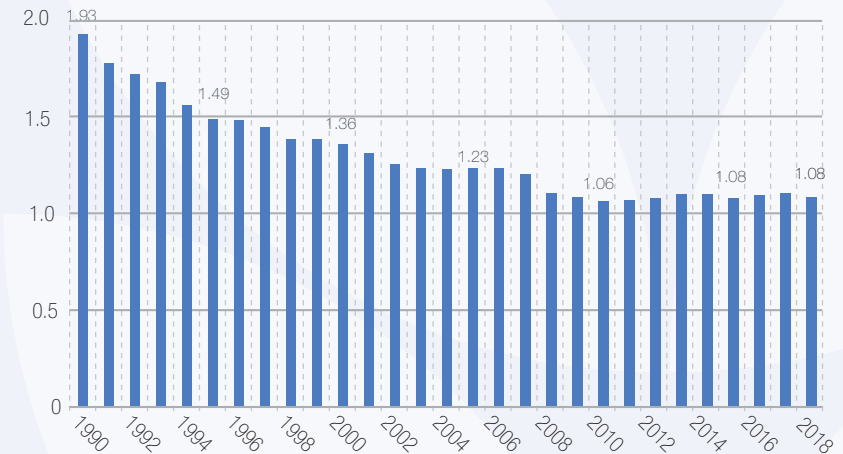
PREFERRED SHEEP WOOL MARKET SHARE IN 2018



RESPONSIBLE WOOL STANDARD (NO. OF SITES)⁽¹⁾



GLOBAL SHEEP WOOL PRODUCTION (MILLION MT)



(1) This figures does not include the number of the 92 ZQ growers in New Zealand that sold their wool under the RWS in 2018.

(2) ZQ, email correspondence.

(3) based on FibL, email correspondence regarding the number of organic sheep in 2012–2016; compared to total number of sheep based on FAOStat database; 2018 figures estimated similar to previous years.

Virgin Wool - Sheep Wool

Directory: Where to find wool certified to the Responsible Wool Standard (RWS)

Responsible Wool was produced on 278 farms in 6 countries in 2018. Major production countries for Responsible Wool in 2018 were South Africa, Uruguay, Argentina, and Australia.

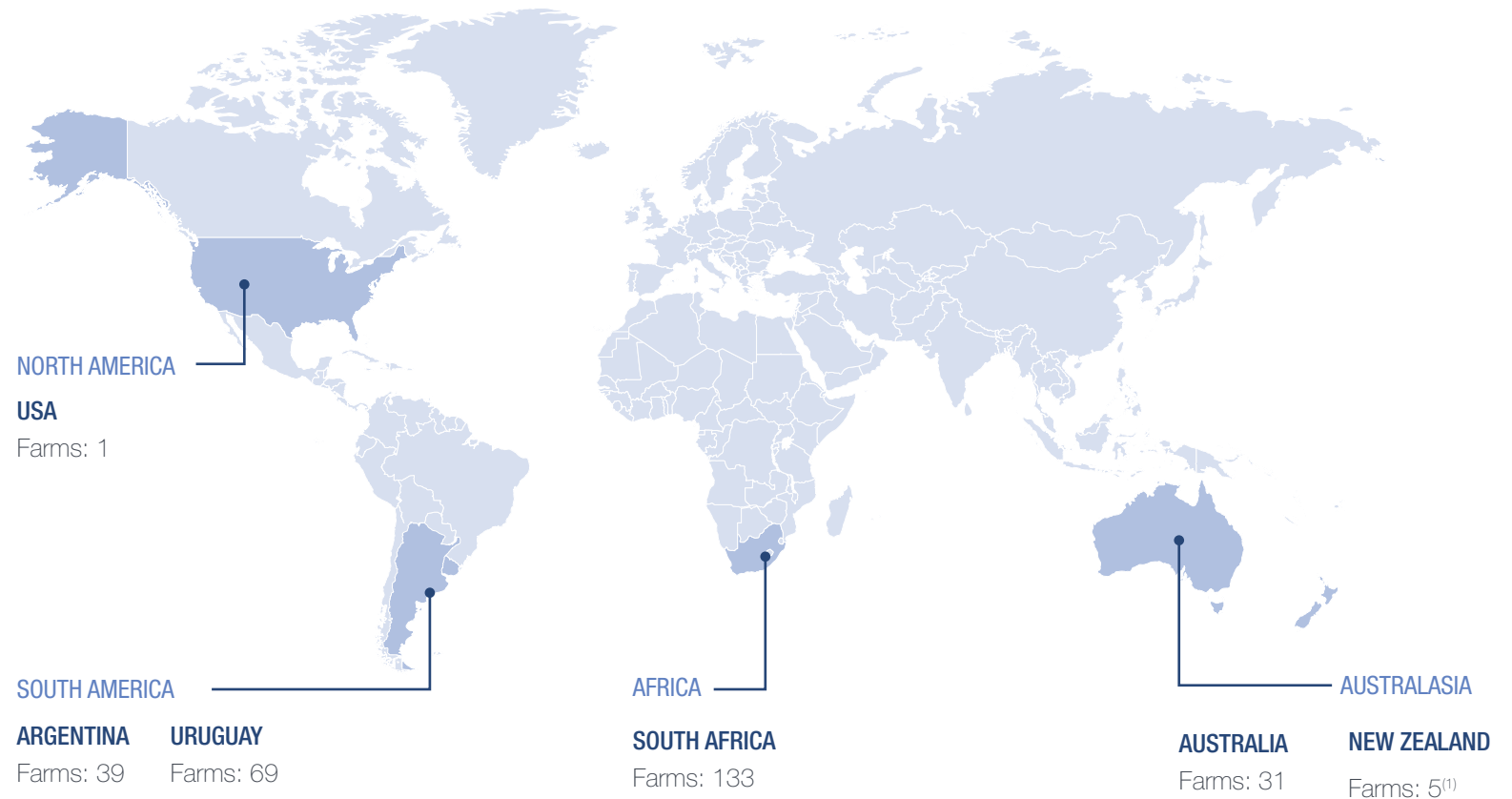
Tip: How to find suppliers of preferred wool

Check out the [Textile Exchange database](#) for certified suppliers of RWS, OCS and recycled wool, the [Responsible Wool Standard Brand Sourcing Guide](#) for support related to the RWS and the [GOTS database](#) for GOTS certified wool suppliers.

RWS Certified Farms

- South Africa: 133
- Uruguay: 69
- Argentina: 39
- Australia: 31
- New Zealand: 5⁽¹⁾
- USA: 1

Total: 278⁽¹⁾



(1) This figures does not include the number of the 92 ZQ growers in New Zealand that sold their wool under the RWS in 2018.

(2) ZQ, email correspondence.

(3) based on FibL, email correspondence regarding the number of organic sheep in 2012–2016; compared to total number of sheep based on FAOStat database; 2018 figures estimated similar to previous years.

Virgin Wool - Sheep Wool

Supplier update

Preferred wool is based on the commitment and support of leading suppliers.

Examples

BKB is a wool broker operating in South Africa and Lesotho that provides a range of services to the producers. BKB suppliers RWS certified wool.

Chargeur Luxury Materials is an internationally operating company that supplies merino wool fibers from RWS certified farms.

Fox and Lillie is a 100 percent Australian family-owned and operated agribusiness, founded in 1948. Fox & Lillie is one of the largest buyers and exporters of Australian wool and a major buyer of wool from other countries. Fox and Lillie operates an RWS farm group and is rapidly expanding.

Fuhrmann, part of Gschneider Group and based in Argentina, is managing 11 farms currently and combing 9 million kg of wool per year. Fuhrmann is a supplier of organic and RWS certified wool.

Imperial Stock Ranch, established 1871, is located in the USA, and has been raising sheep, cattle, grains and hay for more than 147 years. The ranch was the first ranch in the USA certified under the RWS. Having sold their wool textile business, the ranch continues the long

tradition of sheep and wool production as part of their ranching operation.

Lanas Trinidad is a traditional wool company with roots extending back to 1916. Jointly owned by Chargeurs and the Otegui Family, it is the main producer and exporter of combed wool tops in Uruguay. Lanas Trinidad is operating an RWS farm group that is rapidly growing.

Ovis21 is a network of more than 160 producers, technicians and professionals in Argentina, Chile and Uruguay who seek, through constant innovation, to change the paradigm of farming from extractive to regenerative. The group works with over one million sheep. Ovis21 is part of Land to Market and supplies RWS certified wool.

Shaniko Wool Company was established to continue the work of their family ranch (Imperial Stock Ranch) and others like them, in supporting the use of wool. At the request of a leading outdoor recreation brand, Shaniko has been involved with the RWS since 2015. They were a pilot audit site in 2015 and the following year, were the first ranch in the world to receive RWS certification. Working with additional ranches and scaling the effort, Shaniko Wool Company is an approved USA Group supplier of RWS wool (more information in the [Q&A](#)).



Photo (right): Paul Thacker, Shaniko Wool Company - Jeanne and Lambs

Virgin Wool - Sheep Wool

Standards and other updates

Standard and initiatives updates

The **Responsible Wool Standard (RWS)** 2.0 revision process was launched in November 2018. In autumn 2018, the first RWS certified products hit the market.

Ovis21 combines a Grassland Regeneration and Sustainability Standard with the RWS. Ovis21 is a network of more than 160 producers in seven Argentine provinces as well the south of Chile and Uruguay. The network includes over one million sheep. Ovis 21 promotes a culture of grassland regeneration and biodiversity so the land will sustain people, their businesses and communities. Their Grassland Regeneration and Sustainability Standard and the Rangeland Health Index covers these ambition. To cover the animal welfare as well, Ovis21 has adopted the Responsible Wool Standard (RWS).

ZQ invested 1.6 million NZD in Research & Development over the last 2 years. ZQ wool from New Zealand is also certified to the RWS.

Wools of New Zealand is owned by the people who grow the wool – farming families committed to sustainable

practices and caring for the land so that it may be passed to future generations. Wools of New Zealand has been inspected and assessed according to the Responsible Wool Standard (RWS). Wools of New Zealand has also worked with the EU Ecolabel to develop the world's 1st on-farm accreditation system for greasy wool.

Fibershed is a California based organization which develops regional fiber systems that build soil and protect the health of the biosphere. Fibershed is the initiator of the **Climate-Beneficial™ wool** program which is grounded in an effort to scale the implementation of Carbon Farming to create carbon sinks. The wool of the participants is marketed as Climate-Beneficial™ wool.

Mulesing and steining

Australian Wool Innovation (AWI) published the report "Planning for a Non-Mulesed Merino Enterprise" in 2018. This report outlines the key learnings from a number of wool-growing enterprises that have moved to a non-mulesed enterprise. It is intended to assist other woolgrowers in their consideration and planning to also move to non-mulesed Merino.

Four Paws and Human Society

International published a position statement opposing steining / freeze branding in September 2019. Both organizations are against any form of breech mutilation or modification. This includes mulesing (the removal of skin via cutting with shears) and steining (the use of liquid nitrogen).

Four Paws also published the guide 'Transitioning Away from Mulesed Sheep Wool' in 2019 to support brands and retailers on the why and how. In September 2019, Four Paws launched the Wear it Kind Campaign by asking people to pressure brands to phase out mulesing. It also helped to review the renewed Good On You scoring system for animal welfare.

The **Legislative Council of New South Wales (NSW), Australia**, has reaffirmed its ambition to introduce a bill through which it will become a requirement for all sheep subjected to mulesing be administered adequate pain relief in advance.

New Zealand has become the first-wool producing country to officially ban sheep mulesing. The new regulation has been effect since October 1, 2018.

Other news

A severe **drought in Australia** hit the Australian wool producers. The drought is having and will continue to have effects on the availability and price of wool. The wool production is expected to decrease as farmers are destocking; farmers are also doing supplemental feeding which is having an impact on price.

China banned the importation of wool and sheep skins from South Africa due to a Foot and Mouth Disease outbreak from January to May 2019.

Virgin Wool - Mohair

Overview

Mohair is the hair of the angora goat (not to be confused with the angora rabbit which produces Angora wool). Around half of the global mohair is produced South Africa.

In 2018, the animal-rights organization PETA published a video campaign on animal welfare violations related to mohair production. Several brands banned the use of mohair as a result or are looking for preferred mohair alternatives.

Standards

In response to requests from stakeholders, a draft standard for mohair production has been developed. The Draft **Responsible Mohair Standard** is based on the existing Responsible Wool Standard which was released in 2016. The draft for the stakeholder consultation was launched in April 2019.

The South African mohair industry has been governed by its own **Sustainable Mohair Production Guidelines** since 2009. These industry guidelines have been developed, and regularly revised, by the South African Mohair Growers Association. They provided background information on the principles, criteria and indicators supported by self-assessment checklists.

The Responsible Mohair Standard is the evolution of an increasing importance and demand for an independent international standard.

Examples

Mohair South Africa is the organization that represents the South African mohair industry. It has been actively involved in drafting the new Responsible Mohair Standard.

Katharine Hamnett, London-based fashion designer, has partnered with **Steiff** Schulte, the 120-year-old teddy bear company, to produce Bio-Fur. The new “bio-fur” is made from mohair fiber trapped in a cotton backing fabric. It is an alternative to synthetic faux fur and biodegradable. The mohair is sourced from farms in South Africa that adhere to the Sustainable Mohair Production Guidelines.



Virgin Wool - Cashmere

Overview

Cashmere is the hair of the Cashmere goat. The largest cashmere producing countries are China and Mongolia. Around 3 percent (276 mt) of the approximately 9400 mt of cashmere produced in Mongolia in 2018 was transacted as “sustainable cashmere” in 2018⁽¹⁾.

In response to interest and queries from brands, Textile Exchange has established the **Responsible Cashmere Round Table (RCRT)** in March 2019. The RCRT brings together the industry with the aim to better understand the issues and opportunities surrounding global cashmere production, as well as to have a common voice in the development of any market-based solutions.

For Mongolia, where land degradation is the driving issue, **Textile Exchange** is representing the International Buyers Group that will participate as a stakeholder in the **United Nations Development Program (UNDP)** National Platform. The Platform has four key objectives in its two year Collection Action Plan: (1) to formulate and implement a collective action plan that addresses the root causes limiting the sustainability of cashmere in Mongolia; (2) to influence and harmonise government policy that ensures a strong and coherent legal and institutional framework for

sustainable cashmere in Mongolia; (3) to establish partnerships and coordinated investments and actions that accelerates current efforts; (4) to position Mongolia as a global leader for sustainable cashmere.

Textile Exchange and the UN are mapping the work of the different initiatives working to support more sustainable cashmere production in Mongolia to create a more thorough understanding of their work. The initiatives include the **Aid by Trade Foundation (AbTF)** with its Sustainable Cashmere Standard, the **Agronomeset Vétérinaires Sans Frontiers (AVSF)**, the **Green Gold Animal Health Project**, the **Sustainable Fiber Alliance (SFA)** with its SFA standards system, **The Nature Conservancy (TNC)**, and the **Wildlife Conservation Society (WCS)**. More information about these initiatives in the RCRT webinars [here](#).

The **Burberry Foundation, Oxfam and PUR Project** have joined hands to initiate a new five-year community program in Afghanistan under which herders of cashmere goats will receive training and tools to enhance their livelihoods and come out of poverty. The country exports roughly 1,000 mt of cashmere per year, accounting for 7 per cent of total global production.



(1) National Statistical Office of Mongolia; UNDP Mongolia at the RCRT Summit at the Textile Exchange Conference in Vancouver 2019.

Virgin Wool - Other Wool

Overview

Further wool - apart from sheep, cashmere and mohair - includes Alpaca, Angora Rabbit, Camelhair, Guanaco, Llama, Vicuna and Yakhair.

Alpaca is the hair of alpacas. It is mainly from South America, particularly Peru.

Angora is the hair of Angora Rabbits. 90 percent of Angora is produced in China. Europe, Chile and the USA also produce smaller quantities. Several major brands and retailers have banned Angora due to animal welfare concerns.

Camelhair is produced from Mongolia to Russia.

Guanaco, Llama and Vicuna are camelides mainly in South America.

Yakhair is the hair of yak which are mainly found in the Himalayas.

Examples of initiatives

The **Mongolian National Chamber of Commerce and Industry** announced in a press release the development of a cluster to manufacture products from yak and camel wool.

Shokay is a social enterprise in China that works with farmers to promote yak wool.



Recycled Wool

A closer look

Recycled wool has a long tradition. The Italian district of Prato is a major producer of recycled wool where approx 22,000 mt of wool are recycled every year⁽¹⁾. Other major production centers for wool recycling are Panipat in India and China.

Key news

European Outdoor Group (EOG) and Greenroom Voice published the Recycled Wool Report in 2018.

The Italian laboratory service provider Buzzilab focused on parameters for chemical safety assessments of recycled wool and made a Product Restricted Substances List (PRSL) proposal in the seminar on Recycled Wool hosted in Prato in June 2018.

Examples of suppliers

Geetanjali Woollens is an Indian company offering recycled wool fiber and yarn. The company has become a Textile Exchange member and was one of the early adopters of the supplier survey of Textile Exchange.

Novetex is a Hong Kong based company offering recycled wool fibers. The recycled wool is GRS certified.

(1) Cardato Recycled website.

Nuova Fratelli Boretti (NFB) is a Prato-based Italian company which has been working with regenerated textile raw materials since 1960. It is the founding partner of Re.Verso™, a trademark used for its re-engineered wool, cashmere and camel hair. The Re.Verso™ supply chain includes Green Line, a company responsible for sourcing and sorting of pre-consumer textile waste, NFB responsible for the selection and the mechanical recycling into fibers and selected strategic partners for the transformation into yarn, fabrics and knitwear.

Recycled standards

The key standard for recycled wool are the Recycled Content Standard (RCS), Global Recycled Standard (GRS), SCS Recycled Claim and Cardato Recycled for recycled wool from Prato in Italy.

Please see the page on “Sustainability Standards” for more information.



Commitments to Preferred Wool

Examples

An increasing number of brands and retailers are committed to preferred wool such as responsible, organic or recycled wool.

Examples

Arc'teryx is working to transition their wool supply to the RWS. More information [here](#).

Deckers Outdoor is committed to ensure that 80 percent of their wool is sourced from either a RWS certified source or a by-product of the tannery processing their sheepskins. More information [here](#).

Eileen Fisher has published the objective that all suppliers will source wool that meets the Responsible Wool Standard (RWS). More information [here](#).

Esprit has made the commitment that 50 percent of their wool is certified according to the Responsible Wool Standard by 2022. More information [here](#).

H&M is committed to use 100 percent Responsible Wool Standard certified wool in their products by 2022. More information [here](#).

IKEA committed to transforming all wool to 100 percent Responsibly Sourced

Wool by 2025. More information [here](#).

Kmart has to target that 100 per cent of wool used in their own Kmart-branded (Anko) clothing and bedding will be either: farms certified under the Responsible Wool Standard or equivalent standard; or farms that are fully traceable and verified as non-mulesed; or from recycled wool materials by July 2024.

Patagonia is committed to 100 percent RWS as baseline requirement. As of Fall 2018, all of the wool in their products is RWS certified, from farm to finished product. More information [here](#).

Ralph Lauren committed in 2019 that 100 percent of its wool will be RWS certified or recycled by 2025. Ralph Lauren is also committed to 100 percent Sustainable Fiber Alliance certified cashmere in 2025. More information [here](#).

Target said that by July 2023, 100 percent of wool used in its own Target-branded clothing and bedding will be either from farms certified under the Responsible Wool Standard or equivalent standard, from farms fully traceable and verified as non-mulesed, or from recycled wool materials.

Further brands that have made public commitments to the Responsible Wool Standard are Marks & Spencer, William-Sonoma, Inc., Eddie Bauer, REI, Tchibo, Varner, Vaude, Coyuchi, Mountain Equipment Co-op, Kathmandu, and Knowledge Cotton Apparel. Among companies that have expressed support of the standard and are working toward implementation are LL Bean, Indigenous Designs, Nau, Point6 and prAna.



We want others to join us and help us transform the wool industry together⁽¹⁾.

Rafael Elizondo,
Category Manager for
Textile Carpets at IKEA

(1) [IKEA Website 2019](#).

Silk



Silk

A global overview

Another important animal-based fiber is silk. Even though the market share is small, it is estimated that around 300,000 households are involved in the production of raw silk⁽¹⁾.

In 2018, around 75 percent of all silk was produced in China. The second largest producer was India with a market share of 22 percent⁽²⁾. This means that China and India together produced around 97 percent of all silk worldwide in 2018.

Around 159,648 mt of silk was produced in 2018. Silk production volumes more than doubled from 1990 to 2018, but saw a decrease over the last four years.

Preferred silk options includes organic, ahimsa, fairtrade and recycled silk.

Standards used for preferred silk include organic standards such as the Indian National Programme for Organic Production (NPOP), the Organic Content Standard (OCS), the Global Organic Textile Standard (GOTS) and the World Fair Trade Organization (WFTO). For recycled silk there is the Global Recycled Standard (GRS) and the Recycled Claim Standard (RCS).

Examples for organic silk suppliers

Bombyx is a China-based company

(1) DNFI website.
 (2) FAOStat database and inserco statistics from the website.
 (3) Textile Exchange Insider Series 2017 - information provided by Triaz GmbH.

founded in 2017 by the Profits Fund Global Holding Ltd (PFGHL Group). BOMBYX completed the construction of an organic sericulture base at Nanchong's Yilong County in 2018. According to their projection, the base will be able to farm a minimum of 700 tons of fresh cocoons every year.

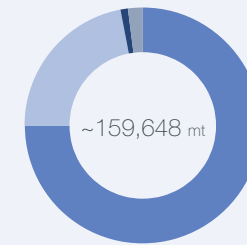
Chul Thai Silk, based in Thailand, is the one of the few companies worldwide producing organic silk. The supply chain is GOTS certified.

Coccon is a company producing organic ahimsa silk in Jharkhand, India. The supply chain is GOTS certified.

Sichuan OTEX Textiles from China is the only producer of organic silk in China and makes 30 mt of silk filament a year. Triaz GmbH supports this project and owns 50 percent of the company⁽³⁾.

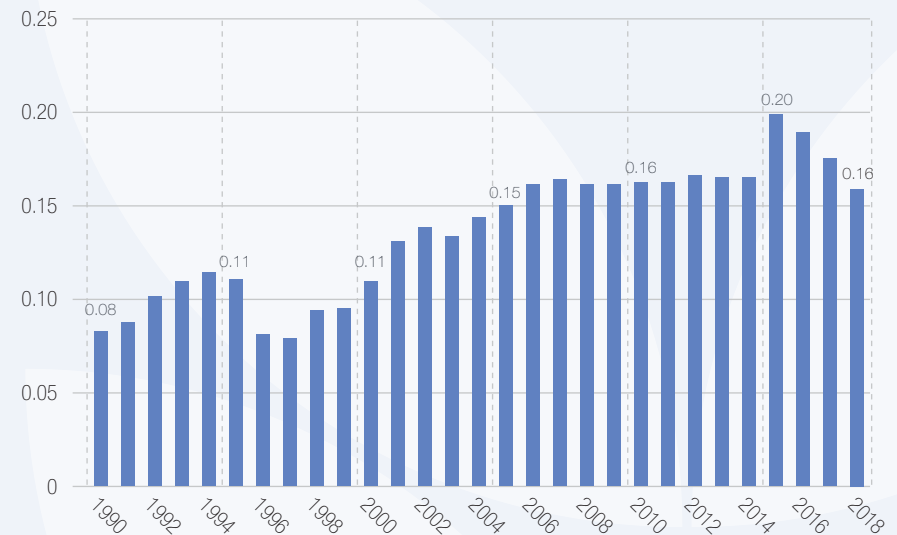
Takihyo, a Japanese company, has started an Eri Silk project that provides additional income to support cassava farmers in Thailand. The cassava plants are cultivated for their roots, an important source of food, and the leaves of the plants are used to feed the silkworms. The fecal byproduct is used as fertilizer for cultivating the cassava plants and the pupa can be sold as food, for cosmetics, or medicine once the silk is harvested.

SILK PRODUCTION 2018



● China (~75%) ● India (~22%) ● Uzbekistan (~1%) ● Other (~2%)

GLOBAL SILK PRODUCTION (MILLION MT)



300,000 households are estimated to be involved in the production of raw silk

Leather



Virgin Leather

A global overview

Global leather production is estimated at more than seven million mt⁽¹⁾. The hides and skins of over one billion animals are used for the leather production⁽¹⁾.

Concerns about animal welfare and environmental impacts of livestock raising and leather production have led to an increasing awareness and demand for more sustainable leathers - or even approaches to replace leather with vegan alternatives (see next page).

Textile Exchange Responsible Leather Round Table (RLRT)

In 2017, Textile Exchange began an initiative to focus on leather in response to demand from brands to address the impacts of the full leather value chain. Textile Exchange has pulled together over 400 stakeholders from all parts of the industry, including brands, farmers, and suppliers, as well as NGOs, international organizations and special interest groups. In 2018, the Responsible Leather Round Table (RLRT) was launched, a platform where everyone can participate, share information and drive the development of an assessment tool for the leather industry.

The **Responsible Leather Assessment (RLA)** tool, which is being developed through the International Working Group (RLA IWG), will establish a benchmark of

agreed-upon best practices. It will be a framework to identify and give visibility to existing standards, programs and tools that brands can use for their sourcing.

In its first version, the RLA will focus on deforestation/conversion-free farming, animal welfare, the social and environmental impacts of leather production, and traceability.

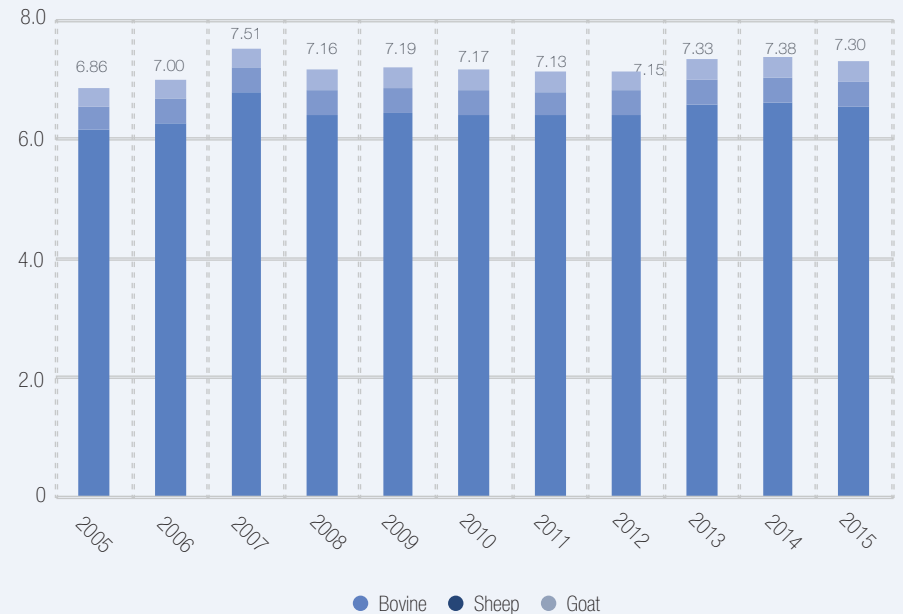
Textile Exchange is also developing an **Impact Credit trading model** for responsible fibers/materials which will apply for leather and beef (more in chapter on [Impact Credits](#)).

The RLRT hosted its first ever global event, the **Global Forum on Responsible Leather**, in Ireland in October 2018, alongside the Global Roundtable on Sustainable Beef (GRSB) conference. The second event was the RLRT Summit on October 18, 2019 in Vancouver.

Leather Working Group (LWG)

The LWG is a 400 member, multi-stakeholder group that has developed an environmental auditing protocol for tanneries. LWG audited tanneries represent approximately 20 percent of the world's production of footwear leather and 16 percent of total leather volume. The LWG standard will be a reference point for the Responsible Leather work.

GLOBAL LEATHER PRODUCTION (MILLION MT) ⁽¹⁾



Recycled Leather and Leather Alternatives

An overview

Alongside a growing interest in more sustainable animal-based leather and vegan synthetic leather alternatives, there is a growing number of initiatives developing innovative biobased or recycled leather options. Examples are:

Recycled Leather

Around 800,000 mt of leather waste is produced annually⁽¹⁾. Leather recycling helps to reduce this leather waste. While there are various suppliers of bonded leather, examples for advanced recycled leather are **RECYC LEATHER** and **Nike Flyleather**, an engineered material made by binding at least 50 percent reclaimed leather fibers together.

The European Outdoor Group (EOG) has published a Recycled Leather report in 2019 that aims to support industry professionals to better understand recycled leather as alternative to virgin leather.

Leather Alternatives

Amadou Leather™ is a compostable mushroom material grown on recycled sawdust using existing edible mushroom cultivation techniques.

Appleninealliance's Apple Peel Skin is a vegan material which integrates organic apple peels into the skin of the material.

Bolt Threads - Mylo™ is developed from mycelium cells by creating optimal growing conditions for it to self-assemble.

Cork is also increasingly used as leather alternative. Work is also being conducted on recycled cork.

Flokser's biobased SERTEX is a 70 percent biobased material derived from corn made in collaboration with BioAmber and DuPont.

Fruitleather Rotterdam is currently developing a new, eco-friendly process that converts leftover fruits into durable, leather-like material, possibly strong enough to be used for shoes, handbags and other products.

Frumat's Apple Skin is a vegan material derived from apple byproducts.

Hemp Bio Leather is developed from hemp waste fiber residues - a by-product from the current local hemp, food and agriculture industry in Denmark.

Malai is a biobased material grown on

coconut water, which is a leftover from the coconut industry in South India, through fermentation of a bacterial culture. This jelly is harvested and enriched with natural fibers, gums and resins to create a more durable and flexible material.

Modern Meadow's Zoa™ is a bioengineered material based on the protein collagen produced through fermentation from yeast in a lab with the support of biotechnology. Modern Meadow is currently collaborating with selected brands to launch their first products in 2019.

MuSkin comes from the *Phellinus Ellipsoideus*, a parasitic fungus that grows in the wild and attacks the trees in the subtropical forests.

MycoWorks is grown rapidly from mycelium and agricultural byproducts in a carbon-negative process.

Natural Fiber Welding is developing its **Mirum™** 100% percent plant-based leather-substitute (more in the [Q&A](#)).

Piñatex® is made of fiber from the

leaves of the pineapple plant.

Provenance is a bioengineered material based on collagen as building blocks.

Ultrafabrics has launched its **Ultraleather® Volar Bio** in 2019, a blended multi-layer leather-like material with 29 percent biobased content, composed of a polycarbonate and biobased surface made from corn and a backing consisting of 65 percent polyester and 35 percent rayon (more in the [HUB](#)).

Vegea uses grape marc, the seeds and the stalks of the wine grape bunch, which are left over after winemaking. From the seeds a bio-oil is extracted which is then polymerized using an innovative patented process. Vegea is currently working on the commercialization.

Vitrolabs is a biotechnology company based in California using stem cell-based technologies to develop "slaughter-free" leather.

(1) UNIDO 2000 - Wastes generated in the leather products industry.

Commitments to Preferred Leather & Alternatives

Examples

Commitments to preferred leather

A growing number of companies are committed to using preferred leather or leather alternatives.

32 fashion brands (including among them Adidas, Burberry, Chanel, Galeries Lafayette, H&M, Inditex, Nike, Puma and Stella McCartney) have signed a commitment called **G7 FashionPact**.

The commitment is built on three pillars: climate, biodiversity and oceans. All signing brands should develop strategies connected to each pillar. The biodiversity pillar includes animal welfare as one of the aspects to consider in their strategies.

Companies are starting to make efforts to **eliminate deforestation** from their supply chain, and are working with global references, such as the Accountability Framework. For example, **H&M, VF Corporation, Timberland, and Vans** are committed to deforestation-free leather and put a temporary ban on leather from Brazil in 2019 to respond to the fires in the Amazon area which are also linked to the cattle production.

To eliminate deforestation and improved grazing practices can also be important measures to contribute to the Sustainable Development Goals (SDGs). As the number of **commitments to the SDGs**

is increasing, the leather industry may also learn from the beef industry. Investor groups, environmental groups and consumers already focus on the question on how the beef industry can help meet the SDGs, particularly SDG 15 “Life on Land” and SDG 13 “Climate Action”, through eliminating deforestation and following improved grazing practices. Leather is linked to the same impacts, and has the same opportunities, so cross-sectoral learning and collaboration can help to accelerate meeting the SDGs. The Responsible Leather Assessment (RLA) tool, which is being developed by the Textile Exchange Responsible Leather Round Table (RLRT), supports the industry to drive progress towards the SDG goals through the leather value chain.

A number of big corporations have strong **animal welfare policies**, that cover all of their animal-derived fibers and materials.

Several companies also started to set leather specific sustainability targets.

For example, **ASOS** is committed to only sourcing leather from tanneries that have a Leather Working Group (LWG) audit.

Kmart has the target that 100 percent of leather used in our their Kmart-branded (Anko) clothing, footwear and accessories will be either: fully traceable

as a by-product of the meat industry; or from sources that are certified to a recognised responsible leather standard; or from recycled leather material by July 2024.

From December 2019, 100 percent of the leather will come from LWG tanneries. **Ralph Lauren** committed to 100 percent LWG-certified leather by 2025.

Commitments to leather alternatives

A growing number of companies have also committed to animal-free products and leather alternatives. An example is **Stella McCartney**, a vegetarian brand, that only uses vegetarian leather alternatives.

Manmade Cellulosic Fibers

Manmade Cellulosic Fibers



Photo: Aditya Birla

Virgin Manmade Cellulosic Fibers

Production facts and figures

With an annual production volume of around 6.7 million mt, manmade cellulosic fibers (MMCFs) have a market share of around 6.2 percent of the total fiber production volume⁽¹⁾.

The global MMCF production volume has more than doubled from around three million mt in 1990 to around 6.7 million mt in 2018 and is expected to further grow in the coming years⁽¹⁾.

MMCFs include viscose, acetate, lyocell, modal, and cupro.

Viscose is the most important MMCF with a market share of around 79 percent of all MMCFs and a production volume of around 5.3 million mt in 2018⁽²⁾. The compound annual growth rate (CAGR) of viscose staple fiber from 2017 to 2022 is estimated at around 6–7 percent⁽¹⁾.

Acetate has a market share of around 14 percent of all MMCFs with a production of around 0.95 million mt in 2018 but it is mainly used for non-textile applications⁽²⁾.

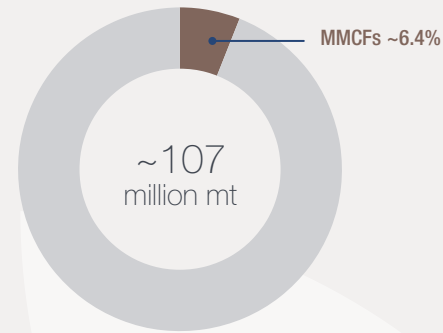
Lyocell was the third most used MMCF type after viscose and acetate in 2018. It had a market share of around 4 percent of all MMCFs in 2018 with a production volume of roughly 0.26 million mt⁽¹⁾. The compound annual growth rate (CAGR) of lyocell from 2017 to 2022 is estimated at around 15 percent⁽¹⁾. This means that lyocell is expected to grow faster than other MMCFs.

Modal had a market share of around 2.7 percent of the total MMCF market in 2018 with a production of around 0.18 million mt⁽¹⁾. The compound annual growth rate (CAGR) of modal from 2017 to 2022 is estimated at around 9 percent⁽¹⁾.

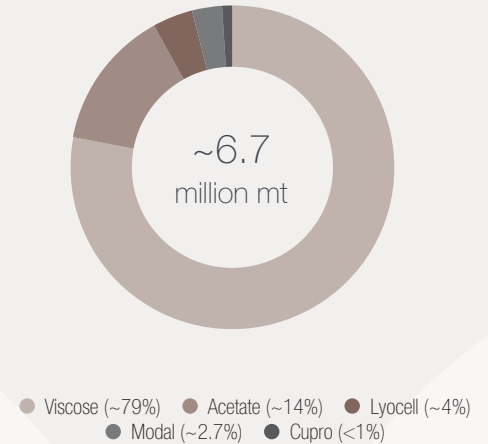
Cupro has a market share of less than one percent of the total MMCF market. There was only one supplier of cupro producing around 17,000 mt in 2018⁽³⁾.

Manmade cellulosic fibers are currently primarily produced from wood.

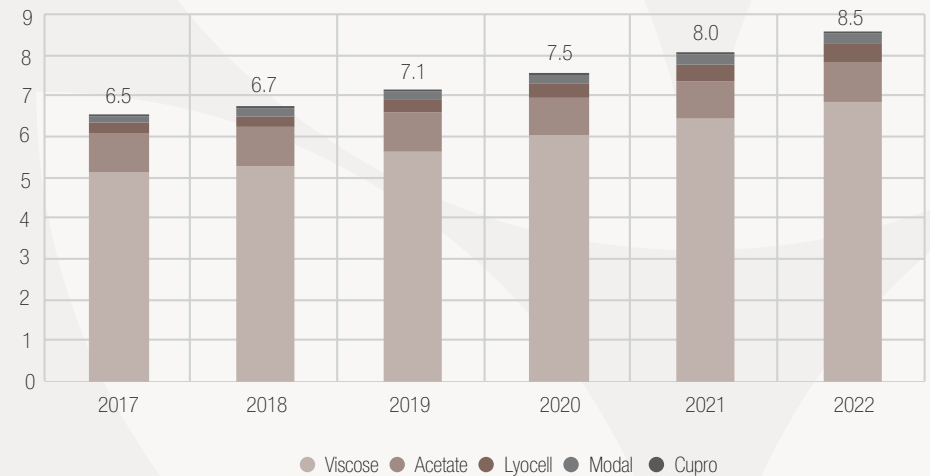
GLOBAL MARKET SHARE OF MMCFs IN 2018



SHARE OF MMCFs BY TYPE IN 2018



GLOBAL MANMADE CELLULOSIC FIBER PRODUCTION (MILLION MT)



(1) Lenzing Investor Presentation from 7 August 2019.

(2) based on Lenzing, email correspondence in July and November 2019; figures based on The Fiber Year 2017, 2018, 2019 and Lenzing's own estimates; global market data and share compiled by Textile Exchange (see "Global Fiber Market").

(3) Asahi Kasei, email correspondence; global market data and share compiled by Textile Exchange (see "Global Fiber Market").

Virgin Manmade Cellulosic Fibers

Standard updates - forests

The global forest area decreased from around 31.20 percent of the global land area in 2000 to 30.77 in 2015⁽¹⁾. This equals a loss of more than 56 million hectare of forests⁽²⁾. The actual state of the forests is even more worrying if forest degradation and the changes in type and quality are taken into account as well.

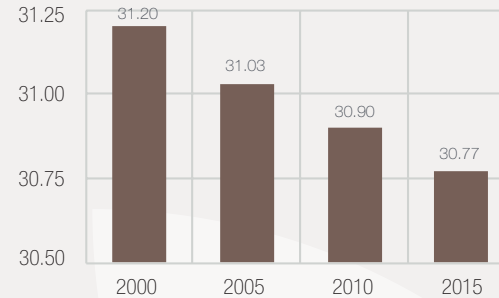
Forests and sustainable forest management are a priority area in the SDGs. The **SDG 15.2.1** indicator measures the progress towards these goals including the share of certified forests. The share of the forest area certified to FSC and/or PEFC has increased from 0.96 percent of all forests in 2000 to 10.82 percent in 2017⁽¹⁾. This means that still around 90 percent of the forests are not certified. While the overall trend shows an increasing area of certified forests, the certified forest area decreased from 432 million ha in 2017 to 423 million ha in 2018.

In total, around 73 percent of the certified forest was certified according to PEFC and its equivalents. This includes the ~30 percent of all certified forests in 2018 that were SFI certified and around 20 percent that were PEFC and FSC double certified. Around 48 percent of certified forests in 2018 were FSC certified (including the double-certified area)⁽³⁾.

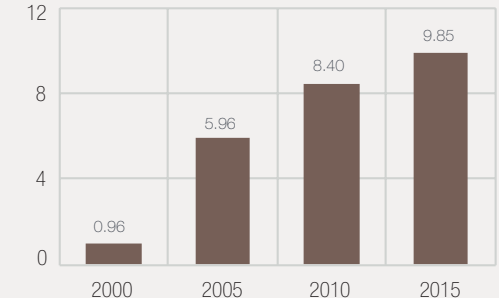
FSC, founded in 1993, is an international member-led organization that sets the FSC standards for responsible forest management and chain of custody. As part of the continuous improvement process, the FSC standards are reviewed every five years. FSC is currently working with key players in the industry to achieve the first complete certified textile supply chains which could allow consumer facing FSC labels on textile products. Since the launch of the first FSC certified fabrics produced by the fiber producer ENKA and the fabric manufacturer Ghezzi S.p.a in 2017, the number of FSC certified fabric suppliers is increasing.

PEFC, founded in 1999, is a global alliance of national forest certification systems and the largest forest certification system worldwide. As part of its continuous improvement process, there is a revision process every five years. The revised PEFC Sustainable Forest Management benchmark standard was approved in November 2018. The updated version expanded social requirements, introduced a stricter definition of ecologically important areas, and now includes Trees Outside Forests (TOFs). Since the launch of the world's first PEFC-certified fabrics in 2018, the number of certified textile companies is increasing.

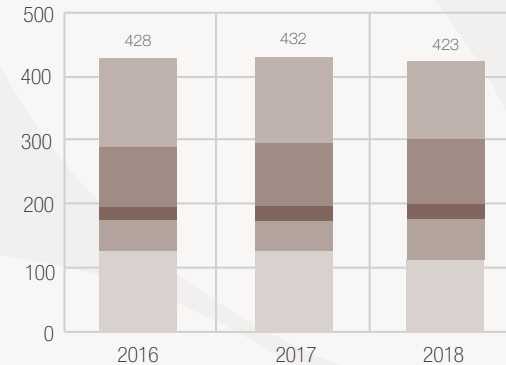
GLOBAL FOREST AREA (% OF LAND)



GLOBAL CERTIFIED FOREST AREA (% OF FOREST)



GLOBAL CERTIFIED FOREST AREA (IN MILLION HA)



Share of certified forest in 2018

- PEFC 29%
- PEFC / SFI 24%
- PEFC / SFI / FSC 6%
- PEFC / FSC 15%
- FSC 27%

Tip: How to find suppliers of MMCFs from FSC and/or PEFC feedstock

Check out the [FSC database](#) or [PEFC database](#). Members of Textile Exchange will also find a list of textile relevant FSC and PEFC suppliers along the supply chain in the [HUB](#).

(1) FAO SDG 15.2.1 Progress Reporting; 2018 figures not yet available at report launch.

(2) FAOStat, accessed on 9 September 2019.

(3) based on FSC and PEFC press releases [May 2017](#) and [February 2019](#) and email correspondence with FSC, PEFC and SFI.

Virgin Manmade Cellulosic Fibers

Standard updates

Forests and other feedstocks (continued)

The **CanopyStyle Audits** have become the leading assessment of MMCF suppliers on their raw material sourcing practices. Around 54 percent of the existing global viscose production capacity has gone through the CanopyStyle independent verification audit in 2018, with 28 percent having a low risk of sourcing from Ancient and Endangered Forests and other controversial sources⁽¹⁾. More information [here](#).

The market share of viscose producers with endangered forest sourcing policies increased from around 35 percent of the global production in 2015 to around 80 percent in 2018 based on Canopy⁽²⁾.

Pulp and fiber

Bluesign is currently developing specific criteria for fiber production that will be added as Annex “Fiber Manufacturing” to its “bluesign® Criteria for production sites”. Criteria for fiber manufacturing will include manufacturing of synthetic fibers as for example polyester and polyamide as well as MMCF. For MMCFs, this will include criteria for the feedstock, pulp, and fiber production. The updated

standard is expected - after a stakeholder involvement which took place in September 2019 - to be published in the beginning of 2020.

ZDHC began to look into the chemical management aspect at the MMCF fibre production in 2018. The Roadmap to Zero Programme expanded its content scope to include fiber and raw material production. For now, the focus is on the production of MMCF. Dissolving pulp production process will be considered at a later stage. In October 2019, CanopyStyle and the ZDHC Roadmap to Zero Programme announced a partnership to scale up their collaborative work toward tackling the negative impacts of chemical processing, wastewater discharge, and raw material sourcing in viscose production. More about ZDHC in the [Q&A](#) and [here](#).

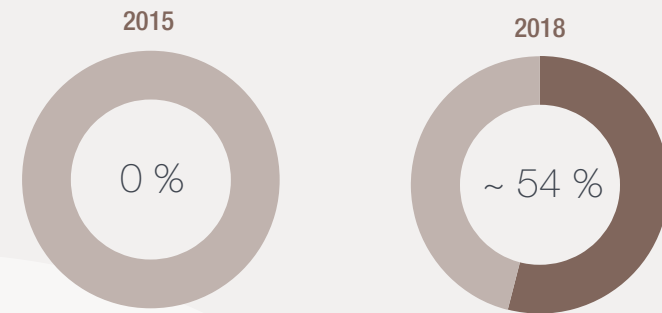
Further standards that can be used for the pulp and/or fiber level include **Cradle to Cradle Material Health Standard**, **EU BAT** and the **EU Eco Label**.

For MMCFs made from recycled materials, the **Reclaimed Claim Standards (RCS)** and **Global Recycled Standard (GRS)** can be used. The first recycled MMCF suppliers have already been certified accordingly.

(1) CanopyStyle Hot Button Report 2018.

(2) CanopyStyle, email correspondence.

GLOBAL MARKET SHARE OF VISCOSE PRODUCTION GONE THROUGH CANOPYSTYLE AUDIT ⁽¹⁾



ENDANGERED FOREST SOURCING POLICIES OF VISCOSE PRODUCERS ⁽²⁾



- Viscose producers with endangered forest sourcing policies by market share
- Viscose producers without endangered forest sourcing policies by market share

Tip: How to find CanopyStyle audited suppliers.

CanopyStyle regularly publishes the [Hot Button Report](#) assessing the key MMCF suppliers on their raw material sourcing practices (more on next page).

Virgin Manmade Cellulosic Fibers

Directory: Suppliers Map⁽¹⁾

This map locates the global dissolving pulp and manmade cellulosic fiber mills based on the Canopy Hot Button Issue 2018. Dissolving pulp was produced in 31 mills in 14 countries in 2018 with around 60 percent produced in China, South Africa, USA and Brazil. Manmade cellulosic fiber was produced in 48 mills in 10 countries with 65–70 percent produced in China.

Tip: How to find CanopyStyle audited suppliers.

CanopyStyle regularly publishes the [Hot Button Report](#) assessing the key MMCF suppliers on their raw material sourcing practices.

TOP 5 COUNTRIES DISSOLVING PULP

- China: ~21 %
- South Africa: ~15 %
- USA: ~13 %
- Brazil: ~11 %
- Canada: ~ 10 %

TOP 5 COUNTRIES MMC FIBER

- China: ~67 %
- US: ~8 %
- India: ~7 %
- Austria: ~6 %
- Indonesia: ~6 %

FUTURE MILLS

- Belarus: 1 pulp mill
- Brazil: 1 pulp mill
- Canada: 3 pulp mill
- Russia: 1 pulp mill
- Turkey: 1 fiber mill

COUNTRY

Mill type (pulp or fiber): number of mills | production capacity per year in metric tons

NORTH AMERICA

CANADA

Pulp: 4 | 678,500 mt

USA

Pulp: 4 | 880,000 mt

Fiber: 2 | 50,000 mt

SOUTH AMERICA

BRAZIL

Pulp: 2 | 735,000 mt

CHILE

Fiber: 1 | 550,000 mt

EUROPE

AUSTRIA

Pulp: 2 | 447,000 mt
Fiber: 3 | 412,000 mt

CZECH REPUBLIC

Fiber: 1 | 270,000 mt

FINLAND

Pulp: 1 | 460,000 mt

GERMANY

Fiber: 2 | 98,000 mt

NORWAY

Pulp: 1 | unknown

PORTUGAL

Pulp: 1 | 100,000 mt

SWEDEN

Pulp: 2 | 425,000 mt

UK

Fiber: 1 | 40,000 mt

ASIA

CHINA

Pulp: 7 | 1,480,000 mt
Fiber: 30 | 4,683,500 mt

TAIWAN

Fiber: 1 | 70,000 mt

THAILAND

Pulp: 1 | 240,000 mt

INDONESIA

Pulp: 2 | 168,000 mt
Fiber: 3 | 412,000 mt

INDIA

Pulp: 1 | 70,000 mt
Fiber: 4 | 498,000 mt

AFRICA

SOUTH AFRICA

Pulp: 2 | 1,010,000 mt

(1) based on Canopy - The Hot Button Report 2018.

Virgin Manmade Cellulosic Fibers

Supplier updates - forest and pulp level

Forest level

Key players in the production of wood for dissolving pulp are Sappi, Bracell (part of the Royal Golden Eagle Group), and Rayonier⁽¹⁾.

Examples

Sappi is a leading global diversified wood fiber company focused on providing dissolving wood pulp and other biobased materials based in South Africa. In 2019, Textile Exchange interviewed Bernhard Riegler from Sappi about its project Khulisa. Through this project, a shared-value tree farming scheme, Sappi is aiming to enhance the economic and social conditions of the communities in which it operates (more in the [Q&A](#)).

Bracell, a leading Brazilian producer of wood for dissolving pulp and part of the Royal Eagle Group, launched a new campaign to explain the benefits of growing eucalyptus to rural landowners in 2019. The new website and telephone hotline explain the company's Forest Partnership Program, which aims to expand the company's network of forest partners.

Pulp level

Key players in the production of dissolving pulp are Sappi, Aditya Birla, Lenzing, Bracell, and Rayonier⁽¹⁾.

Examples

Bracell, one of the largest producers of dissolving pulp, announced the expansion of its dissolving pulp mill in Brazil in July 2019. When the expansion is completed by late 2021, Bracell will have an annual production capacity of approximately 2.0 million tons of dissolving pulp.

Duratex and **Lenzing** announced in 2018 to build a 450,000 mt dissolving wood pulp plant in Brazil in a joint venture.

Further expansion of dissolving pulp production is expected in Belarus, Canada and Russia⁽²⁾.

(1) Water Footprint Network 2017 - Viscose Fibers Production. An assessment of sustainability issues.
(2) Canopy Hot Button Report 2018.



Virgin Manmade Cellulosic Fibers

Supplier updates - fiber level

The ten largest MMCF producers in 2018 were Lenzing, Aditya Birla, Tanghan Sanyou, Sateri (RGE Group), Yibin Grace, Xinjiang Zhongtai Chemicals, Sandong Yamei, Jiangsu Xiansheng, Aoyang Technology, and Asia Pacific Rayon according to Canopy estimates⁽¹⁾.

Examples

Aditya Birla has received a “light green shirt” in the Canopy assessment in 2018 and the Material Health Certificate Gold Level from the Cradle to Cradle Products Innovation Institute for its Spunshades Viscose Staple Fiber (more in the [Q&A](#)).

Eastman launched **Naia™**, a di-acetate filament made from wood pulp responsibly sourced from sustainably managed plantations and produced in a near closed-loop chemical process in 2017 (more in the [HUB](#)).

Enka has received a “light green shirt” in the Canopy assessment 2018 and is thus the third company after Aditya Birla and Lenzing that received this.

Lenzing announced in June 2019 that it will build the world's largest lyocell plant with an annual production capacity of 100,000 mt in Thailand. In 2018, Lenzing announced plans to build a 450,000 mt dissolving wood pulp plant in Brazil in a

joint venture with Duratex. Lenzing also started a new blockchain project. More in the chapter on “Traceability”.

Metsä Group and **Itochu** established a joint venture that builds an industrial demo plant to produce wood-based textile fibers with the aim to demonstrate a new technology for converting paper-grade pulp into textile fibers. Construction of the demo plant in Äänekoski, Finland, with an annual capacity of about 500 mt, began in October 2018 and it is planned to be started up in late 2019.

Royal Golden Eagle (RGE) has announced plans to invest \$200 million USD over the next 10 years into cellulosic textile fiber research and development. The investment, revealed ahead of the Textile Exchange Sustainability Conference in Vancouver in October 2019, will support solutions in alternative cellulose or plant-based feedstock and closed-loop manufacturing. Through its business groups **Sateri** in China and **Asia Pacific Rayon (APR)** in Indonesia, Singapore-based RGE is the world's largest viscose producer with a total annual production capacity at 1.4 million mt.

Read more about news regarding “recycled” MMCFs [here](#).



(1) Canopy Hot Button Report 2018.

Virgin Manmade Cellulosic Fibers

Supporting the transition

There are a number of initiatives working towards preferred MMCFs. Collaboration and information are key for a successful uptake of preferred MMCFs.

Textile Exchange Manmade Cellulosics Global Round Table is an international meeting held during the annual Textile Exchange Conference. In July 2019, an European Manmade Cellulosics Roundtable was held during the Berlin Fashion Week.

Textile Exchange MMCF E-Learning Series was a 4-part series for its members offering the opportunity to learn more about MMCFs, their future role and more responsible approaches that ran between April and September 2018.

Canopy works with over 160 of the forest industry's biggest customers and their suppliers to develop business solutions that address deforestation and protect forests. In December 2018, Canopy published the updated **Hot Button Report 2018**, which was first launched in 2016 and supports brands and retailers in their selection of manmade cellulosic fiber suppliers. Since 2017, **CanopyStyle Audits** were conducted by the Rainforest Alliance for Lenzing, Birla Cellulose, Sateri, Sanyou, Fulida and ENKA. The audit results are available to the public.

Changing Markets in collaboration with Earthworm (formerly The Forest Trust) launched a Roadmap towards responsible viscose and modal fiber manufacturing in February 2018. In November 2018, Changing Markets published its new report "Dirty Fashion: Spotlight on China" focusing on the China Collaboration for Sustainable Viscose (CV). In November 2019, Changing Market released its new report 'Dirty Fashion Disrupted: Leaders and laggards revealed'.

The **Collaboration for Sustainable Development of Viscose (CV)**, founded early 2018, aims to offer viscose producers a platform to achieve more sustainable viscose. CV is a collaboration of 10 viscose fiber producers – collectively representing over 50% of the world's viscose staple fiber production. This self-regulating initiative published the CV Roadmap in June 2018. This three years action plan includes a set of existing sustainability standards for the raw materials (FSC and PEFC), manufacturing (e.g. ZDHC, BSCI) and product level (e.g. OEKO-TEX standard 100). CV is currently working on a Roadmap 2025.

Earthworm (formerly known as The Forest Trust) has worked in value chains of key raw materials linked to forests such

as wood and pulp since 1999. Over the years, Earthworm helped more than 60 companies to set up No Deforestation, Peat and Exploitation (NDPE) policies and put them into practice. With businesses and civil society, Earthworm innovated the High Carbon Stock (HCS) Approach - paving the way for a concrete definition of deforestation.

Fashion Positive leverages Cradle to Cradle Certified™ Product Standards to transform the way fashion products and materials are made. Lyocell, cupro and viscose were selected for the Call to Innovation because of their potential for circular economy. In 2019, Fashion Positive has selected MMCFs as priority area for their work.

Forum for the Future is collaborating with Textile Exchange to gather diverse perspectives on the vision for Net Positive MMCF. The Visioning Workshop concept was presented at the European Manmade Cellulosics Roundtable in Berlin in July 2019 and conducted at the Textile Exchange Conference in Vancouver in October 2019. Another visioning workshop is planned for Asia in early 2020.

Partnership for Sustainable Textiles aims to increase the use of more

sustainable MMCFs and released the Joint Letter Viscose in April 2019 (see commitments).

UNECE/FAO Forestry and Timber Section organized an exhibit during the United Nations High Level Political Forum on Sustainable Development in New York in July 2018 entitled "Forests for Fashion".

ZDHC began to work on the chemical management aspect at the MMC fiber production in 2018. The Roadmap to Zero Programme expanded its content scope to include fiber and raw material production. For now, the focus is on the production of MMCF. Dissolving pulp production process will be considered at a later stage (more in the [Q&A](#)).

“Recycled” Manmade Cellulosic Fibers & Alternatives

A closer look

Manmade cellulose represent a particularly vibrant innovation landscape. It includes “recycled” MMCFs made from textile or non-textile based cellulose residues. The first MMCFs made from recycled materials that are commercially available use cotton based pre-consumer textile residues as feedstock.

MMCFs made from recycled textiles

Asahi Kasei’s Bemberg is a cupro fiber made in Japan from 100 percent cotton linter, a pre-consumer residue of the cotton processing, and certified under the Global Recycle Standard (GRS). The annual production capacity is 17,000 mt.

Birla’s R&D has innovated on making viscose fiber using recycled cotton fabric waste. The fiber and process have been certified under the Recycled Claim Standard (RCS). Partnership in value chain, collections with leading brands have been progressed. Scale up is underway with technology partner (more in the [Q&A](#)).

Evrnu is a USA-Based startup working on the development of a chemical process turning cellulosic textile residues into new MMCFs.

Infinite Fiber is a Finnish startup and spin-off of the VTT Technical Research Center of Finland that has developed a technology that can return the cotton,

viscose and other cellulose based residues to new MMCF. The technology can be applied in any existing dissolving pulp and MMCF plant. Investors include the H&M Group, Virala, Fortum and the RGE Group (more in the [HUB](#)).

loncell is a technology that turns used textiles, pulp or even old newspapers into new textile fibers using a novel solvent called ionic liquid. The commercial production start is planned for 2025.

Lenzing’s Refibra™ is the first lyocell fiber made with reclaimed materials offered on a commercial scale. Refibra™ was launched in spring 2017. While it was originally made with 20 percent pre-consumer cotton residues, this share has been increased to 30 percent in 2019 (more in the [Q&A](#)).

Re:newcell transforms high cellulosic waste such as cotton and manmade cellulose into dissolving pulp reusing the process chemicals. The Kristinehamn demo plant in Sweden produces 7,000 mt of re:newcell pulp per year. In June 2019, re:newcell announced that its partner Tangshan Sanyou succeeded in producing viscose staple fiber **Tangcell™** made from 50% post-consumer recycled cotton textiles supplied by Re:newcell. In September 2019, re:newcell presented **CIRCULOSE**, a branded material made from 100% recycled textiles.

The following companies are working on MMCFs made from blended textiles: **Blend Re:Wind**, **Block-Texx**, **HKRITA**, **Södra**, **Tyton Biosciences**, and **Worn Again**. As the majority of textiles are fiber blends, these are very important innovations. Read more about these innovations in the chapter on “Fiber Blend Recycling”.

MMCFs made from non-textile residues

Inspidere’s Mestic® is a method in development to retrieve and convert cellulose from dairy cow manure into regenerated cellulose fibers. The startup is based in the Netherlands.

Nanollose is an Australian biotechnology company that has developed a MMCF which is derived using microbes that convert biomass waste products from the beer, wine and liquid industries into microbial cellulose. Nanollose currently is in the process to scale the production. In 2018, Nanollose launched its first microbial cellulose based fabrics.

Orange Fiber is an Italian startup which has developed a process to extract cellulose from the by-products of the citrus industry to produce fabrics. The latest collection was produced in an acetate process.

Commitments to Preferred Manmade Cellulosic Fibers

Examples

The number of brands and retailers committed to preferred manmade cellulose is increasing.

Canopy Commitments

The number of brands and retailers committed to eliminate ancient and endangered forests from their fabrics increased from zero in fall 2013 to 60 in fall 2015 and 160 in fall 2018⁽¹⁾.

Among the committed brands are Levi Strauss & Co., Marks & Spencer, EILEEN FISHER, Stella McCartney and H&M.

Changing Markets Roadmap

Eight major brands and retailers have publicly committed to the Changing Markets Roadmap. These eight companies were ASOS, C&A, Esprit, H&M, Inditex, M&S, Next and Tesco, as of November 2018⁽²⁾. This number increased to 10 companies in November 2019, with New Look and Morrisons as new signatories⁽³⁾.

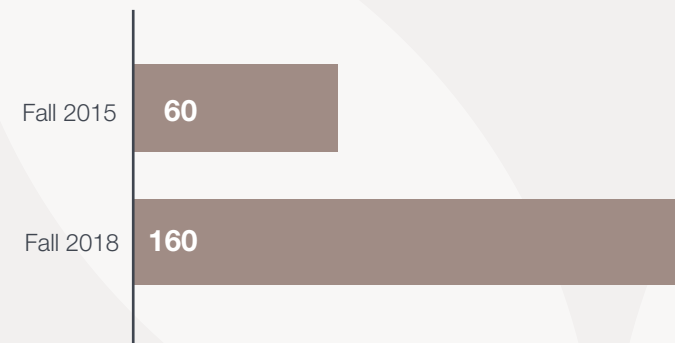
The brands and retailers committed to use their leverage with manufacturers to reduce carbon emissions, improve

health and safety of workers and local communities and drive the transition to closed-loop chemical processes.

Call by the Partnership for Sustainable Textiles

The goal of the Partnership for Sustainable Textiles is a significant increase in the volumes of more sustainable MMCF on the market. To ensure that its members can fulfill their goals, the Partnership for Sustainable Textiles released a call for commitment to sustainable MMCF production in April 2019, encouraging all MMCF to improve transparency in the supply chain and collaborate with expert organizations and initiatives, particularly with regard to responsible sourcing of cellulosic raw materials and hazardous chemicals. Existing schemes (for example CanopyStyle Initiative or similar requirements and the Changing Market Report Foundation and EU BAT) were mentioned as examples for orientation⁽⁴⁾.

NUMBER OF BRANDS/RETAILERS COMMITTED TO ELIMINATE THE USE OF ANCIENT AND ENDANGERED FORESTS



(1) CanopyStyle Impact Infographic, email correspondence

(2) Changing Markets 2018 - Dirty Fashion: Spotlight on China

(3) Changing Markets 2019 - Dirty Fashion Disrupted. Leaders and laggards revealed

(4) Partnership for Sustainable Textiles - Joint Letter Viscose 2019

Synthetic Fibers



Photo: Pixabay Public Domain

Polyester

Recycled Polyester

Production facts and figures

Polyester is the most widely used fiber worldwide. With an annual production of around 55 million mt polyester had a share of around 52 percent of the global fiber production in 2018⁽¹⁾.

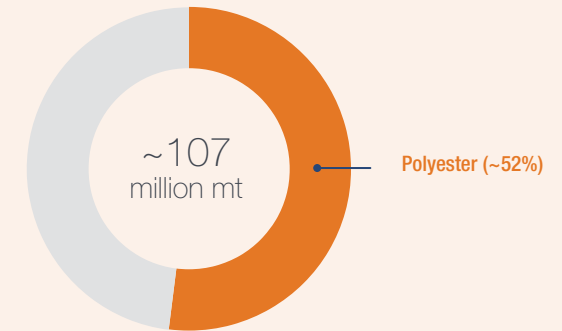
Recycled polyester is mainly made from PET plastic bottles. Recycled polyester can also be made from other post-consumer plastic such as ocean waste or discarded polyester textiles or from pre-consumer processing residues such as fabric scraps.

The market share of recycled polyester increased from around 8 percent of the world PET fiber production in 2008⁽²⁾ to around 13 percent in 2018⁽³⁾. Compared to 16 percent in 2017⁽²⁾, this is a short-term decline in the global rPET market share. The main reason for this decline

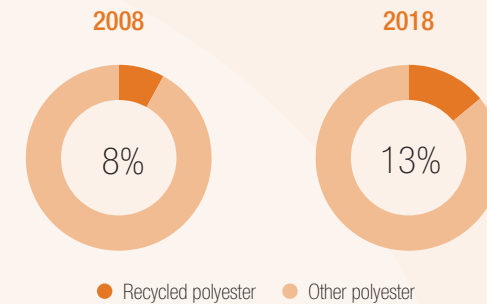
was the ban on importing different types of solid waste, including plastic bottles and polyester textile waste, to China that came into effect in January 2018. The prices for recycled polyester have been increasing as a reaction to the ban⁽³⁾. As a consequence of the China import ban on waste, much of the waste has been sent to other countries such as Malaysia, Vietnam, and Thailand.

The estimated rPET share of polyester staple fiber was as high as around 29 percent in 2018 (36 percent in 2017)⁽³⁾. However, as the rPET share for polyester filament is much lower, the total rPET share of polyester fiber including staple fiber and filament is lower as well.

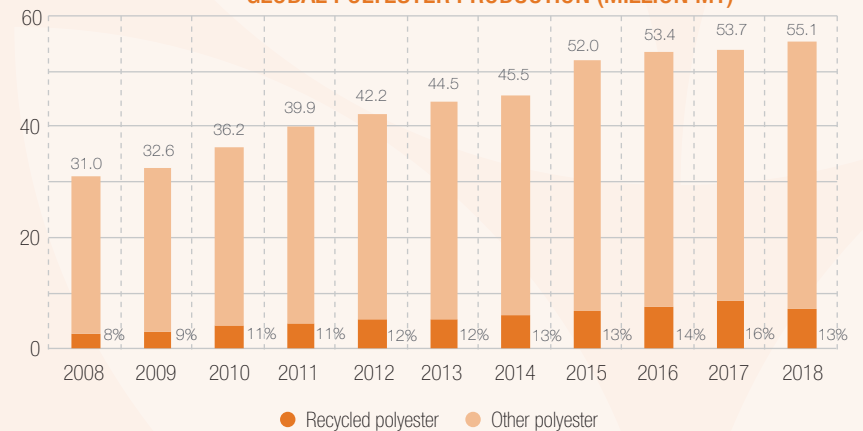
GLOBAL FIBER PRODUCTION IN 2018



MARKET SHARE OF RECYCLED POLYESTER



GLOBAL POLYESTER PRODUCTION (MILLION MT)



(1) Oerlikon presentation based on The Fiber Year 2019, published at ITMA 2019.

(2) Unifi presentation at the Textile Exchange Conference in Milan in 2018.

(3) based on IHSM 2018 presentation by Ashish Pujari "Highlights of a strong growth market - polyester fibers & PET" and Textile Exchange estimates.

Recycled Polyester

Directory: Key suppliers and innovators

This map locates key suppliers and innovators of recycled polyester based on their headquarter.

All use mechanical recycling of plastic bottles except where indicated otherwise.


CANADA

- Loop Industries / Indorama joint venture - emerging 

USA

- Ambercycle 
- BIONIC® 
- Circular Systems - Texloop rPET-1
- Eastman 
- Lycra Company (Invista) - LYCRA® T400®  + COOLMAX® + THERMOLITE® EcoMade
- Poole Company - EcoSure®
- Premiere
- First Mile by Thread - Ground to Good™  
- Unifi - REPPEVE® 

Innovation beyond mechanical recycling of plastic bottles

-  Chemical recycling
-  Biological recycling
-  Ocean waste incl. ocean bound
-  Post-consumer textiles
-  Pre-consumer textiles
-  Other feedstock
-  Fairness

SPAIN

- Seaqual 

FRANCE

- CARBIOS   

NETHERLANDS

- Cumapol 
- Ioniq 

GERMANY

- Advansa - Suprelle®
- Trevira - SINFINECO®





SWITZERLAND

- Gr3n 

CHINA

- Cixi Xingke
- Zhejiang Haili Environmental Technology
- Nan Ya Plastics - ECOGREEN® -plus 

JAPAN

- Itochu - RENU™ 
- Jeplan  
- Teijin - ECOJET™ + Eco Circle™ 
- Toray - ECOUSE™

KOREA

- Hyosung - Regen™

TAIWAN

- Far Eastern - TOPGREEN®  
- Libolon - RePET™

THAILAND

- EcoBlue - 3D pure rPET chips
- Indorama - Ecorama

SRI LANKA

- Eco Spindles

ITALY

- De Martini Bayart & Textifibra SpA
- Radici Group - r-RADYARN® + r-Starlight®
- Sinterama - Newlife™

KENYA

- The Megh Group - T3. Trash. Textile 

INDIA

- AGL Polyfil Private Limited
- Ganesha Ecosphere - Rivivere
- JB Ecotex
- Plastics for Change   
- Polygenta - perPETual 
- Reliance - R|Elan™ GreenGold
- Sutlej Textiles
- Sybil Industries - SyGreen

Extended supplier mapping:

All Textile Exchange Members have access to a full version of the supplier mapping. For more information visit the [HUB](#) or contact our Membership Coordinator.

Recycled Polyester

Key news and innovations

Ocean plastic - examples

BIONIC® materials (resins, fiber, yarns and fabrics) are made with plastic recovered from marine and coastal environments. BIONIC® has joined forces with Waterkeeper Alliance on an initiative designed to protect the world's coastal and marine environments from plastic pollution. This network of coastal cleanup efforts is called STRONGER THREAD®.

FENC New Century offers recycled polyester filament made with ocean plastic. It accounts for approximately 5 percent of all its feedstock used for recycled polyester (more in the [HUB](#)).

First Mile: more than half of their collection networks in Haiti, Honduras, and Taiwan fall under the "Ocean bound" plastic definition as set forth by the Next Wave working group based on the work of Dr. Jenna Jambeck. Plastic that is mismanaged within 50 km of shore lines will end up in the ocean if not properly collected and processed (more in the [HUB](#)).

Plastics For Change is expanding to coastal communities across Asia. This initiative is about creating better livelihoods for the urban poor while keeping plastic out of the ocean (see the [HUB](#)).

Seaqual is an initiative in Spain to clean

oceans from marine litter. Licensed Seaqual members can produce, buy or sell products containing Upcycled Marine Plastic. Seaqual yarn is an 100% recycled material with full traceability ('DNA tracer inside').

Unifi launched REPREVE® Our Ocean™ fiber in June 2019 that is made from bottles collected within 50 kilometers of coastlines in countries or areas that lack formal waste or recycling systems.

Social responsibility - examples

First Mile are recycled polyester bottles that can be traced back to the collection networks responsible for picking up the post consumer bottles. They are used for the **Thread Ground to Good™** and collected by people earning their way out of poverty. The raw materials are sourced from Haiti, Honduras, and Taiwan (more in the [HUB](#)).

The **Megh Group - T3. Trash. Thread. Textile.** is a new project in development in Kenya. T3 is currently constructing a mechanical PET bottle recycling plant in Kenya with an initial capacity of 25 mt per day. The core focus of the project is to directly collaborate with the first collectors (scavengers) and uplift them from severe poverty.

Plastics For Change is the first and currently the only rPET supplier certified

by the World Fair Trade Organization. **Plastics For Change** has developed a franchise model to fortify recycling businesses that pay waste-pickers decent incomes, train them, and make investments (more in the [HUB](#)).

Chemical and biological recycling

Commercially available on the market:

FENC's TOPGREEN®, **Polygenta's perPETual** and **Teijin's Eco Circle™** commercially offer chemically recycled PET.

In 2018 **INVISTA** launched LYCRA® T400® EcoMade fiber. More than 65 percent of the overall fiber content comes from a combination of recycled plastics (PET bottles) and renewable plant-based resources (corn). The LYCRA® T400® Ecomade recycled content is chemically recycled.

Ioniqa has developed a chemical recycling process for rPET. In July 2019 they took the first production plant of 10 kilotons in the Netherlands in operation.

Jeplan's new Kitakyushu Hibikinada Plant for chemical recycling of polyester in Japan has started test production in December 2017 and started commercial operation in January 2019.

In development:

Ambercycle is a USA based startup developing an enzymatic process for polyester recycling.

CARBIO is piloting an enzymatic process to depolymerize PET into its monomers. The construction of a demonstration plant will start late 2020 or early 2021.

Cumapol, DSM-Niaga, Morssinkhof, DuFor and NHL Stenden are collaborating on the new CuRe Technology, a new low energy chemical polyester recycling process for any type of coloured polyester. The pilot plant located in The Netherlands is planned to be operational at the end of 2019.

Eastman announced in March 2019 their intention to launch a new chemical recycling process for polyester.

Gr3n invented a new chemical process using microwave radiation to accelerate the depolymerization of PET into monomers.

Loop Industries / Indorama joint venture has developed a patented chemical recycling process to depolymerize all kinds of polyesters with zero energy use. The chemical recycling produces recycled polyester DMT and MEG. The partnership plans to begin production in 2020.

Recycled Polyester

Supporting the transition

The Textile Exchange rPET Round

Table (rPET RT) is a global multi-stakeholder network aiming to increase the uptake of recycled polyester. The rPET Round Table has over 90 individual members from 56 companies/organizations.

At the start of 2019, the rPET Round Table formed three Working Groups to dive deeper into key issues as we move toward 2030:

- Government: Legislation; Clear bottles; Collection; rPET mandatory % product content; Preferential tariffs;
- Supply: Building a robust supplier matrix; Standardizing chip quality; GRS use as baseline; economies.
- Brands/Retailer/Consumer: Development of a new industry commitment; Support for new technologies; Matching performance to products; Cross-industry collaborations; Consumer awareness; Campaigns to support multi sector use.

The rPET RT also initiated the Recycled Polyester Commitment in 2017. More on the page on Commitments to Preferred Polyester.

Fashion Positive PLUS members have identified chemical recycling as a necessary innovation for circular growth of polyester in apparel.

Plastics for Change has adopted strategies from fair trade agricultural practices and applied them to the informal recycling economy in developing countries (more in the [HUB](#)).

“ As we move into 2020, we are busy expanding our supplier matrix, interfacing on Legislation and Policy, and establishing a new commitment to further grow the uptake of recycled polyester. Our aim is to transform business – moving from linear to circular, and to find solutions to technical, societal, and commercial barriers. We need to positively impact economies of scale, and overcome challenges in factories, marketplace, and the communities where recycling initiatives start. Cross industry collaboration will be key to establishing sustained growth.

Elayne Masterson, Collaborating Partner,
Fabrikology | Chair of the rPET Round Table

Biobased Polyester

Facts and figures

The market share of biobased polyester is estimated at less than one percent of the total polyester production⁽¹⁾.

Biobased polyesters include biobased PET but also other polyesters such as PLA or biobased PTT. Further examples are shown in the Innovation section.

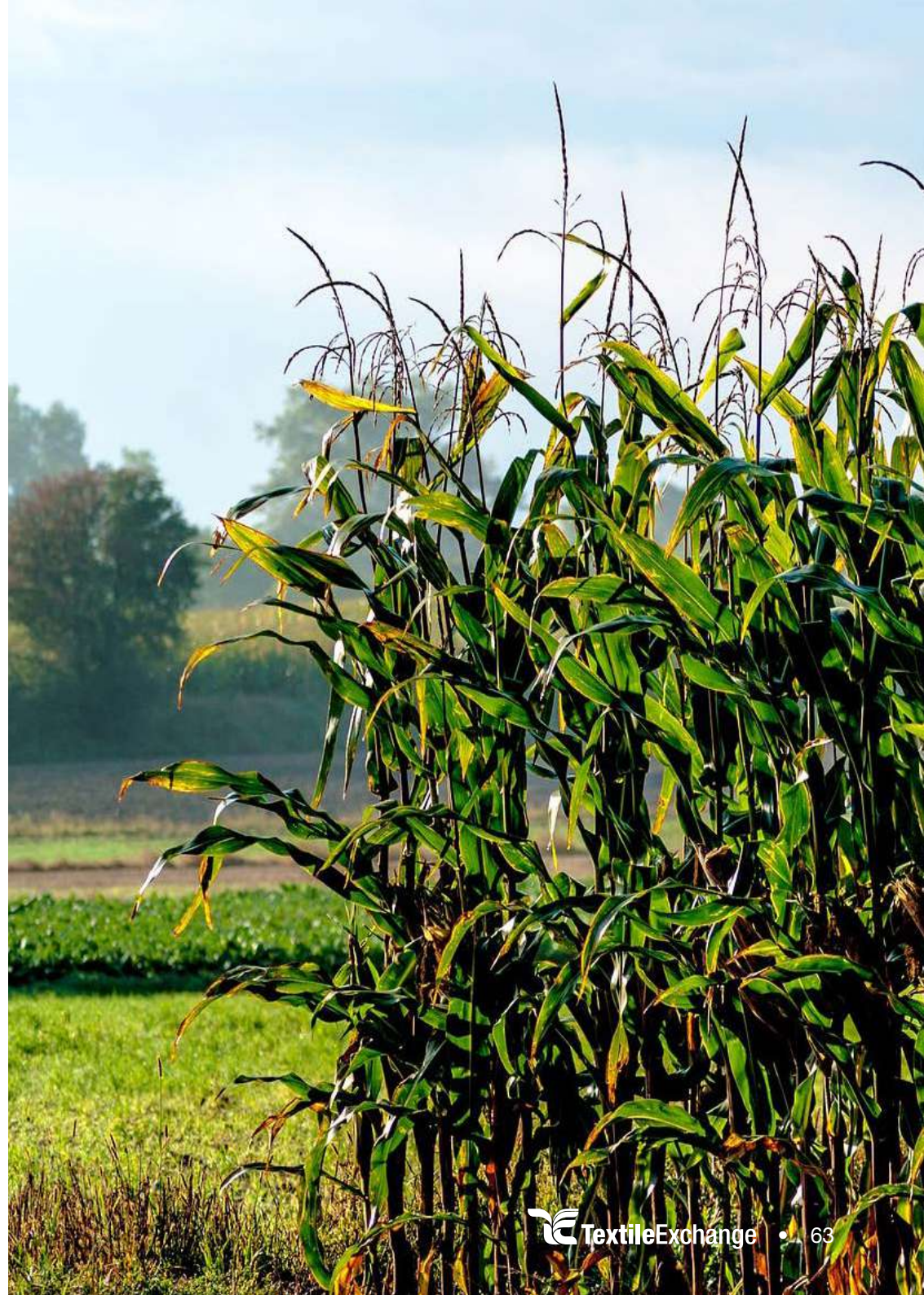
Sustainability advantages and challenges

Biobased polyester is a renewable alternative to fossil-based polyester, particularly as the future availability and stability of oil becomes a higher risk. It can also play an important role in combating climate change. Biobased polyester is not, purely by definition, sustainable or preferred. Agriculture and forestry can drive biodiversity degradation and combat food security if not managed well. Key to the successful and sustainable development and deployment of a biobased economy will be innovation in feedstocks that do not compete with food production, that are not dependent on high inputs of water or agrichemicals in agriculture, and that are produced through a responsible governance of land, and management of natural resources⁽²⁾.

Supporting the transition

Textile Exchange Biosynthetics Working Group is a multi-stakeholder initiative with the objective to support the knowledge, understanding and development of biosynthetics for the textile industry. Textile Exchange launched the new website aboutbiosynthetics.org in 2018 which focuses on textiles made from sugars, biomass and plant oils. Also a **Quick Guide to Biosynthetics** was published in the beginning of 2018.

FIBFAB is a EU Horizon 2020 project that aims to industrialize the production of biodegradable and sustainable polylactic acid (PLA) based fabrics (wool/PLA and cotton/PLA) and to overcome the current limitations of PLA fibers.



(1) estimate based on European Bioplastics 2019 - Bioplastics Market Data 2018 and global polyester figures (see "[Global Fiber Market](#)").

(2) Textile Exchange 2018 - Quick Guide to Biosynthetics.

Biobased Polyester

Supplier innovation landscape

Fibers and yarns

Far Eastern's TopGreen® Bio PET Filament is bPET filament made with 30 percent biobased feedstock from sugarcane (more in the [HUB](#)).

Far Eastern also offers biobased PTT and biobased PLA made with NatureWorks Ingeo™ which is made from corn.

In 2018 **INVISTA** launched LYCRA® T400® EcoMade fiber. More than 65 percent of the overall fiber content comes from a combination of chemically recycled plastics (PET bottles) and renewable plant-based resources (corn) (more in the [HUB](#)).

Mango Materials is developing a process to produce PHA biopolymers from waste biogas (methane) via a microbial process.

Palmetto offers biobased PLA staple fiber made with NatureWorks Ingeo® which is derived from corn.

Radici's CornLeaf is a filament yarn based on Ingeo™ PLA biopolymer which is made from corn.

Teijin has developed ECO CIRCLE™ Plantfiber, a 30 percent biobased PET resin derived from sugarcane.

Toray's Ecodear® PET is a 30 percent plant-based polyester fiber derived from sugarcane. Toray also offers a 30 percent plant-based Ecodear® PTT and a 100 percent biobased PLA filament.

Trevira, an Indorama Ventures company, offers biobased PLA fibers and filaments made with Nature Works LLC Ingeo™ which is made from grain (corn).

Chemicals

Avantium started the construction of bio-MEG demonstration plant in the Netherlands.

Anellotech is a USA based company producing biobased paraxylene.

Braskem and Haldor Topsoe announced a partnership in 2017 to validate the MOSAIK™ sugar-to-biochemicals solution for production of bio-MEG in a demonstration plant.

DuPont Sorona® is a partially biobased PTT polyester polymer with 37 percent renewably sourced, plant-based content by weight made from corn sugar (more in the [HUB](#)).

Gevo has developed fully renewable carbon-based para-xylene, a key ingredient to convert petro-based polyester for fibers and bottles to 100 percent renewable content.

Indorama offers a Bio-PET resin made with 30 percent plant-based bio-MEG.

Natureworks manufactures its Ingeo™ branded polylactic acid (PLA) to manufacture plastics and fibers. Ingeo™ is currently derived from corn, cassava, sugar cane or beets. In 2019, NatureWorks announced its commitment that 100 percent of its agricultural feedstock used for Ingeo will be ISCC Plus certified by 2020. The Natureworks R&D team is also working on a new technology to skip plants entirely.

Virent offers its BioFormPX® paraxylene made from sugars. Virent completed a year long run of a demonstration plant in 2017/18 which demonstrates the technology to convert plant sugars to bio-paraxylene, a key raw material for bio-polyester fiber (more in the [HUB](#)).

Commitments to Preferred Polyester

Examples

Commitments to Recycled Polyester

In 2017, the rPET Round Table created a Recycled Polyester Commitment to encourage brands and retailers to publicly commit to accelerating their use of recycled polyester by 25 percent by 2020. The rPET Round Table is delighted to report that the aggregate target was reached two years early, in 2018, when the combined rPET use of the commitment signatories grew by 36%.

The number of brands and retailers that publicly committed to increase their use of rPET by at least 25 percent by 2020 grew from 29 in October 2017 to 38 in October 2018.

Brands that have signed the commitment as of the Textile Exchange Conference in October 2018 are AB Lindex, Adidas, Aldi-Nord, Bluey Australia Pty Ltd., Aventura Clothing/Sportif USA, Dedicated, Burton Snowboards, Dibella, EILEEN FISHER, Inc., Esprit Europe Services GmbH, Gap Inc., H&M, IKEA, ITC Accessories, ITOCHUKALANI S.A., Kastfel, Kurkku, Mantis World, Mara Hoffman, Indigenous Designs, MEC, Metawear, Mini Rodini, Norrøna Sport AS, Outerknown, Kathmandu, Skunkfunk, Target, Taylor Home & Fashions Limited, Teva, Timberland, Toad & Company, Volcom Inc., Nike, Inc., West Point Home, Ohmme and Under the Canopy.

Among the suppliers that have expressed their support for the brands and retailers participating in the rPET challenge are Geetanjali Woolens, Haiyan Haili Green Fiber, Nan Ya Plastics Corporation, Applied DNA Sciences, gr3n, Hallotex S.L., Hussain Mills Limited, Orimpex Tekstil Ltd.Sti, Pettenati Centro America, Polygenta/Perpetual, Pratibha Syntex Pvt. Ltd., PSP India, Unifi, Inc., Recycutex Co., Ltd., rePATRN and Worn Again.

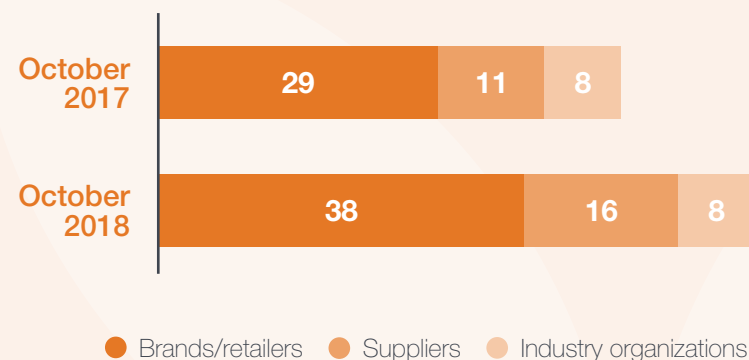
Industry organizations that expressed their support are Chetana Society, Circle Economy, GreenBlue, Japan Organic Cotton Association/JOCA, Plastics For Change, Pre Organic Cotton Program (ITOCHU/ KURKKU, Sustainable Furnishings Council and Thread International.

Commitments to Biobased Polyester

A survey by Textile Exchange revealed that there is a growing interest in biosynthetics. Public commitments to biobased polyester are still very rare.

In 2019, NatureWorks announced its commitment that 100 percent of its agricultural feedstock used for Ingeo will be ISCC Plus certified by 2020.

NUMBER OF COMPANIES THAT SIGNED THE rPET COMMITMENT





Polyamide

Photo: NOAA Coral Reef Ecosystem Program, CC BY-SA 2.0

Recycled Polyamide

Production facts and figures

With around 5.4 million mt ⁽¹⁾, polyamide had a market share of around 5 percent of the global fiber production market in 2018⁽²⁾.

Global polyamide production increased from 3.74 million mt in 1990⁽³⁾ to 5.4 million mt in 2018⁽¹⁾.

The market share of recycled polyamide is difficult to estimate. Reliable numbers on the global recycled polyamide production volume are currently not publicly available. As polyamide is more difficult to recycle than polyester, the market share of recycled polyamide is much lower than the one of recycled polyester.

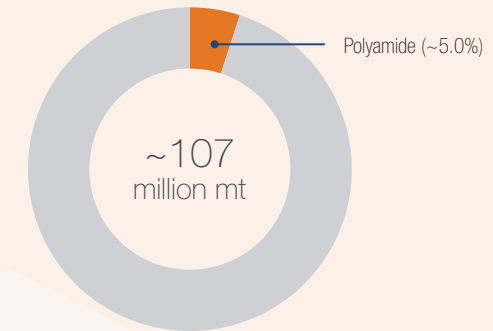
Recycled polyamide can be produced from pre- or post-consumer waste. Pre-consumer waste may be processing

scraps. Post-consumer polyamide is made from materials such as discarded fishing nets, carpets, or other used textiles. The recycling process can be mechanical or chemical.

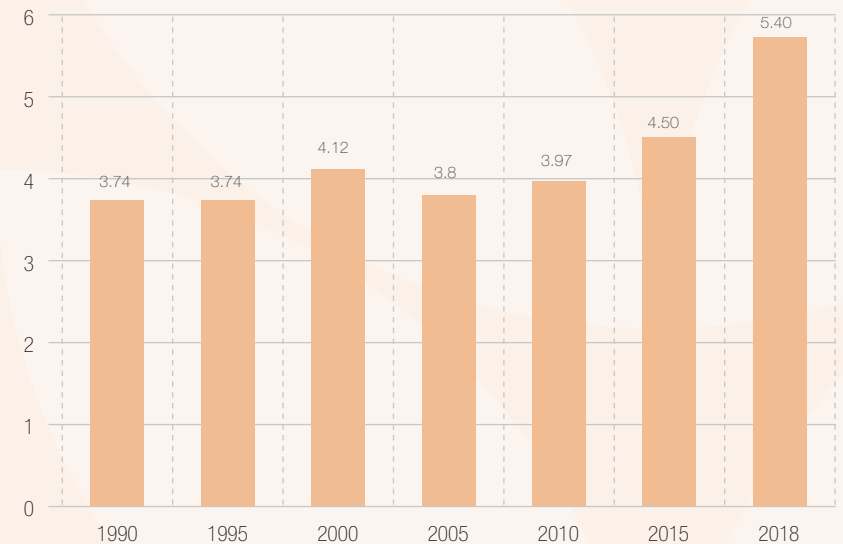
Main standards used for recycled polyamide include the GRS, RCS and SCS RC.

The recycling of polyamide helps to decrease dependency on fossil based raw materials and to reduce the waste material. Aquafil estimates that 70,000 barrels of oil are saved per 10,000 mt of regenerated caprolactam⁽⁴⁾.

GLOBAL MARKET SHARE OF POLYAMIDE IN 2018



GLOBAL POLYAMIDE PRODUCTION (MILLION MT)



(1) Oerlikon based on The Fiber Year 2019 - published at ITMA.

(2) Global fiber compilation by Textile Exchange based on various sources (see chapter on the "Global Fiber Market").

(3) IVC website.

(4) Aquafil website: <http://www.econyl.com/de/the-process/>.

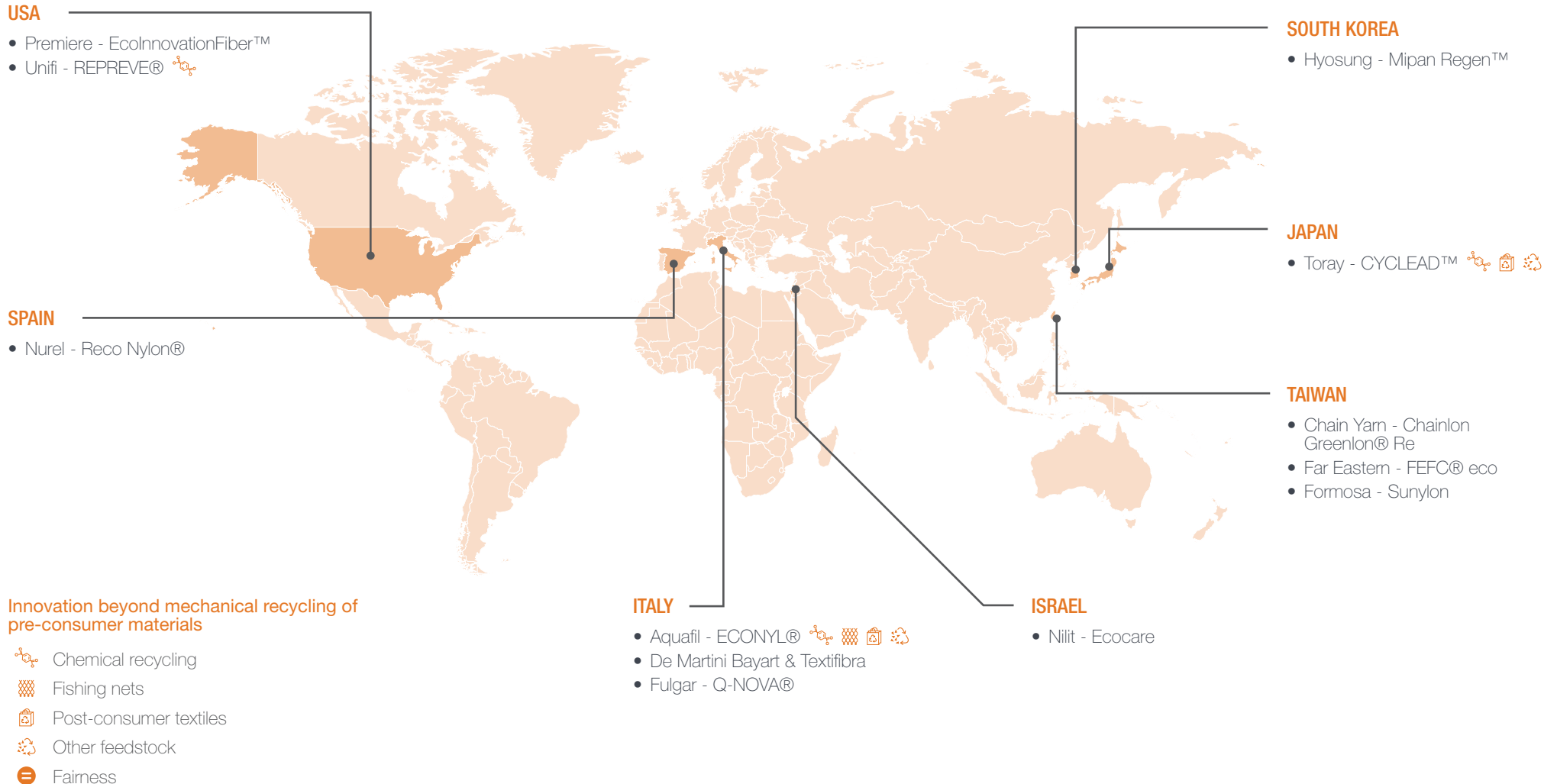
Recycled Polyamide

Directory: Key suppliers and innovators

This map locates key suppliers and innovators producing recycled polyamide by headquarter. All polyamide is mechanically recycled from pre-consumer waste unless indicated otherwise.

Tip: How to find suppliers of recycled polyamide.

Check out the [Textile Exchange database](#) for a list of certified suppliers. Textile Exchange members can also find Supplier Snapshots in the [Textile Exchange HUB](#).



Biobased Polyamide

Introduction and supplier innovation landscape

The global production capacity for biobased polyamide is around 0.24 million mt⁽¹⁾. It is estimated that the share of biobased polyamide fibers is less than 1 percent of the polyamide fiber market⁽¹⁾.

Biobased polyamide is at least partially made from renewable resources, helping to reduce dependency on oil. It is not, purely by definition, sustainable or preferred. Further impact areas such as competition with food, the use of agrochemicals, and the governance of land have to be taken into account.

Fibers and yarns

Cathay's TERRYL® is a biobased polyamide line offering PA56, PA510, PA512, PA514 and co-polymers chips and filament with 31–100 percent renewable shares.

Fulgar's EVO® is a 100 percent biobased polyamide yarn made from castor oil.

RadiciGroup's Biofeel® is a 100 percent biobased polyamide yarn derived from renewable, non-food plant sources.

RadiciGroup's dorix® 6.10 is 64 percent biobased polyamide staple fiber.

RadiciGroup's Radilon® 6.10 is a 64 percent biobased polyamide yarn for

apparel (ready to wear, technical wear, sportswear, intimatewear), and for home interiors.

Toray's ECODEAR® PA 6.10 is a biobased polyamide filament derived from castor bean.

Chemicals and resins

Aquafil and Genomatica have announced a multi-year agreement to create sustainable caprolactam, a key ingredient to producing 100 percent sustainable polyamide. This development is part of the "Project EFFECTIVE".

Arkema's Rilsan® is a polyamide 11 resin produced from 100 percent castor oil.

DSM's EcoPaXX® is a 70 percent biobased polyamide (PA410) resin derived from castor bean plant.

Evonik and BioAmber have a long term agreement for the development and manufacturing of catalysts for making BDO (1,4- butanediol), THF (tetrahydrofuran) and GBL (gamma – butyrolactone) from biobased succinic acid.

Virent's BioFormBZ®Benzene can be used for the production of polyamide (more in the [HUB](#)).



(1) European Bioplastics 2018 - Bioplastics Market Data 2018. Compared to the global fiber production volume compiled by Textile Exchange based on various sources (see chapter on "[Global Fiber Production](#)").

Commitments to Preferred Polyamide

Examples

Brands and retailers are starting to make public commitments to replace virgin polyamide with recycled polyamide.

Examples:

Brookes Running is committed to use 100% recycled nylon fiber by 2023. More information [here](#).

H&M is committed to use only 100% recycled or other sustainably sourced materials including recycled nylon. More information [here](#).

Norrna has the goal that 75% of their nylon should be recycled in 2020. More information [here](#).

Prada has published their goal of converting all Prada virgin nylon into regenerated nylon ECONYL® by the end of 2021. More information [here](#).

StellaMcCartney has the goal to stop using virgin nylon by 2021. To do so, they are replacing all virgin nylon with ECONYL® regenerated nylon. More information [here](#).

Volcom is committed to increase their share of recycled nylon to 20% by 2020. More information [here](#).



Synthetic materials, such as nylon and polyester, can – and should – be recycled and come from recycled sources.

Stella McCartney ⁽¹⁾

(1) StellaMcCartney Website. Link [here](#).



Other Manmade Fibers

Photo: Tyton Biosciences

Recycled Fiber from Blended Textiles

Overview

Many textiles produced today are fiber blends. Fiber blends recycling is particularly challenging due to the mix of materials, such as cotton and polyester. Thanks to a few innovative startups, there is the prospect that high value fiber blend recycling will be possible soon.

Chemical recycling

BlockTexx owns proprietary technology that separates polyester and cotton materials such as clothes, sheets and towels of any colour or condition back into their high value raw materials of PET and cellulose for reuse as new products for all industries (more in the [Q&A](#)).

The **Hong Kong Research Institute of Textiles and Apparel (HKRITA)** - in collaboration with the H&M Foundation - has developed a hydrothermal method using heat, water and green chemicals for recycling cotton and polyester blends. A new pre-industrial size facility scaling this technology was opened in September 2018.

Mistra Future Fashion's Blend

Re:Wind is a Swedish process for the recycling of poly-cotton blended textiles. Cotton is turned into new high quality viscose filaments and polyester into two pure new monomers.

Södra announced its new solution called Once More to separate cotton

and polyester from polycotton blends in October 2019. The project started in autumn 2019 with 30 mt of cotton derived from used textiles added to their wood-derived pulp in their mill in Mörrum, Sweden. Södra is looking for partners to help increase the recycled share in their pulp from the current 3 percent to around 20–30 percent. Södra is also exploring a decolouring solution, possibilities to extract products from the polyester, and the use of used MMCF textiles.

Tyton Biosciences can recycle polyester or poly-cotton blends into the building blocks of virgin-grade polyester. The chemical process reduces polyester to its monomers (terephthalic acid and ethylene glycol).

Worn Again Technologies' patented process can separate, decontaminate and extract polyester polymers and cellulose (from cotton) from non-reusable textiles, as well as plastic bottles and packaging, to go back into new products as part of a repeatable process.

Mechanical recycling

Novetex opened its Novetex Upcycling Factory in Hong Kong in September 2018 for mechanical fiber-to-fiber recycling. The technology was developed in collaboration with HKRITA and H&M Foundation and can recycle post-consumer fiber blends.



Recycled CO₂ based fibers

Overview

Addressing climate change is one of the most urgent action areas for the textile industry. A few companies are exploring innovative approaches to recycle carbon and directly use it as feedstock for textiles.

Examples

Covestro and its partners, foremost the Institute of Textile Technology at **RWTH Aachen University** and various textile manufacturers, announced in July 2019 that they have succeeded in making elastic textile fibers based on CO₂ and so partly replacing crude oil as a raw material. More information [here](#).


LanzaTech is developing a carbon recycling technology. Their aim is to create clothing like yoga pants from the CO₂ emissions from a steel mill. LanzaTech calls these products "CarbonSmart™". More information [here](#).

NatureWorks is currently using plants to capture and sequester CO₂ into long-chain sugar molecules and its PLA called Ingeo. Their R&D team is assessing new technology to skip plants and use microorganisms to directly convert greenhouse gases into lactic acid. More information [here](#).

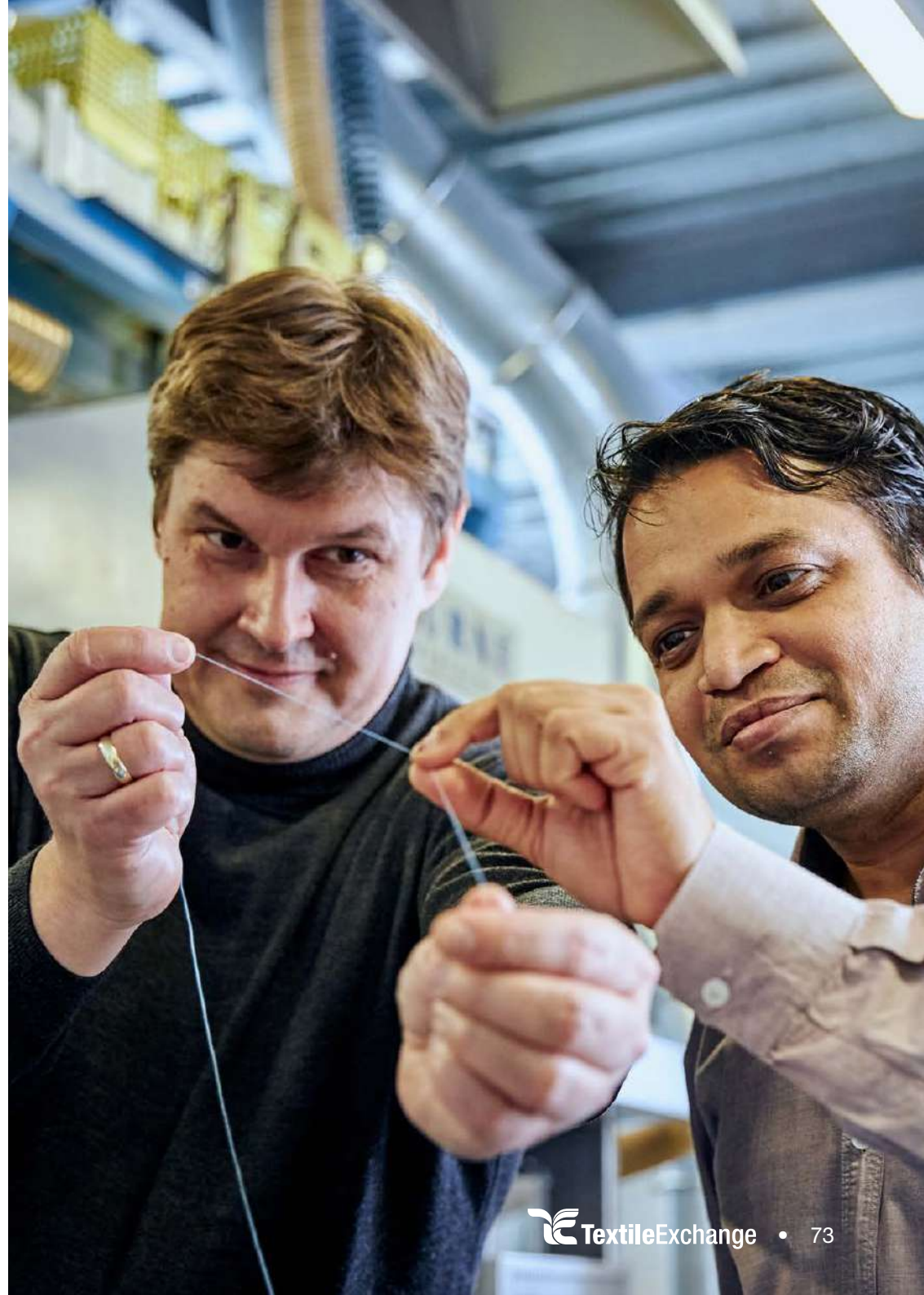
NewLight is working on a technology to turn greenhouse gases into aircarbon™, a material that can be melted and forged into fibers and solid parts. More information [here](#).



The CO₂-based material could be a sustainable alternative to conventional elastic fibers in the near future.

Professor Thomas Gries, Director of the Institute of Textile Technology at RWTH Aachen University 

(1) Covestro July 2, 2019 Press Release "Dress with CO₂". More information [here](#).



Other Recycled or Biobased Fibers

Overview

There are a number of further examples of recycled or biobased manmade fibers. Please note that not all biobased fibers are, by definition, sustainable or preferred. Further research is required in order to holistically assess their sustainability profiles.

Recycled elastane

Asahi Kasei's Roica™ launched its first GRS certified recycled elastane, polyurethane filament, in 2016.

Sheico Group's Sheiflex® is a recycled spandex which received its GRS certification in 2017.

Recyclable PDK

A team of researchers at the **U.S. Berkeley Lab** has designed a new recyclable plastic called poly(diketoenamine), or **PDK**, that can be disassembled into its constituent parts at the molecular level, and then reassembled again and again.

Biobased elastane

In 2014 **INVISTA** introduced **T162R LYCRA®** fiber, a 70 percent biobased elastane derived from corn. INVISTA is currently exploring whether the market for this product has changed since then and whether there is growing demand.

Biobased polyurethane

Dupont's Susterra® propanediol is 100% corn-based building block for a variety of polyurethane applications (more in the [HUB](#)).

Biobased manmade protein fibers

AMSilk Biosteel® is a biobased protein fiber produced in a continuous spinning process.

Bolt Threads' Microsilk is a biobased manmade "spidersilk" primarily made of sugar, water, salts and yeast.

Kraig Biokraft is a protein fiber made by genetically engineered silkworms and composed entirely of protein produced naturally by the silkworm.

Spiber is a protein based material made through fermentation.

Biopolymer made from algae

Algiknit is a biobased material made from the seaweed kelp.

Sustainability Standards & Traceability

Sustainability Standards

Beyond fiber specific standards

The previous chapters in this report provide an overview of the most important fiber specific standards such as cotton, wool and down standards.

Beyond the fiber specific standards, there are a variety of standards that can be used for various fiber types. Examples are the traceability standard Content Claim Standard (CCS), standards for organic materials such as Organic Content Standard (OCS) and the Global Organic Textile Standard (GOTS) and standards for recycled materials such as the Recycled Claim Standard (RCS), the Global Recycled Standard (GRS) or the SCS Recycled Content (RC) Standard.

As leading standards for organic textiles, the OCS and GOTS standards both further expanded their market.

The number of **OCS** certified facilities increased from 3,174 in 2014 to 4,226 in 2018. Textile Exchange launched a revision of the Organic Content Standard 2.0 in 2019. This revision is running from April 2019 to April 2020.

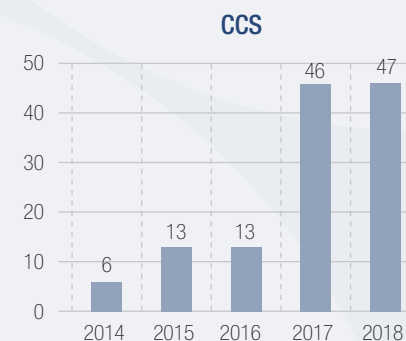
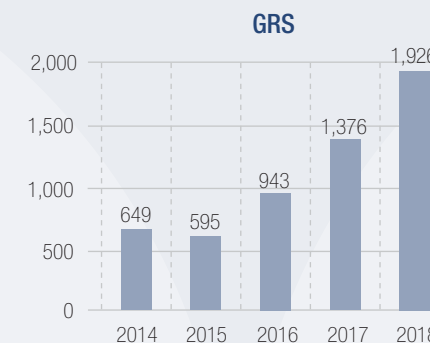
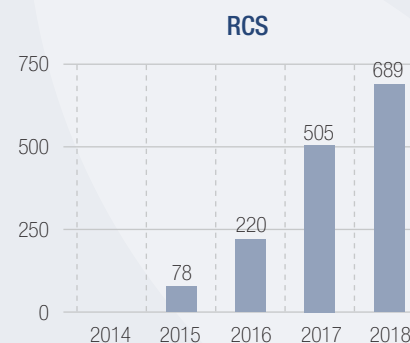
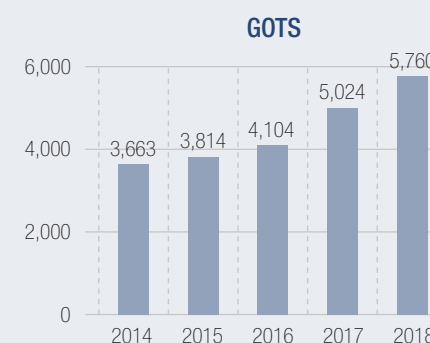
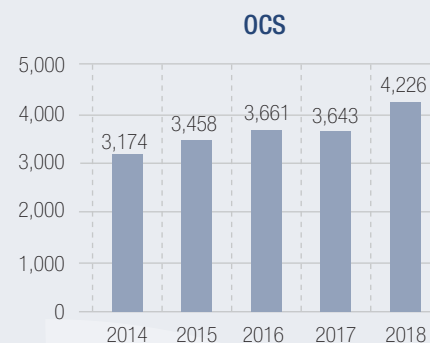
The number of **GOTS** certified facilities increased from 3,663 in 2014 to 5,760 in 2018. GOTS version 5.0 is due for revision in 2019, the formal GOTS 6.0 revision process commenced in March 2019. GOTS version 6.0 is scheduled to be released in spring 2020.

The two leading standards for textiles made with recycled materials are growing particularly fast.

The number of **RCS** certified facilities increased from 78 in 2015 to 689 in 2018. Since July 2018, the new Recycled Claim Standard 2.0 is in effect. This new version was released in 2017. A key change is the introduction of the Reclaimed Materials Supplier Agreement. This document provides more visibility to the suppliers of reclaimed materials. Guidelines have also been introduced for added clarity and consistency of recycling claims, including pre- and post-consumer.

The number of **GRS** certified facilities increased from 649 in 2014 to 1,926 in 2018. The revised version of the GRS was released in parallel to the updated RCS version in 2017 and has been in effect since July 2018: the Global Recycled Standard 4.0. A key change is the adoption of ZDHC's Manufacturing Restricted Substance List v1.1 (MRSL) that will replace GRS's previous Prohibited Substance List. Other changes and additions include new examples of accepted recycled inputs, updated wastewater limits, and clarifications.

The number of **CCS** certified facilities increased from 6 in 2014 to 47 in 2018.



Traceability Systems

Innovation

New technologies and approaches to traceability are being piloted.

Blockchain-based traceability

Birla Cellulose pioneered a unique block chain traceability system where customer brands have visibility of their supply chain from forest to retail. Developed with Microsoft team and first to launch such a high tech system, the business now has partnerships across the chain who actively work on sustainability in their processes. With a code, the brands can see the supply chain from Tier 1 garmenter to Tier 6 pulp to forest source. Liva Eco campaign using a block chain platform with consumers has been appreciated by brands for higher sell through and consumers for increased awareness, participation and usage of eco enhanced fiber based garments (access [Q&A here](#)).

The **Organic Cotton Traceability Pilot** is a pioneering project to revolutionize the organic cotton supply chain, shedding a light on every step from the farmer to the consumer. Through a unique combination of cutting-edge technologies including blockchain, machine vision, artificial intelligence, micro-biome

sequencing, and on-product markers for organic cotton, the pilot is forging promising opportunities to dramatically boost traceability in the fashion industry. The pilot was created through a partnership between Fashion for Good, C&A Foundation, the Organic Cotton Accelerator (OCA), and lead technical partner, Bext360. The first phase was made possible with the technical support of Haelixa, Tailorlux, InCode Technologies and Pratibha Syntex, and the additional support of Kering, Zalando, PVH Corp., and C&A (more [here](#)).

Lenzing announced a partnership with Hong Kong based **TextileGenesis™** in June 2019. TextileGenesis™ is a blockchain enabled digital transparency platform for the textile industry. First results were presented in September 2019. Lenzing expects the platform to be fully operational as of 2020.

Waste2Wear, a brand of the China-based company Vision Textiles founded by the Dutch Monique Maissan, launched the world's first collection of fabrics made from ocean plastics that will be fully traceable using blockchain technology in September 2019.

DNA-based traceability

Spain-based down and feather company **Navarpluma and Applied DNA Science** announced in September 2019 their partnership to apply the DNA based traceability solution to the down supply chain for the first time.

Haelixa, also part of the Organic Cotton Traceability Pilot, has developed a DNA marker technology to track products in supply chains.

Data analysis and machine learning

Google and StellaMcCartney launched a pilot in May 2019 to measure the environmental impacts of fashion, particularly at the raw material level. To start, a tool will be build that uses data analytics and machine learning on Google Cloud to give brands a more comprehensive view into their supply chain, particularly at the level of raw material production, referred to in the industry as Tier 4 of the supply chain. The initial focus will be on cotton and viscose, each chosen due to the scale of their production, data availability and impact considerations (more [here](#)).

Impact Credits

An innovative approach to creating impact

Impact Credits are essentially a mechanism for brands to deliver their expectations back to the start of the supply chain and provide financial rewards to incentivize them.

Impact Credits refer to the certificates that are traded in support of a sustainability claim. The credits are issued when a set of criteria have been confirmed to have been met. The physical goods and the credits are traded separately from each other. The credit certificates represent a specified quantity of verified material that has been produced but has not been physically traded as verified goods.

The way they work is quite simple; farms that meet the standard or benchmark will be able to sell credits for their volume of output, and brands can purchase these credits to balance out their use of these output materials. The farms selling the credits may or may not be in the supply chain of the brands, as the credit trading system does not address any traceability.

While this means that brands cannot make any content claims on their products, they can by-pass the cost and complexity of long or opaque supply chains in order to deliver impact quickly and efficiently. And they can still make claims about their support for best practices.

Impact Credits are a powerful tool to bypass long and complex supply chains, and to address the price conundrum that often inhibits the widescale adoption of full traceability standards. They provide a fast and efficient means to build up more sustainable supply, and drive the scale of impact that is needed to address the world's issues.

Mega Trends

Sustainable Development Goals

Who is doing what

The Sustainable Development Goals (SDGs) - a set of 17 universally agreed-upon goals addressing the top current environmental, social and economic issues - offer many business opportunities for companies while addressing critical operational risks.

To support the industry with their SDG journey, Textile Exchange launched the online platform TextilesforSDGs.org in 2018.

KPMG and Textile Exchange have partnered on a report entitled “Threading the Needle: Weaving the SDGs into the textile, retail and apparel industry”, published in 2018. A culmination of industry interviews, NGO inputs, and desk research, the report highlights shared value examples for companies in the sector grappling with how to integrate the SDGs into their core business and global supply chain.

Textile Exchange also encourages companies to consider participating in Textile Exchange's **Corporate Fiber and Materials Benchmark** program to evaluate not only their preferred fiber and material usage and its direct SDG impacts but also their corporate responsibility implementation. For additional information, please view our Benchmark Framework.

Fashion Industry Charter for Climate

Action is industry-led and driven effort. Brands, suppliers, NGOs and industry associations, convened by the UN Climate Change, developed a climate action agenda for fashion. In December 2018, 43 founding signatories publicly announced their commitments at a high-level event hosted by the UN Climate Change at COP24 (more in the [Q&A](#)).

The UN Alliance for Sustainable

Fashion is an initiative of United Nations agencies and allied organizations designed to contribute to the Sustainable Development Goals through coordinated action in the fashion sector. Specifically, the Alliance works to support coordination between UN bodies working in fashion and promoting projects and policies that ensure that the fashion value chain contributes to the achievement of the Sustainable Development Goals' targets.

Circular Economy

Who is doing what

It is estimated that less than one percent of all clothing is recycled back into clothing⁽¹⁾.

The amount of global textile production and consumption is increasing. Around 48 million mt of clothes are disposed annually, with around 75 percent of them landfilled or incinerated⁽¹⁾.

Initiatives supporting the transition

Textile Exchange supports the industry's move towards circular economy through its membership network, facilitation of exchange, publications, the Global Recycled Standard (GRS) and Recycled Claim Standard (RCS) and through benchmarking via the Corporate Fiber and Materials Benchmark (CFMB).

Circle Economy's Circle Textile Program develops the systems innovations necessary for the transition towards a circular textile industry. One of the flagship initiatives is Fibersort, a technology able to automatically sort large volumes of mixed post-consumer textiles based on fiber composition. The first Fibersort production started in February 2018.

The **Cradle to Cradle Products Innovation Institute**, a non-profit organization, administers the Cradle to Cradle Certified™ Product Standard, which was gifted to the institute by its founders, William McDonough and Dr. Michael Braungart, in 2010.

Ellen MacArthur Foundation (EMF) has launched the Circular Fibres Initiative in May 2017 at the Copenhagen Fashion Summit and published the research report "A New Textiles Economy: Redesigning fashion's future" at the end of 2017. One year later, at the 2018 Copenhagen Fashion Summit, the Circular Fibres Initiative entered its second phase: Make Fashion Circular.

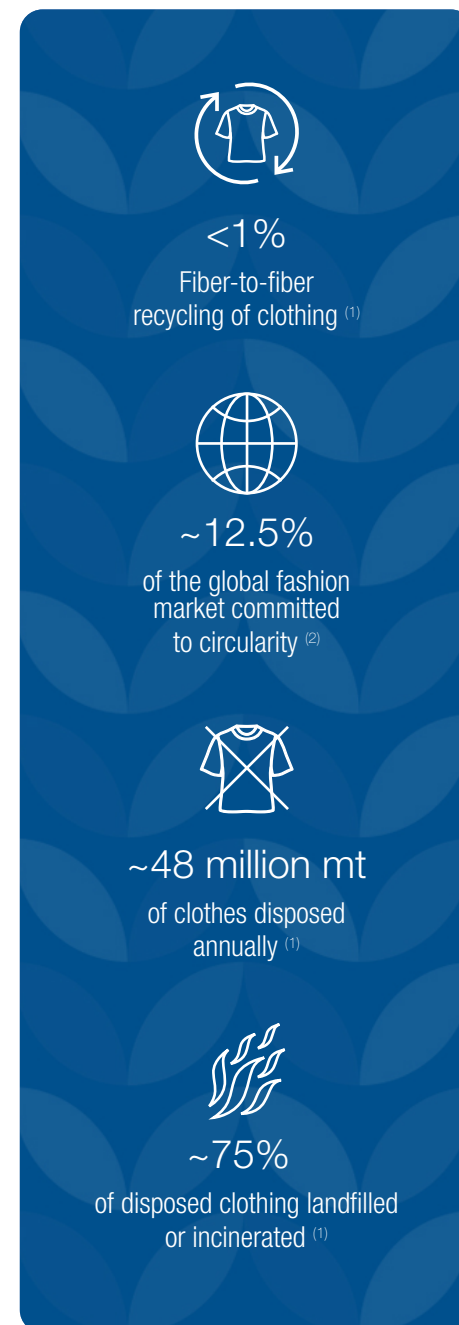
The **European Clothing Action Plan (ECAP)** is a €3.6 million EU LIFE funded project which aims to reduce clothing waste across Europe and embed a circular economy approach. The project ran for three and a half years and ended in March 2019.

Fashion for Good is a global initiative that reimagines how fashion is designed, made, worn, and reused. Through innovation and practical action, they

demonstrate a better way for the fashion industry to work that allows companies, communities, and the planet to flourish (more in the [Q&A](#)).

Fashion Positive Plus is a group of apparel brands committed to the development and adoption of materials designed to provide the foundation of a circular economy for fashion.

The **Global Fashion Agenda 2020** Circular Fashion System Commitment, a call by the Global Fashion Agenda, had been signed by 94 companies, representing 12.5 percent of the global fashion market by June 2018. The companies have committed to take action on one or more of four immediate action points - one being to increase the use of post-consumer recycled fibers⁽²⁾.



(1) Ellen MacArthur Foundation (2017) - A New Textiles Economy

(2) <http://www.globalfashionagenda.com/commitment/#>

Circular Economy

Service providers

It is estimated that around 75 percent of disposed clothes are landfilled or incinerated, and only 25 percent collected for reuse or recycling. This equals 35 million mt of post consumer clothes and one million mt of retailer overstock landfilled or incinerated per year⁽¹⁾. A few innovative service providers support brands and retailers to maximize the reutilization of their unsold or used textiles and reappraise them as valuable secondary raw material.

Examples

I:CO, short for I:Collect, is a global solutions provider for collection, reuse and recycling of used clothing and shoes. I:CO's take-back system and logistics network collects clothing and shoes through in-store boxes in more than 60 countries, sorts the items and either reuses or recycles them ensuring maximum reutilization of these valuable materials.

TEXAID offers with its in-shop collection system at selected clothes stores the possibility of handing in used clothes where they are sold – in shops. TEXAID collects, sorts and recycles left-over stock, remnants and other textile waste in order to obtain raw materials for new uses. TEXAID can utilize high-quality goods all over the world, which means that there is no additional competition for retailers and manufacturers on their own market.

Bank & Vogue is a wholesale supplier & buyer of used goods & store returns across North America, with international shipping. Bank & Vogue started with the desire to provide a service to the Salvation Army and has since grown into something much larger. They operate their own chain of stores, Beyond Retro, that sells vintage and upcycled clothing. Credential clothing (bags of unsorted clothes from donations & unsold inventory from stores) is sent to places where they can find a second life.

The Renewal Workshop takes discarded apparel and textiles and turns them into Renewed Apparel, upcycled materials or recycling feedstock. Data is collected on everything that flows through the system and is given back to the brand partners to help them improve the production and design of future products.

Yerdle supports brands to buy back and resell used items by providing technology and logistics to develop white-label resale programs.

The reGAIN app supports users to pack unwanted clothes into a box or bag, then, with the help of the app, find the nearest drop off point and print a shipping label. After dropping the package off, the app unlocks discount coupons which give the user a discount at reGAIN's partners.

(1) Ellen MacArthur Foundation (2017) - A New Textiles Economy.

Bio Economy

Supporting the transition to a Bio Economy

It is estimated that around 48 million mt of oil feedstock are used for the global synthetic fiber production per year⁽¹⁾. Another seven million mt of oil feedstock are used for the production of synthetic fertilizers and 200.000 mt for the production of synthetic pesticides⁽¹⁾. A sustainable bioeconomy together with a move to a circular economy can support the transition towards a fossil-free future and play an important role in addressing climate change.

Textile Exchange's Biosynthetics Round Table kicked off in 2016. The first task of the Biosynthetics Round Table has been to research and create the microsite: AboutBiosynthetics.org. It has involved the gathering and synthesis of available information and resources on biosynthetics, with the goal of enabling this relatively new material to become a larger part of a company's PFM portfolio. bio8tion has been leading this project and Virent has been a key provider of input and support. An important next step will be the definition of "preferred" biosynthetics.

In 2018, the Biosynthetics Roundtable formed two Working Groups: one focusing on the sustainability of biosynthetics and the other one on

communication and the microsite update. The Biosynthetics Round Table also started an Biosynthetics e-Learning Series where different sustainability standards and initiatives present their work.

If you are interested to join the Biosynthetic Working Group, please contact Materials@TextileExchange.org.

A Textile Exchange Biosynthetics Survey conducted in 2018 with 138 participants revealed a growing interest in biosynthetics. Brands and suppliers are exploring biobased materials as interesting alternative to fossil-based synthetics.

(1) Ellen MacArthur Foundation (2017) - A New Textiles Economy.



Microfibers

Spotlights

Microplastics continue to be a hot spot issue. It is estimated that another 22 million mt of microfibers will be added to the ocean between 2015 and 2050⁽¹⁾. The annual amount of primary microplastics released from textiles is estimated at 190,000 mt per annum⁽²⁾.

Proposals for textile labeling regulation

In the two USA states California and Connecticut, proposals were made suggesting additional labeling of synthetic textiles to alert consumers about the microfiber issue.

Reports and studies

SIFO published a report “Microplastic pollution from textiles: A literature review” in early 2018.

Greenpeace published a report called “Microplastics and persistent fluorinated chemicals in the Antarctic” in June 2018.

The European Outdoor Group has initiated a new project to compare the impacts of recycled and virgin polyester and nylon on synthetic textile microfiber pollution. Another project aims to understand how textile coloration could affect textile microfiber release.

SINTEF and the research institutes NTNU and Sichuan University together with Norwegian brands, textile

manufacturers and NGOs initiated a project on microfibers, evaluating the fate, effects and mitigation measures for microplastic fiber pollution in aquatic environments.

Campaigns

The Women’s Insistute (WI), a UK based organization, launched the End Plastic Soup campaign in 2017 to protect the ocean from contaminating micro plastic fibers.

Initiatives

The European Outdoor Group (EOG) has formed a **Microfibers Consortium**. The Consortium is designed to build a collaborative approach to address, and align on the emerging need for a better understanding of microfiber pollution. The ultimate aim is to develop a better understanding of microfiber shedding and to work towards concrete solutions. Member of the Consortium include: bio8tion, the University of Leeds (UK), The North Face, Marks & Spencer, and Norrøna.

The three-year project **“TextileMission”** (2017–2020) to combat the microfiber issue is funded by the German Federal Ministry for Education and Research. The project is coordinated by the Federal Association of the German

Sporting Goods Industry e.V. / BSI and supported by adidas, Henkel, Hochschule Niederrhein, Miele, Polartec, TU Dresden, Vaude and WWF Germany.

Innovative solutions

The **Cora Ball** is a new kind of laundry ball. Inspired by the way coral filters the ocean, the Cora Ball aims to collect microfibers into fuzz we can see, so we can dispose of microfibers in the right way.

Guppyfriend washing bag is a patented solution that aims to filter out microfibers released from textiles during washing. The fabric bag is made of a specially designed micro-filter material allowing users to collect and dispose the fibers after laundry.

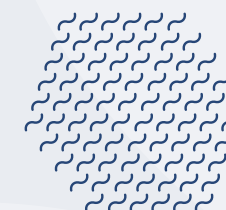
The **Filtrol** is an affordable, easy to install filter. It stops microfibers as they leave the washing machine and makes it easy to put them into the trash.

Xeros introduced a filtration innovation called XFiltera™ which is compatible with any home washing machine to protect the environment from microfibers created from home laundry.

(1) Ellen MacArthur Foundation 2017 - A New Textiles Economy.
(2) Eunomia 2016 - Plastics in the Marine Environment.



190,000 mt
of primary microplastics
from textiles per year ⁽²⁾



An additional
22 million mt
between 2015 to 2050
if no action ⁽¹⁾

Methodology & Disclaimer

Methodology & Disclaimer

The Preferred Fiber and Materials Market Report contains 1) global production volumes of various fibers and materials, 2) standard specific data such as the number of certified sites or production volumes per standard, as well as 3) a variety of news, updates, stories and quotes.

Textile Exchange has collected, analyzed and compiled all this information in all good conscience and cross-checked the data and information wherever possible. A guarantee for all the information is not given. This report is intended for general guidance and information purposes only. It is not the intention of the report to be used or considered as advice or recommendation in any direction.

The report covers the market for the key fibers and materials including the conventional ones and examples of “preferred” options. Textile Exchange describes a fiber or material as “preferred” if it is ecologically and/or socially progressive and has been selected because it has more sustainable properties in comparison to conventional options. Textile Exchange acknowledges that there are a variety of different approaches towards sustainability and that this continuum evolves over time. The report provides examples of programs, initiatives and products

working towards more sustainable solutions. Textile Exchange has not assessed the degree of sustainability of the individual programs, initiatives or products mentioned in this report.

1. Global production volumes

The compilation of global market data is challenging. The collection of primary data from the suppliers is beyond what is possible within the scope of this report, so we rely on secondary data from industry associations, international organizations, governmental organizations, standard setters or research institutes. We are trying our best to provide an accurate and reliable picture of the market but data gaps and inconsistencies are very common for global market data. Specific data sources are directly mentioned on the pages.

a) Data quality checks and triangulation

Textile Exchange tried to identify the most reliable sources for each fiber category and conducted triangulations with at least 2–3 sources wherever possible. In general all global market data are rounded estimates.

b) Organic cotton data

For a detailed description of the methodology behind the organic cotton

production volumes, please see our Organic Cotton Market Report.

c) Production volume scope

The production data in this report cover the total amount of fibers produced. The report does not differentiate between different usages and is thus not specific to the apparel industry. The fibers may be used for apparel, home textiles, technical textiles or any other application.

d) Definition of fiber

Fiber includes staple fiber and filament. All numbers reported on manmade cellulose and synthetics include staple fiber and filament production volumes.

e) Reporting period

The report focuses on the calendar year 2018 and provides trends if available. As the cotton production volumes are collected in ICAC harvest years starting from August 1 and ending on July 31, the cotton production volumes can be allocated to the calendar years in different ways. Most reports allocate the ICAC year which starts in a calendar year to the respective calendar year (e.g. 2017/18 cotton production volumes to the 2017 calendar year). Textile Exchange has decided to follow this approach for the global production volume trend figures. When it comes to the breakdown of

preferred cotton options however, this report covers the 2017/18 figures as these are the latest available data.

f) Methodological changes and comparison to previous years

Textile Exchange continuously improves its data collection methodology. Some data reported in previous years has been revised or updated since the actual data has become available for initial estimates or the methodology has been improved. A simple comparison between previously reported numbers and data reported in this year does not show the actual change over time but is caused by one of the reasons mentioned above.

2. Standard specific data

The standard specific data such as the number of certified sites per standard or production volumes are based on information collected from the standard owners and initiatives.

3. News and narratives

The news, updates, stories, quotes and narratives presented in the report are either based on information directly received from the companies and organizations or their press releases or websites. They cover the time of the reporting period up to the launch of the report.

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Textile Exchange envisions a global textile industry that protects and restores the environment and enhances lives.
www.TextileExchange.org

For the latest news and trends in the organic cotton sector, check out Textile Exchange's [Organic Cotton Market Report 2019](#).

For the latest updates on brand and retailer fiber and materials-related activities, check out Textile Exchange's [Corporate Fiber & Materials Benchmark](#) and its accompanying Insights Reports.