Cotton Outlook

Special Feature

WORLD COTTON DAY

2021

Contents

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Published by : Cotlook Limited, Outlook House, 458 New Chester Road, Rock Ferry, Birkenhead, Merseyside, CH42 2AE, U.K. Tel : 44 (151) 644 6400 Fax : 44 (151) 644 8550 E-Mail : editor@cotlook.co m World Wide Web : www.cotlook.com

Welcome to Cotton Outlook's second World Cotton Day Special Feature!

Antonia Prescott,
Deputy editor,
Cotton Outlook

There is no question that the 21 months since the first alarm bells began to sound alerting the world to a novel coronavirus in the human population have been difficult – not to say devastating – for individuals, communities and businesses across the globe. And the cotton industry has borne its share of the strain. However, in October 2021, there are signs that, notwithstanding the scale of the damage at a macro and micro level – to world economies and family life – some more positive outcomes are starting to be felt.

It is remarkable how the issue of sustainability has surged to the foreground. Once the preserve of a few lone individuals and pressure groups, perceived as eccentric, fringe and even dangerous, discussions about ecology, social responsibility and our long-term future on this planet are suddenly taking place everywhere – in our literature, television programmes, on social media, and in advertising. Global brands have identified this trend and have been quick to dedicate large sums of money promoting their sustainable credentials and commitments. Surely this is the most telling fact of all about the urgency and cut-through of the message.

Of course, there is a long, long way to go. We are still feeling our way, fumbling in the half-light of a possible new dawn. There are those who talk about green washing, about drops in the ocean, and argue about what the word sustainable even means. But we have started the conversation – and it is loud!

We are so grateful to our writers, who have lent their time and vast expertise to the production of this Special Feature for World Cotton Day 2021. Here, readers will find well informed, measured, clear-thinking discussions about what sustainability means for the cotton industry and how the issues affect our business, both now and in the future.

Cotton Outlook's feature
ICA Trade Event
Cotton Connected
Available to download here

With cotton, life is good

Mike McCue,
Director of Communications,
International Cotton Advisory Committee

When things are going well, you can feel it in every aspect of your life. The sunshine on your skin feels warmer, the water tastes sweeter and the air smells cleaner. Your work is satisfying, your basic needs are met and all is right with the world.

That overall sense of 'goodness' is what the International Cotton Advisory Committee (ICAC) and its industry allies had in mind during the advance planning for World Cotton Day 2021 that began earlier this year. Of course, World Cotton Day is a celebration for everyone in the global cotton and textile industries, and how people commemorate the world's most important natural fibre on 7 October is a personal choice.

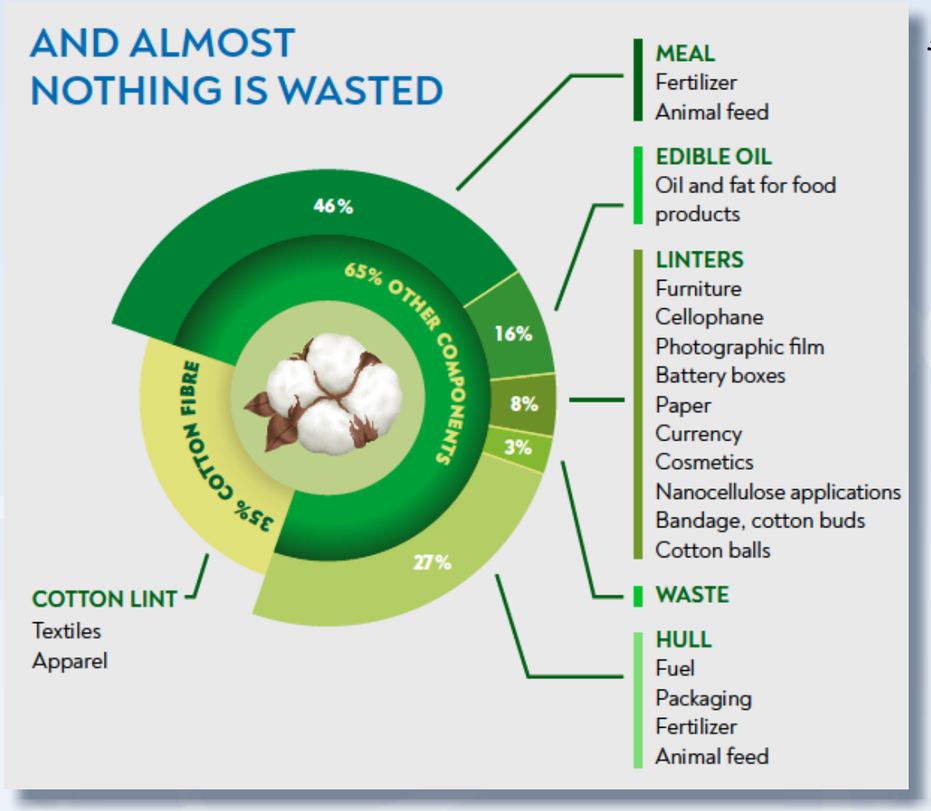
But some people like to have guidelines in place for planning, so we chose the theme 'Cotton for Good' to help guide their efforts. After all, given how many ways cotton benefits all of us on a daily basis, it gives people a lot of options! They can focus on how cotton is good for any or all of the following.

Global employment. It's difficult to put an exact figure on how many people derive their income from cotton, whether directly or indirectly, and the that figure would shift by the minute anyway. But according to ICAC Chief Scientist Dr Keshav Kranthi, it's fair to estimate that every tonne of cotton produced each year provides full-time employment for 5-6 people. With cotton's annual production in the vicinity of 25 million tonnes, that amounts to more than 150 million people worldwide.

Poverty alleviation. Obviously, any employment generated by the cotton and textile industries, anywhere in the world, is a net positive. But the story is better, and more urgent, than global employment levels overall. That's because cotton is especially critical to the economies of many least-developed countries in Africa and Asia — and if you dig a little bit deeper, you'll see it's even more important than that! The reason: cotton is a xerophyte, meaning it thrives in dry conditions where most other crops won't grow. So in the case of smallholder farmers who live in those arid places, cotton is literally synonymous with life.

People from all walks of life. When people think of cotton, they usually think of the plant in the field or the clothing in their favourite store. But the cotton supply chain is longer and more complex than it is for most other commodities, so there are millions of people working between the farm gate and the retailer's shelf, including ginners, logistics and insurance professionals, merchants, spinners and garment manufacturers and providers of finished goods. Directly or indirectly, cotton provides all of them with the ability to earn a living. The fact that it is relevant to so many different people, in so many different parts of the world — from smallholder farmers all the way to the CEOs of global brands — means cotton provides something for everyone.

Our planet's health. The human population has a dangerous relationship with synthetic fibres. Fast and cheap to make, products composed of polyester and other man-made fibres are the foundation upon which society's obsession with fast fashion is based. It's difficult to understand why — now that science has conclusively demonstrated that we are literally



drowning the planet and its wildlife in plastic pollution — people are not more alarmed by the frightening growth of fast fashion, which leaves oil-based garments and textiles piling up ever higher in our landfills. The story is even worse in our oceans and waterways, where plastic waste is so prevalent that it has entered our food chain after being consumed by fish and crustaceans. Recent research shows microfibres can also be airborne and have been found as far north as the Arctic Circle and as high as the tops of the Himalayan mountains. Given such a pervasive and insidious threat, it's startling that more people and governments aren't taking more and bigger steps to get the problem under control, but until they do, it's a battle we need to keep fighting every single day.

Lack of waste. One of the most amazing and least appreciated things about cotton is its incredible versatility. People might immediately think of lint when they think of cotton, but the plant provides far, far more than just the fibre. The seed can be crushed to provide fertiliser, cooking oil for human consumption and meal cakes for livestock; its hull can be used to make fuel and packaging materials, and the linters are used to make bank notes, cosmetics and furniture. In fact, if you were to use every part of the cotton plant for every application it is suitable for, you'd be left with just three percent of its mass as waste.

Comfort. The fact that cotton feels good on your skin might not be as significant as some of the other points in this list, but it is clear — and has been for decades — that consumers prefer it to synthetics such as polyester and nylon by a wide margin. According to research by Cotton Incorporated, 93 percent of consumers prefer garments made from natural fibres including cotton; 74 percent specifically name cotton/cotton blends as their fibre of choice; and 70 percent are willing to pay a premium for products made from a natural fibre such as cotton. Generations have spoken and the contest between natural and man-made isn't even close.

Climate change. Another astonishing feature of the cotton plant is its ability to remove carbon from the atmosphere. Each kilogram of cotton fibre emits about 1.7 kg of greenhouse gases (GHGs) during its production — but then it sequesters 2.2 kg of GHGs, removing them from our atmosphere and storing them in its soil and biomass. It also uses water and carbon dioxide to create cellulose and since cotton fibres are 96-98% pure cellulose, their ability to help the atmosphere is remarkable.

This Cotton Outlook Special Feature is being released on 7 October and while that means people have already planned their World Cotton Day activities before they read this article, it should serve as a reminder that all of us who work in the global cotton industry need to ensure we are delivering positive news about cotton all year long, not just on this one special day.

Regardless of where you put your emphasis — on cotton's ability to employ so many people (especially in LDCs), its environmental friendliness, or simply that you like the way it feels on your skin — the industry needs our constant support and diligence to ensure that 'fake news' doesn't cloud the public's perception of cotton. Not just on 7 October but also for the other 364 days each year, we need to keep helping cotton so it can keep helping us.

The economic sustainability of cotton

Mike Edwards,
Editor,
Cotton Outlook

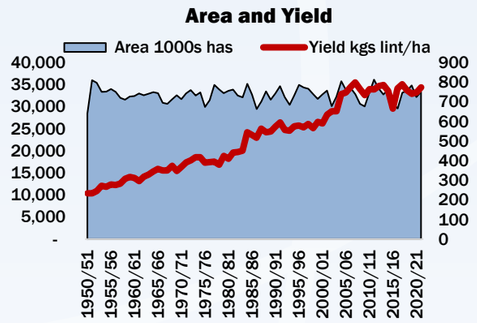
The third pillar

Debates about agricultural sustainability generally revolve around three main 'pillars': environmental, social and economic. In a cotton context, much attention is currently – and quite rightly – directed to the first two of these. Discussion of the third is apt to be rather superficial amongst those whose livelihoods do not depend directly on the crop.

For anyone unfamiliar with our market, a glance at the pattern of world cotton area over the past seventy years or so might give the impression of a barely changing landscape. Global cotton plantings have been confined within a range of 30 to 36 million hectares for almost the whole of the period following the Second World War, and for much of that time the band has been narrower. The rise and fall of area, our outsider might conclude, has no doubt been a function of market incentives to sow cotton or another more lucrative crop.

The truth is, of course, more complex. Our linear portrayal gives no clue as to the geographical shifts and technical advances that have taken place over the period.

Change has sometimes been far-reaching within producing countries. To take just one example, in Brazil, production has migrated from the south of the country to the new agricultural frontier of the centre-west region. At the same time, a moribund smallholder model of production has been replaced by extensive mechanised farming that produces the highest rain-fed yields in the world.

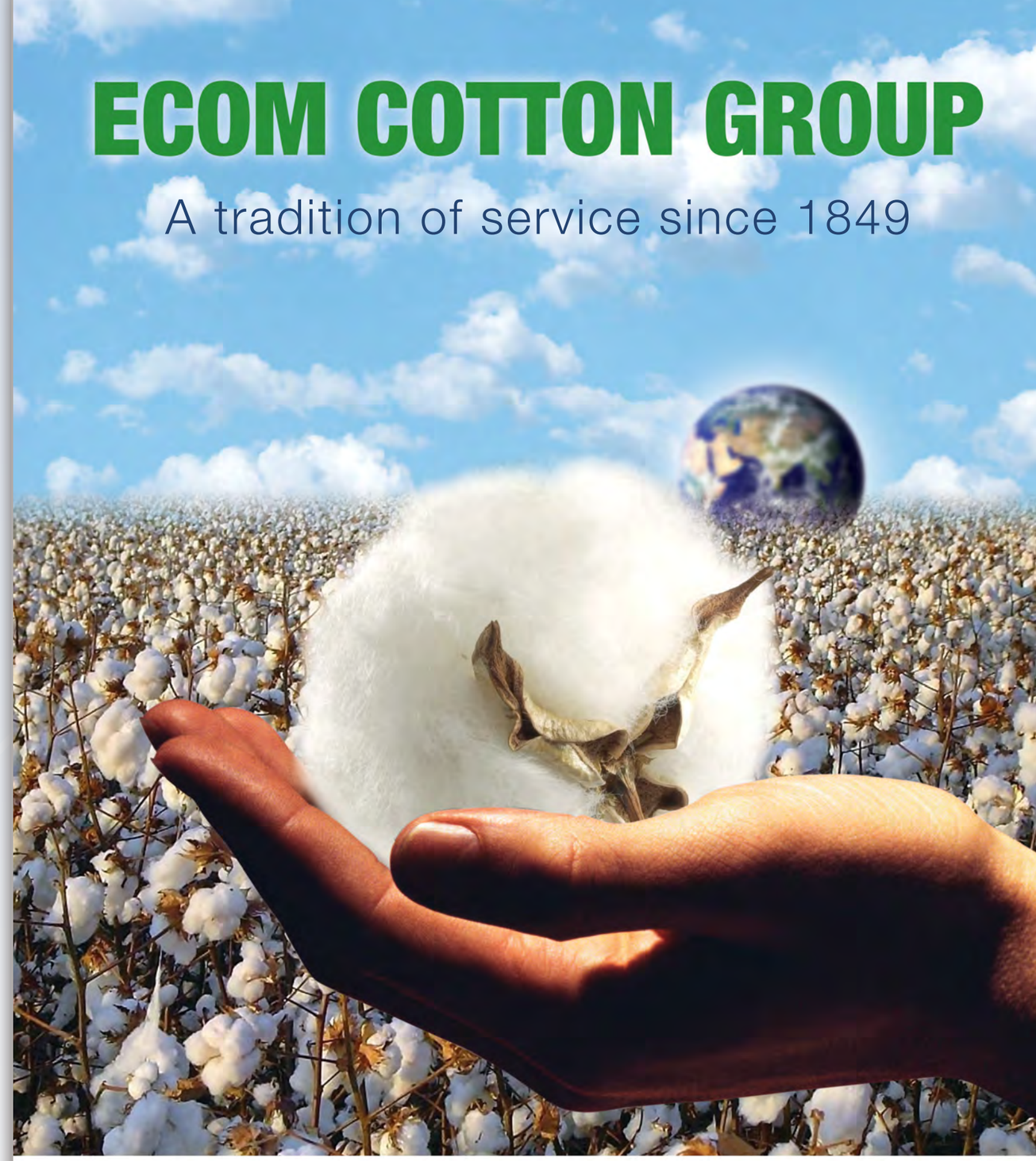


Source: Cotlook/ICAC

Elsewhere in Latin America, one can list a number of countries – Colombia, Paraguay, all of Central America – in which a once significant crop has become barely sustainable or has disappeared entirely.

China has seen the focus of production shift from the eastern producing provinces to Xinjiang in the north west, which today contributes over 90 percent to national output, versus roughly half a decade ago. There too, mechanisation has accelerated in recent years.

The advent of genetically modified seed varieties in India around the turn of the century coincided with a period of rising yields and area that established the country as the world's largest cotton producer and transformed it from modest net importer to major net exporter. By contrast, cotton area in Pakistan has



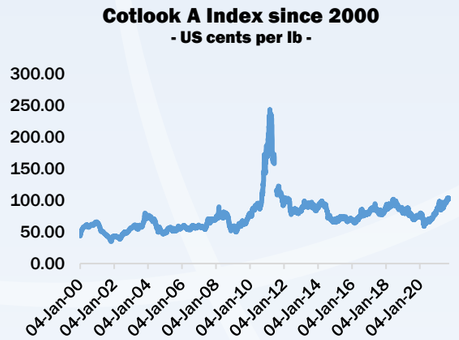
fallen quite dramatically in recent seasons as yields have stagnated. The country's structural import requirement is large and growing.

Rather than the long-term stability implied by a cursory look at the global area data, permanent flux may more accurately describe the development of cotton production during the modern era.

Price incentives and diverse production models

Price is of course an important driver of production. World cotton values have been nothing if not volatile since the turn of the century. The Cotlook A Index has fluctuated between a low of 34.95 cents per lb in October/November 2001 and an all-time record high of 243.65 in March 2011.

Important as the fluctuation of prices may be, it only partially explains the farmer's motivation. Producers' incomes are a function not only of price but also of yield, as well as input and labour costs.



However, production models are diverse. Cotton is irrigated in some major producing countries, but more than half of the world's output is dependent on seasonal rainfall. Smallholders may cultivate cotton on just a few hectares, while commercial farmers devote hundreds, thousands or even tens of thousands of hectares to mechanised production.

And since production models vary substantially around the globe, so too do yields. The development of new varieties and other technological advances has meant that over time global average yields have risen, as can be seen clearly from the chart on the previous page. Results have been varied, however, and stagnating productivity remains a threat to the viability of cotton cultivation, particularly in parts of the developing world.

In Australia and China, where irrigation predominates, results in excess of 2,000 kilos of lint per hectare have not been uncommon in recent seasons. Brazil's record performance was achieved in 2019/20 at just over 1,800 kilos per hectare – an impressive feat in a non-irrigated environment, albeit one in which rainfall is predictable.

Within the United States, where cotton is both irrigated and rain-fed, wide variations are observed. The average in recent seasons has typically fallen between 900 and 1,000 kgs/ha. Last season, upland yields in Texas were 18 percent below the national average; those in Mississippi were 29 percent higher.

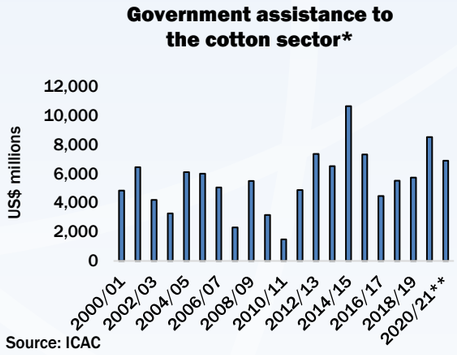
Raingrown cultivation in India generally produces 450/500 kilos per hectare, while in the African Franc Zone the range is lower and in other parts of the continent poorer still.

The casual observer might enquire why world cotton production could not be raised substantially, and made more economically sustainable, simply by elevating yields in the lowest yielding countries to those achieved in the most productive, or at least closer to the global average. It is true that therein lies one of the major challenges facing producers in less developed nations. With some exceptions, the effective coordination of research, extension and transfer of technology has proved difficult to achieve in a smallholder setting, most notably in an African context.

Even modest incremental losses in yield can mean the difference between economic sustainability and abandonment of the crop. On the other hand, a five-percent increase in yield may equate to a 100-percent increase in a farmer's profits.

State intervention

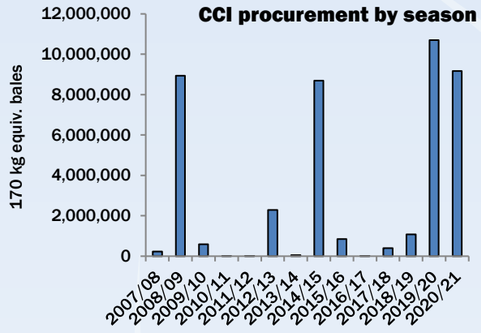
Last but by no means least, farmers' incomes and the longer-term stability of production are affected by government support in its various guises. Based on preliminary data, ICAC estimates that in 2020/21, governments around the world spent close to US$6.9 billion on cotton support measures. In 2014/15, that figure exceeded US$10 billion. Frequently this substantial expenditure is intended to mitigate the effect of price fluctuations so as to afford the producer a degree of security and confidence.



Source: ICAC

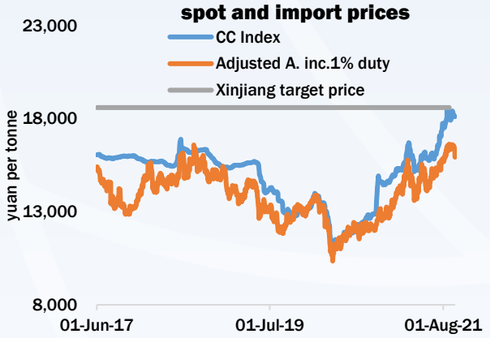
* Income and price support programs only. Credit and other assistance not included. **Preliminary.

The United States Loan was introduced in the Roosevelt 'New Deal' era with just such an aim in mind. In the 1980s, it was modified to incorporate the Marketing Loan – a mechanism intended to ensure the international competitiveness of US cotton, whatever the level of world prices. One should also mention the importance of federal insurance programmes for farmers in West Texas, the country's largest cotton-growing region and one prone to unpredictable weather, and thus wide swings in abandonment and yields.



India's Minimum Support Price for seed cotton represents another government commitment that is of significance to both the local and international markets. In periods of low prices, the Cotton Corporation of India intervenes in the market in defence of the MSP. On occasion, the Corporation has thus come to control a substantial proportion of the crop. Purchases in the 2019/20 season surpassed ten million bales (170 kgs) and those last season over nine million.

Farmers' returns in China's Xinjiang region are determined by a mechanism based on a target price that is (almost always) well above the local and international markets. Imports are regulated by a system of quotas, some mandated under the terms of entry to the World Trade Organisation, others issued at the discretion of Beijing in the light of prevailing market circumstances.



The practice in the African Franc Zone is usually to announce a national pre-planting seed cotton price. Gins are supplied by farmers within their designated catchment area. While this form of monopsony is the norm in West and Central Africa, elsewhere on the continent, a more liberal seed cotton market exists.

When prices are high and crops are large, both ginners and farmers can prosper. However, in recent seasons, the viability of ginners has been undermined by excessive competition for a limited supply of seed cotton. Any short-term gain for the farmer has been outweighed by the threat to the longer-term health of an industry of major socio-economic importance to rural Africa. The contractual relationship between ginner and farmer has often appeared fragile, with 'pirate buying' proving a disincentive for the ginner to provide much-needed inputs on credit to the producer.

While Franc Zone production set a new record in 2019/20 (one that may be matched during the season ahead), the contribution of countries Southern and East Africa to the continent's output is much reduced.

It would be difficult to exaggerate the importance of research as the underpinning of a successful modern cotton industry. The example of Australia is instructive in this regard. It is perhaps no coincidence that a cotton industry regarded by many as a global exemplar receives no state support other than funding for research that matches a per-bale levy on producers.

No abstraction

What can we conclude from this short survey of the factors that encourage producers to plant cotton? We can see that the economic sustainability of our crop is not a simple function of local or world prices. In reality, it is a far more elusive concept, involving yields, costs of production and government support, amongst other factors. At what level of international prices cotton production would be viable in a world devoid of any subvention is an intriguing question, but one to which we will doubtless never know the answer.

The more pertinent question to ask on World Cotton Day concerns the appropriate blend of price incentives, support mechanisms, research and access to technology that ensure the crop's future viability for the planet's millions of cotton farmers. For them, the economic sustainability of production is no mere abstraction. But the retail consumer also has a stake in this debate – if he or she envisages a future for clothing manufactured from a fibre that is renewable, bio-degradable and not dependant on fossil fuel extraction.

Cotton rolls up its sleeves

Elke Hortmeyer,
Director of Communications and International Relations,
Bremer Baumwollbörse

The sustainability of goods has been gaining in importance for years, and the discussion is deepening in every area of life. This includes the textile industry and the cotton sector. At the political level there are some developments in Europe that will lead to increased and stricter regulations for sustainable action, in both product manufacturing in general and the textile value chain in particular. As the most widely used natural fibre, cotton is an important player here. With this in mind, it is worth taking a closer look at developments in Germany and the European Union.

Regulations in Germany

In contrast to the general political discourse, which elegantly circumvents the fact that there is still no real definition of sustainability and that such a definition may not even be possible, the cotton industry must always present facts about its social and environmental impact. Profitability for the farmer must fundamentally, and at all times, be just as important as other factors affecting cotton's long-term viability as a textile fibre.

The current European and German negotiations on stricter controls and requirements in the field of sustainability have the potential to affect certain stages of the textile supply chain. For cotton, this starts with seed breeding and the farmer, which could have a large and possibly quite negative impact on the cotton sector, depending on how the regulations develop.

At the 35th International Cotton Conference, which took place virtually in Bremen in March 2021, Ms. Anusha Wahidi from the Federal Ministry for Economic Cooperation and Development (BMZ) explained the resolutions of the German Supply Chain Due Diligence Law (*Lieferkettensorgfaltspflichtengesetz*), which were then imminent and are now coming into force. She reported that less than 20 percent of German companies had voluntarily incorporated human rights principles into their business practices by 2020. The government has therefore made human rights due diligence along the entire supply chain a mandatory obligation for German companies, from the procurement and processing of raw materials through to manufactured consumer goods. Ecological and social aspects are included when they affect human rights, such as the supply of clean drinking water.

The law will be implemented step by step and will eventually also cover the activities of indirect suppliers. When companies discover human rights violations, they must take action. The regulations will apply to all sectors and there will be strong enforcement mechanisms, including fines and the possible exclusion from participation in public tenders. It is expected that the German law will serve as a blueprint for European regulations to ensure a level playing field for all companies, and European regulations are intended to ensure compliance with human rights at the beginning of the supply chain.

Ms. Wahidi explained that the European regulations to be introduced later will contribute to an intelligent mix of mandatory and voluntary measures to ensure the upholding of human rights globally. Moreover, there are already initiatives in train in Germany intended to help improve the sustainability of supply chains, such as the "Green Button" developed in 2019 for sustainable textiles. Another example is the Partnership for Sustainable Textiles which was established in 2014. The aim of the Partnership is to improve ecological and social conditions on the world textile market.

Europe-wide regulations

Outside Germany, additional challenges are looming for the textile chain in Europe, which will also be of importance for the cotton industry. One of these is hidden behind the concept of the Product Environmental Footprint (PEF). PEF is being developed by the European Commission in collaboration with experts as a method for measuring the sustainability performance of products. The means of determining environmental pollution and resource consumption should be standardised and at the same time comparable. As a primary sector identified by the EU, the textile industry should now also enter the race for climate neutrality and the circular economy with the help of PEF.

However, the Product Environmental Footprint has serious shortcomings when it comes to its evaluation criteria: raw material properties such as "natural", "renewable", "recyclable" and "biodegradable" are either not included in the PEF evaluation or are taken into account only in a marginal way. The lack of these criteria means that fossil fibres that are non-renewable and non-biodegradable do not receive any negative assessment during the evaluation. Their contribution to pollution from microplastics is not considered in the planned PEF assessment in the EU system.

Thus, there is a risk that products made from natural fibres will officially be rated worse than synthetic fibres in the future. This in turn could lead to a decline in demand for cotton, for example, as buyers from big brands are forced to look for alternative fibres with a supposedly smaller 'footprint' based on the index values.

Fossil fashion

In the midst of all this, the range of fast fashion continues to develop. The volume of clothing production has increased enormously, and with it the quick disposal of clothing. Fast fashion requires cheap raw materials, and cheap fossil fibres such as polyester make "throwaway products" possible. Cotton and other natural fibres such as wool are more expensive than polyester, so the enormous growth in "fossil fashion" is counterproductive for cotton and all other natural fibres.

These differences need to be resolved. Natural fibres already have good, though not perfect, solutions and answers ready. The renewable and biodegradable properties of cotton are of the utmost importance from an environmental point of view. Against the backdrop of the growing discussion on CO_2, it should also be remembered that as a broad-leaved plant, cotton binds CO_2 when growing in the field. Science and research are actively working on the cultivation and processing of cotton to meet consumer expectations for transparency in the supply chain.

Sustainability is very popular with consumers

As a naturally grown fibre and renewable raw material with the excellent property of biodegradability, cotton can really score here.

The cotton family knows the data well: between 70 and 80 countries produce cotton, it is a sun-loving plant and grows near the equator. Around 150 million people make a living from cotton cultivation and a large proportion of these people live in developing countries. Here, the natural fibre is often of immense importance as a cash crop and plays a principal role in livelihoods and income.

Cotton production does not just extend to different countries. It also spans different political, cultural and religious conditions, as well as hardly comparable technical standards and countless languages, even within some countries. Only a few crops can combine these worlds. Cotton is one of these.

Cotton is the most significant material within the broad family of natural fibres, with a share of around 80 percent. However, if we look at other natural fibres away from the world of cotton, there is another success story: the value of natural fibre production at the farm level was between US$50 and $60 billion in 2019, including around $30 billion for cotton, $10 billion for wool and about $2 billion each for jute and silk. Every natural fibre has different properties and is therefore used in a wide variety of products.

Despite the great benefits, which cotton shares with most if not all natural fibres, it will remain a challenge in the future to repeatedly emphasise the importance of cotton for the environment, civilisation and the economy in the context of a resource-saving circular economy. This should be based on the sensible use of data and facts.

October 7 is World Cotton Day. This is a great opportunity to discuss the fibre's excellence. It is time we all spoke up more for cotton.

A Natural Partnership

Together, natural fibres can transform the textile industry toward circularity and socially responsible consumption

Dalena White,
Secretary General,
International Wool Textile Organisation

The markets of the world like to compare one thing with another and in doing so, a sense of competition is formed. This sense of competition can in some cases stimulate innovation and creativity. However, it can also at times create a false sense of "us versus them."

This is the case we have today with sustainability and natural fibres.

Whether plant-based, such as cotton, or animal in origin, natural fibres have a lot in common. Both types have seen changes to their share of the world fibre market – captured in Chart A.

As recently as 1980, natural fibres – mainly cotton and wool – made up more than 50 percent of the world fibre market. If cellulosic fibres are added in, the total market share for the naturals was just under 70 percent.

By 2030, however, assuming current trends continue, the inverse will be true: polyester fibre, polyamide, acrylic and polypropylene will rise to 80 percent of the world fibre market, while cellulosic, cotton and wool fibre will together make up 20 percent.

The same trend is reflected in production (Chart B). With output set to rise to more than 130 million tonnes in total by 2030, we are producing more fibre than ever before. The main increase is for polyester, polyamide, acrylic and polypropylene fibres.

The main application of the majority of these fibres is clothing. A 2017 report from the Ellen MacArthur Foundation, an independent organisation whose remit is to speed transition to a circular economy, found that clothing represented more than 60 percent of the world's total textiles and this was expected to continue.

Connecting the dots, it is clear that in the past few decades we have been producing more textiles than ever before, and that the increase is largely in the area of synthetic fibres.

While there is a place for textiles of all fibre types, we need to take a good look at what we are doing when, each year, nearly 70 million barrels of oil are used to make the world's polyester.

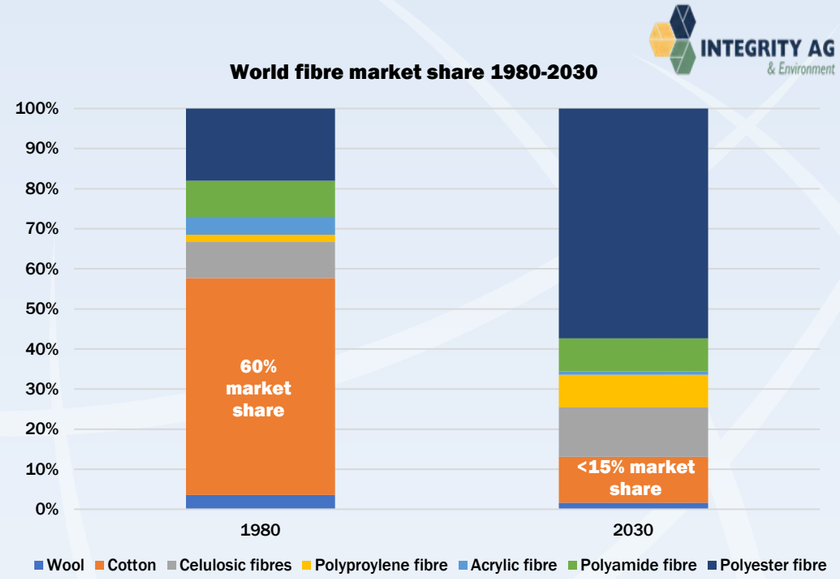
Natural solutions

The science on climate change is stark. The latest report from the Intergovernmental Panel on Climate Change (IPCC), the UN's climate science body, came out in early August this year. The IPCC's reckoning was grim: we are running out of time to limit global warming to 1.5°C – the goal set at the Paris Agreement in 2015.

Textiles are seen as so important to greener living that they have been flagged as a priority sector by the European Union in the EU's Green Deal and Circular Economy Action Plan.

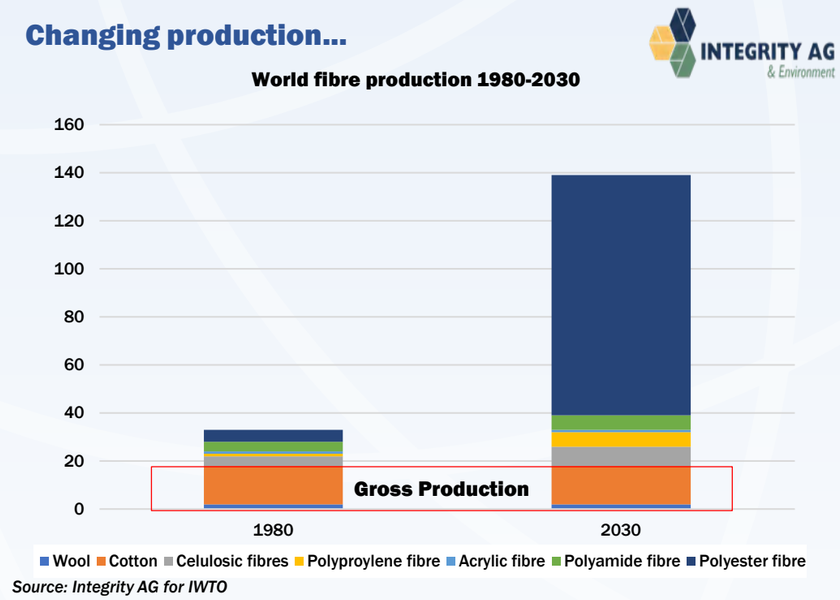
To secure climate stability requires a transition to a more sustainable and circular economy. For textiles, this means circular design ----, scaling up

Chart A



Source: Integrity AG for IWTO

Chart B



Source: Integrity AG for IWTO

recycling, and consumer-facing environmental-impact labelling are all under discussion. The latter will be based on product environmental footprinting (PEF). The EU is currently building its PEF methodology for apparel and footwear, through a multi-stakeholder process of which the IWTO is a part. It is very likely that soon, clothing (and other textiles) sold in the EU will be required to display environmental impact scoring on a label.

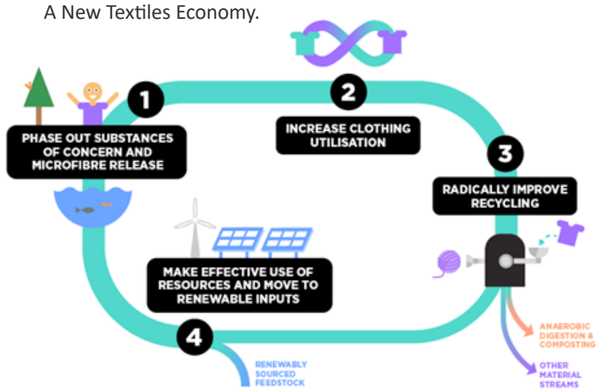
Because of the dominance, and relative inexpensiveness, of synthetic fibres, it is important that natural fibres make their positive attributes known and included in that scoring. These include:

1. inherent circularity – natural fibres, whether plant or animal in origin, are renewable and biodegradable;
2. the fact that natural fibres do not create or contribute to microplastic pollution;
3. positive socio-economic impacts, not least in developing economies.

Inherent circularity

Natural fibres are renewable materials that can be regenerated by living systems, rather than involving the extraction of finite fossil resources required to produce synthetic fibres. Raw materials produced on farms can be grown and regrown indefinitely, and biodegrade at end-of-life, returning their nutrients to the soil to be used again. This is the circularity inherent to natural fibres.

A New Textiles Economy.



Source: Ellen MacArthur Foundation

Today's stringent requirements for chemical processes such as dyes mean that processing does not negate this circularity. For example, in the case of wool that has been processed to allow it to be machine washable, research shows that the ready-to-wash processing actually enhances the biodegradability of the wool fibre.

Natural fibres do not create microplastic

There is increasing scientific evidence of the harmful impact from microplastic fibres to both planetary and human health. Synthetic textiles discharge significant amounts of these microplastic fibres through laundering and wear, releasing them into both terrestrial and marine environments, and the human food chain.

Studies have shown that a typical 5-kg wash load of polyester fabrics can release as many as six million microplastic fibres. It is estimated that, by 2030, synthetic fibres will represent 73 percent of fibre production, of which 85 percent will be polyester.

Natural fibres do not do this because, very simply, they are plant or protein-based. On the other hand, synthetic fibres are petroleum based, the same as plastic.

Positive socio-economics

Sustainability rests on two pillars: environmental and social. The globally agreed definition of sustainability is consumption that meets the needs of the present without compromising the ability of future generations to meet their needs, and within that context, the needs of the world's poor must be given priority.

Small farms provide livelihoods and a route out of poverty for millions of people. The production of wool, alpaca, cashmere, silk and cotton supports the financial and social wellbeing of rural farmers, communities, and regional supply chains across the globe.

Globally, the silk industry engages 21.5 million people and cotton more than 100 million. Alpaca sales are crucial to 46 of Peru's poorest provinces, where 35.3 percent of the population had an income insufficient to meet their basic needs in 2018. According to the OIE, 300 million of the world's poorest families depend on sheep and goat farming for their daily income.

In some cases, a single fibre underpins national prosperity. In Benin, for example, cotton accounts for 50 percent of the national export income.

In these ways, natural, farmed fibres contribute to a truly sustainable fashion and textile industry – one that doesn't exclude thriving traditional, localised and rural industries.

Future implications: natural responsibility

Natural fibres together can offer these and other solutions to the world's current environmental challenges. Contemporary farming understands how to care for the land so that it remains viable from one generation to the next. This is a responsibility that every farmer practises.

While there has been a massive shift away from rural life since the Industrial Revolution, agriculture remains a priority for societies around the world. As we begin to unlock other benefits of farming such as carbon storage and support for biodiversity, the importance of farmed fibres can make itself felt even more.

By working collaboratively, producers and manufacturers using natural fibres for the fashion and textile industries can map out constructive solutions for policy makers that can help consumers make truly informed choices about their purchases, and ensure that our industries also continue to see a sustainable future.

Dalena White is the Secretary General of the **International Wool Textile Organisation (IWTO),** the global authority for standards in the wool textile industry. The IWTO's members represent all stages of the wool textile pipeline. Through scientific research, wool textile education and knowledge sharing, IWTO ensures a sustainable future for wool.

Sustainable cotton: true sustainability by creating shared value

Nanda Bergstein,
Director of Corporate Responsibility,
Tchibo GmbH

In 2015, I visited a cotton project in South India that supports smallholder farmers to develop organic farming methods, ensuring fair prices and allowing them a living income. This experience was transformative because it taught me what a sustainable, respectful cotton supply chain could look like.

To learn more, I met directly with the project's beneficiaries. On the field, female cotton pickers showed me how to pull the cotton out of the plant bud. I was surprised by how tedious the work was and how long it took me to pluck an armful. Yet, the women told me what a difference it made to them to be able to work on these organic fields. They were healthier and had no itching or breathing problems because the fields were free of chemical pesticides and insecticides.

Equally impressive was my meeting with Kumar, one of the farmers. Kumar moved me to tears when he shared that he used to be so poor before transitioning from conventional to fair and organic cotton that he had to beg to sustain his family. He had felt worthless and dependent. Now, with the income he earned through the better price he received, he could take care of his family. And this made him proud.

It was impossible not to feel his plight and the ensuing relief. While listening to him, I suddenly realized: the garment I was wearing – made of cotton produced by the project – was connected to the dreams and hopes of the people with whom I was engaging. Suddenly, the shirt was not merely a shirt. It supported better livelihoods and agriculture in harmony with nature. The garment now had a completely different value to me. As we said good bye, Kumar said, "We grew the cotton in your shirt and are proud that you are wearing it. We are proud of our contribution, and we ask you to give us a face. We are not anonymous, unintelligent people somewhere in poor India. We are the ones who make sure that you and your consumers can wear such beautiful clothes. We deserve to be recognized."

Fast forward to 2021. This experience still shapes my perspective on what is essential for fair and sustainable supply chains.

I have been working in sustainability and human rights for 17 years, and am currently engaged at the German consumer goods and coffee retailing company Tchibo. Tchibo is unique in the industry. With a commitment to a 100-percent sustainable business, the company has been making its vision a reality for 15 years now.

Tchibo's journey in cotton started like many others, i.e., under the assumption that growing demand would drive the conversion from conventional to sustainable materials at scale. Year by year, we required our suppliers to increase the amount of sustainable cotton in our products. Indeed, today, 99 percent of the cotton in our products is more sustainable. We are one of the largest buyers of organic cotton globally.

Yet even today, far less than ten percent of cotton is produced organically. In retrospect, the idea that demand drives supply is not working.

So, where did we go wrong?

Cotton has a long history of inequality, power imbalances, and even slavery, with the essential, producing end of the supply chain remaining the most disadvantaged. Today, more than 90 percent of cotton farmers, around 100 million people, are smallholders who own less than two hectares of land, who depend on the income provided by cotton farming (Innovation Forum, 2015). While the fashion industry is booming (at least before the pandemic), the value created is not shared evenly, making smallholder farmers vulnerable in their livelihoods. The powerful experience I had in South India is unfortunately not the norm.

Economic viability presents a tremendous barrier to turning to sustainable, particularly organic farming, because farmers often lack the financial resources to invest. Moreover, the first years of conversion are particularly crucial and challenging for farmers. They first need to build experience in sustainable farming practices. In addition, access to non-GM seeds is a challenge, and cotton yield and quality may decrease in the first years of conversion. Thus, from a farmer's perspective, this shift can be risky.

So how can we grow the share of sustainable cotton that is greatly needed to support the planet's ecosystem?

Redefining the role and view of brands and retailers: moving from top-down to eye-to-eye

The first thing for us as brands and retailers is to redefine our role in the process. It is not enough to just be the buyer, maybe even with an unconscious bias of being "on top" of the chain.

Instead, we have to realize that the chain begins with the farmers. Their success shapes our success, increasingly so in the future when the effects of climate change will hit the supply chain harder, whether that be via drought, erratic rainfall patterns, or other weather incidents. Therefore, we need to actively support farmers' economic viability so that the supply chains remain available long-term.

Adopting a mindset of global empathy

Let me take this even further. I believe one of the most significant shifts necessary in sustainability and human rights is to adopt a mindset of global empathy. We as a consumer-facing industry have to get to know and listen to the perspectives of farmers, workers, and processors. Frankly, also, because there are many prejudices out there. In my work, I often encounter half-truths about what farmers and workers want or don't want. Frequently, the claim is something along the lines of them failing to understand the context the context and not wanting to change. In practice, I have rarely found this to be true. Most of the time, we haven't listened carefully enough, haven't used comprehensible language, or have disregarded the disabling factors in the environment that make it difficult to change.

True partnerships

Supply chain relationships must be partnerships that are defined by co-creation, joint responsibility and joint innovation. From a brand and retailer perspective, this also means ensuring fair purchasing practices. The initiative ACT on Living Wage has defined a framework within which to think about fair purchasing practices. They have been developed in co-creation with the feedback of supply chain partners and are highly recommended as a means of self-checking (ACT on Living Wages 2021).

Sharing risks and investments

Mitigating the risks for farmers and creating incentives to invest must be long-term purchasing commitments. To illustrate, it takes around three years before cotton is marketable as organic. In that time, farmers can only hope that the investment will pay off. This waiting period is especially challenging for smallholder farmers who often lack the financial resources to bridge the gap. On the other hand, fashion brands and retailers can decide from season to season and from product to product which materials to use, thereby changing their demand and buying relationships more easily. In the worst case, this can leave smallholder farmers hanging out to dry. Farmers need the security that someone will buy the cotton they grow (while in transition) at a price that justifies their investment. Purchasing commitments, therefore, are critical, as is paying a premium for the conversion and the end products of sustainable cotton.

At Tchibo, we have been moving towards this path of sharing the risk and the value of sustainable cotton, step by step.

As an example: the textile supplier Dibella, Fairtrade Germany, the German development co-operation GIZ and Tchibo started a three-year organic cotton farming project in India in 2020, with Chetna Organic and the support of the multi-stakeholder organization Organic Cotton Accelerator. The project is helping us understand the challenges and requirements of growing sustainable and high-quality organic cotton and how to work with a co-operative of smallholder farmers as good partners. We co-finance training and capacity building for farmers to increase the yield and quality of organically grown cotton; we provide high-quality, non-GM seed packages; and purchase in-conversion cotton supported by premium payments.

Sharing risk and value in sustainable cotton supply chains increases net incomes, financial security, capacity, food security, farmers' health, and livelihoods. Ultimately, it secures the supply of fair and organic cotton and increases its economic value even further. This is also important for those brands and retailers who are committed to sustainability from a purely commercial perspective. Only recently, Textile Exchange projected the demand for organic cotton to increase by 84% by 2030 (Textile Exchange, 2021). Therefore, supply needs to grow accordingly.

If I may express a wish, it is that we should all learn jointly about the different supply partners' challenges and start solving them together, instead of working separately or even against one other. And most of all, let us ensure that all partners in the supply chain take a fair share of the transformation price, instead of placing the sole burden on smallholder farmers. The great thing is, a number of companies have already begun moving in this direction. So, hopefully, scale will follow over time.

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Environmental emissions and impacts of textiles

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The problem

A decade ago, we showed plastic fibres from clothing contaminate shores across every continent from the poles to the equator, and linked the fibres to inputs of sewage that had been contaminated from washing clothes (Browne et al. 2011). Since then, fibres have been shown to contaminate people, wildlife and a broader range of freshwater (i.e. lakes, rivers, streams) and terrestrial habitats, with laboratory experiments showing animals that ingest plastic fibres can suffer mortality as a result of changes in their cells, tissues and organs and feeding habits.

While the use of washing machine filters and natural fibres instead of plastic are marketed as ecological processes that mitigate pollution by fibres, scientific evidence is lacking. This is because it is unclear what types of fibres and stages of the life-cycles of garments cause the largest emissions and impacts to wildlife, and how long different fibres persist for. Part of the problem has been that different types of plastic fibres are easier to identify with spectroscopy than certain cellulosic and animal fibres (Tedesco & Browne 2021) and no one has linked these to ecological impacts (Browne et al. 2015). Without better surveys gathering more accurate information about the sizes, quantities and types of fibres and organisms it is unclear whether the fibres used in experimental tests of toxicity and degradation reflect those found in the environment. The use of laboratory experiments is also problematic because they exclude natural variations in environmental stressors, use large densities of monocultured organisms that keep well in laboratories, and refer to metrics of the persistence of fibres and their toxicity to organisms that are not used in environmental surveys. This being the case, it is unclear what environmental processes are causing the particular sizes, type and mixtures of fibres and organisms that occur in the habitats, and data from the surveys and experiments cannot be synthesized into models to assess the emissions and impacts to the ecosystem over the life-cycle of the garment. Given that countries such as Australia classify any polymer made from plants, animals or plastic as a pollutant, we have a dedicated programme (called Benign by Design) that allows scientists and engineers from the University of New South Wales and Sydney to work with the public, industry and government to help them understand and manage the environmental emissions and impacts of fibres.

The solution

Our scientists and engineers complete systematic reviews, surveys, experiments and modelling for the public, industry and government in order to allow them to understand and manage the environmental emissions, persistence and impacts of fibres from textiles.

For instance, our textile engineers work with producers and factories to quantify the emissions of fibres when yarns and fabrics are made and sewn into clothes. Meanwhile, collaborations between environmental scientists, textile engineers and manufacturers (e.g. Eileen Fisher, Piping Hot, Icebreaker, Roxy, Quiksilver, Billabong) enable us to develop and use novel forensic techniques to quantify the fibres shed from clothes when they are worn and washed. They also use randomized controlled experiments in households and a dedicated laundromat to assess how different features of the wash (e.g. temperature, speed, detergent, conditioner, filters) and garment (e.g. type of polymer, yarn, fabric, seam, model or brand of clothing, filter) affect emissions of fibres to sewage. Through this we have worked with filtration companies (e.g. WexCo, USA; Environmental Enhancements, Canada) to re-engineer filters to improve their ability to catch cotton and polyester fibres (Figure 3; Browne et al. 2020). Because our laundromat has 40 appliances, the experiments can be done quickly and overcome many of the problems of existing studies that lack sufficient replicate appliances to support general claims about the features of the wash and garment that cause and reduce emissions of fibres.

Because sewage and stormwater are added to terrestrial, freshwater and marine habitats, our ecologists (toxicological, microbial, freshwater, marine, terrestrial) and chemists (analytical, environmental) work with facilities that treat sewage and stormwater (e.g. Melbourne Water, South Australia) and Environmental Protection Agencies (e.g. New South Wales, Victoria). Through this work, we use surveys with advanced forensic, spectroscopic, ecological, microbial and statistical techniques to quantify patterns in the sizes, types and mixtures of fibres and organisms present. Field experiments are then used across habitats to determine what processes of degradation and/or toxicity are causing the patterns of fibres and/or organisms to be present. This involves experiments to measure changes in the chemical, physical, mechanical, microbial and toxicological properties of fibres deployed in the environment, and their capacity to cause ecological impacts (i.e. reduced sizes or growth of populations of organisms; altered numbers and mixtures of organisms). Because the fibres carry a range of chemicals (e.g. antimicrobial, flame-retardants, mordants; Browne et al. 2013) and microbes (i.e. pathogenic bacteria, fungi, virus; Rotjan et al. 2019) we also do experiments to determine whether observed ecological impacts are caused

by the type of fibre, chemical and/or microbes that are present. As similar types of emissions and impacts of fibres can also occur when the clothes are discarded to landfill, our scientists and engineers are exploring opportunities to work with industries and governments to help them manage discarded textiles. By gathering and synthesizing robust data about the emissions and ecological impacts of fibres across the life-cycle of clothes, it is possible to determine what types of fibres (e.g. cotton, linen, rayon-viscose, silk, wool, polyester, nylon, etc) may be causing environmental problems and whether they need to be managed. Through this, we identify and test the range of possible interventions to determine if they reduce the emissions and impacts of fibres. This allows the public, industry and government to make decisions based on robust scientific evidence.

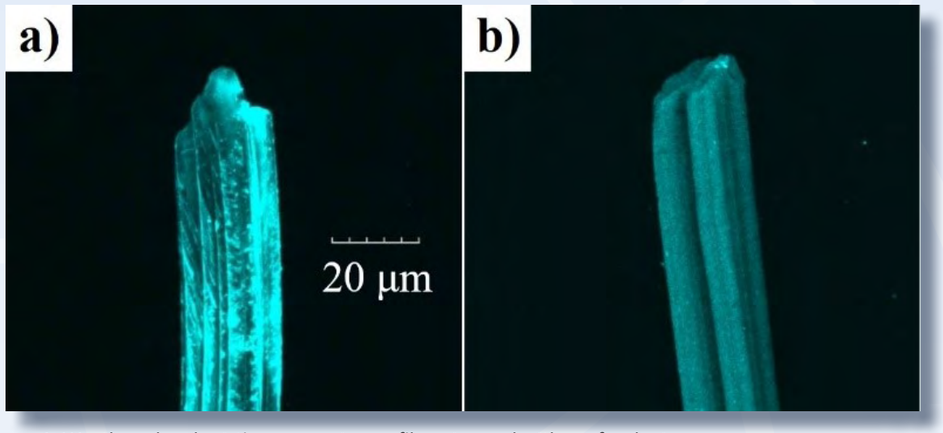

Figure 1. Weathered and pristine rayon-viscose fibres imaged with confocal microscopy (Tedesco & Browne 2020).

Figure 2. Our Laundromat with 40 appliances at the Water Research Laboratory (Manly Vale Sydney, Australia). This was supported by a strategic investment by the Australian Research Council and the University of New South Wales.

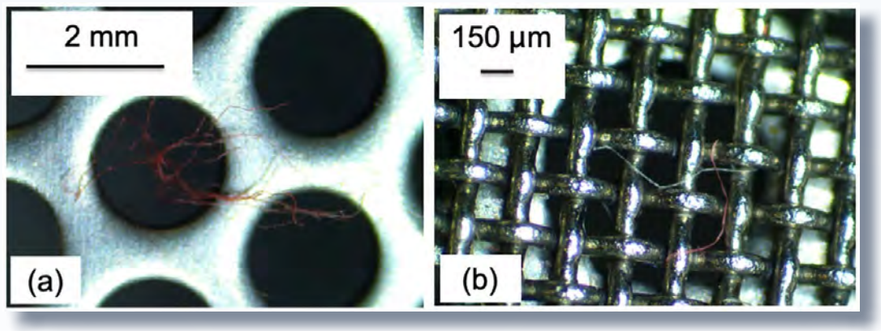

Figure 3. Polyester fibres caught by filters for washing machines with different sized pores.

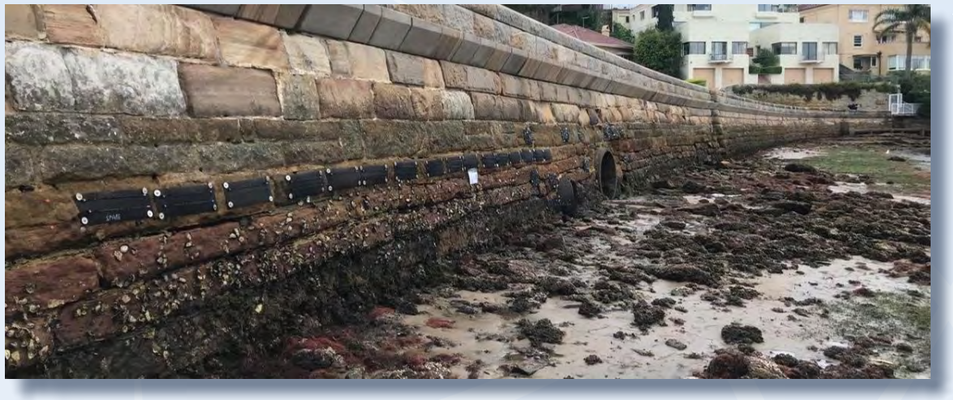

Figure 4. Fibres deployed in marine habitats in Sydney Harbour to investigate rates of chemical, physical and mechanical degradation (work by Bella Charlesworth and Charlotte Beloe, University of New South Wales).

Figure 5. Field experiments exposing marine organisms to contaminants to detremine if they cause cologocal impacts (Browne et al. 2016).

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Cotton: the most sustainable choice

Julio Cézar Busato,
President,
ABRAPA – the Brazilian Cotton Growers Association

As cotton growers, we must commit to sustainable production and thereby show the true value of cotton.

Cotton is a natural, biodegradable fiber that, produced in a responsible manner, has a lesser impact on the environment than synthetic fibers. This makes cotton the most sustainable choice for the clothing and textile products of today and tomorrow. According to data from the International Cotton Advisory Committee (ICAC), however, cotton has lost ground to synthetic fibers in the global market. From a market share of approximately 50 percent in the 1980s, we have dropped to less than 30 percent today.

Having undertaken the mission of putting cotton back into its prominent position in the global textile chain, we at the Brazilian Cotton Growers Association (ABRAPA) are working on two fronts: high-quality production that is sustainable and traceable, and the promotion of cotton consumption.

Since 1990, cotton production in Brazil has grown over 300 percent, rising from 717,000 tonnes in the 1990/91 farming year to more than three million tonnes in the 2019/20 season. This growth has been driven mainly by increased efficiency, with investment targeted at the most innovative production technologies without needing to increase acreage.

The constant advances in Brazilian production systems have allowed us to achieve some of the highest yields in the world from rain-fed crops. As a result, we have become the world's second largest cotton exporter with the potential to grow our share of the global market still further.

We understand that the process of improvement is continuous, and we aim to get better year after year. This is why one of ABRAPA's main initiatives is the Standard Brazil HVI (SBRHVI) program. This program is aimed at ensuring the quality levels of Brazilian cotton and guaranteeing the results of HVI testing performed by partnered cotton classing laboratories throughout the country. This network of labs is guided and monitored by ABRAPA's central laboratory, the Brazilian Reference Center for Cotton Analysis (CBRA), and the testing reliability rate is 96 percent.

Another priority for ABRAPA is traceability in order to offer transparency when it comes to all information on Brazilian cotton. With the use of the ABRAPA Identification System (SAI) we are introducing new technology such as QR codes on bale labels and providing full online data on the quality, origin and certifications of Brazilian cotton.

In addition to volume, availability and quality, we have sustainability. We are the largest supplier of Better Cotton in the world. We have achieved this position thanks to an exceptionally high proportion of growers who adhere to the Brazilian Responsible Cotton (ABR) certification program, which runs in partnership with the Better Cotton Initiative (BCI) and covers 81 percent of all domestic cotton production. Taking BCI's precepts as a starting point, our program includes an even greater number of social, environmental and economic responsibility

criteria, with strict protocols for sustainability, labor relations, good farming practices and other important indicators.

With these initiatives firmly embedded in the production chain, we turned our attention towards the end consumers. We began with the domestic market, which is our second largest customer behind China. Here too, our biggest competitor is synthetic fiber. Ten years ago, cotton had a 57-percent share of all the fiber used by the domestic textile industry. Today, that number has dropped to 46 percent.

In 2015, faced with this growing preference for synthetics, ABRAPA carried out a large market survey that found there was a lack of awareness among Brazilians in relation to the clothes they wear. Consumers recognize the positive aspects of cotton but are unaware that it is a natural fiber produced from a renewable source, is less harmful to the environment and is produced in a sustainable way.

Based on this study, we devised a strategy that focused on the benefits of cotton for consumers and aimed to engage society in order to value a product that is both socially and environmentally responsible. We understand that it is only when Brazilians value best practice and recognize the intrinsic properties of products made from responsible Brazilian cotton that will we be able to recover the market share lost to synthetics. This is the mission handed to the *Sou de Algodão* ("I am Cotton") movement launched in the most important fashion event in the country, São Paulo Fashion Week N42.

Raising awareness and mobilizing public opinion about Brazilian cotton's qualities have become as much a priority for us as increasing production and quality levels. We focus the *Sou de Algodão* movement on promotional, business and informational action which includes communication campaigns and initiatives to increase market competitiveness. With a view to the future, we approach universities with the aim of expanding the relationship between the textile industry and academia, encouraging creativity, providing experiences for future professionals and offering qualifications.

Currently, the initiative encompasses the cotton growers represented by ABRAPA, agents in the production chain and textile manufacturers that make items containing a minimum of 70 percent cotton. As the project progressed, we also started to include companies and sectoral associations that have solid initiatives in the sustainability area or that raise the banner for more conscious choices in fashion.

That is how the *Sou de Algodão* movement managed to reach more than 650 partner brands by September 2021, including spinning mills, weaving mills, clothing manufacturers, retail chains, social projects, non-governmental organizations, artisans

and micro-entrepreneurs. We set up and maintain an unprecedented channel of communication with end consumers where we show that by purchasing an item made from cotton they become part of a cause and are doing their part in accomplishing the mission of making a fairer and better world for everyone.

At the same time as we expand our connection with the domestic market, we are improving our presence in the global market. Since 2020, we have intensified the promotion of Brazilian cotton through the Cotton Brazil program developed by ABRAPA in partnership with the Brazilian Trade and Investment Promotion Agency (Apex Brasil). This work is supported by the National Cotton Exporter's Association (ANEA) and the Ministries of Agriculture and Foreign Affairs.

We have a physical presence in Asia with our office in Singapore and we have expanded our promotional activities into the main Asian markets – which absorb 99 percent of our exports. At the same time, we have reinforced our relationships with buyers through business roundtables and online events. Thus, we have been able to identify commercial demands and preferences that allow us (the growers and the domestic textile industry) to become increasingly agile in our customer service. This strategy has made an impact: in the 2020/21 season we exported 23 percent more than in the previous season, generating US$3.8 billion in revenue, an all-time record.

The path we have taken so far means we can confidently state that producers, sectoral organizations, manufacturers and retail brands can and should unite in a truly global alliance to promote this most valuable of fibers – cotton. In addition to the improvement of technical, production or commercial aspects, more investment is required to further spread and show the true value of our product. It is up to each one of us, as agents in the production chain, to tell the world that opting for cotton clothes and goods is to make the most responsible and sustainable choice possible. This is the banner under which we all come together.

Growing cotton for a better future, this is our motto.

Why is the US Cotton Trust Protocol important?

Hank Reichle,
President & CEO,
Staplcotn

U.S. COTTON TRUST PROTOCOL®
Trust in a smarter cotton future

A key goal of a grower-owned cotton marketing cooperative is to ensure we put our members in the best possible position to market their crop. In today's world, that doesn't just mean offering a desirable product with top-notch service, but that the transparency of our supply chain must also be increased. Brands and retailers are under more pressure to embrace sustainability, including proving they are doing their part to combat climate change and foster ethical working conditions. They are increasingly trying to discern how to gain more knowledge of parts of their supply chain that they previously knew very little about. They are looking for partners that will help them meet the challenges they have in complying with fast-changing governmental, NGO and consumer standards. What is really happening is that commodities such as cotton are becoming de-commoditized. The biggest factor is no longer exclusively the inherent physical properties or location of the commodity itself, but the management style under which that commodity is produced, distributed and converted. In such an environment, commodity producers, handlers and processors who acknowledge and embrace this change will be the most successful, and the others will achieve less. Fortunately for me as the CEO of Staplcotn, a US-based grower-owned cotton marketing company, our team works for growers who have a long and strong history of acting to meet the challenges and opportunities of the day and using responsible and modern production practices.

Although US cotton producers have traditionally led the world in innovation, quality and responsible production, our industry realized a few years ago that there was not enough awareness of their efforts to produce more sustainably grown cotton and that we needed an objective program to quantify and demonstrate these efforts. Launched in 2020, the US Cotton Trust Protocol is a farm-level, science-based program that sets a new standard for more sustainably grown cotton. It brings quantifiable and verifiable goals and measurements to sustainable cotton production and drives continuous improvement in six key sustainability metrics – land use, soil carbon, water management, soil loss, greenhouse gas emissions and energy efficiency.

Similarly, brands and retailers increasingly need reliable, verified programs that offer real data to prove compliance and protect their greatest assets – their brand names. The Trust Protocol seeks to provide them with these critical assurances. Brands and retailers will gain access to aggregated US cotton production data with sustainability credentials proven via Field to Market: The Alliance for Sustainable Agriculture, measured by the Field Calculator and verified with Control Union Certifications. The program aggregates year-over-year data on critical metrics including water use, greenhouse gas emissions, energy use, soil carbon, soil loss and land-use efficiency. US cotton producers' participation in this data-backed and third-party-verified program also provides another significant benefit – it draws attention to their commitment to "continuous improvement." Only producers see their individual data, but they can benchmark their results against aggregated peer data to see if they can make further

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improvements. Brands and retailers can use the aggregated data in their corporate footprint analysis as they already often do with other aspects of their production and procurement processes.

Many Staplcotn members and staff are contributing to this national initiative by guiding its design and implementation. We are also highlighting and promoting the Trust Protocol at every chance we get to our more than 6,000 members. It is a priority at Staplcotn to lead a grassroots effort not only to foster awareness of the program but to guide our membership through the process and get them fully enrolled. We have trained our field staff to work with our members to help them gain comfort and confidence in the Trust Protocol. We truly believe this is a worthy investment of their time and energy as it will put them in a better position to market their cotton and will aid their continual improvement.

Given our relationships with growers, we recognize that we are in a unique position to bring the critical participation that is required to make the Trust Protocol a success. About 300 US cotton producers were fully enrolled in the Trust Protocol for the 2020 crop, a substantial percentage of which are our members. The Trust Protocol's goal is to more than double US producer participation in 2021 – and that's our goal at Staplcotn too. Growth in Trust Protocol volume is extremely important at this early stage of the program given the interest that has already been created globally. Already, over 500 textile supply chain members have joined the program. Members include Levi Strauss & Co, one of the most recognizable denim companies worldwide, and its legacy brands Levi's®, Dockers®, Denizen® by Levi's®, and Signature by Levi Strauss & Co.™; Gap Inc. and its collection of purpose-led lifestyle brands Old Navy, Gap, Banana Republic and Athleta; as well as global apparel manufacturer Gildan. Also, the US Cotton Trust Protocol is already cooperating with the world's sustainability community. The program is aligned with the UN Sustainable Development Goals, it is recognized by Textile Exchange and Forum for the Future and it accounts for part of the US cotton industry's contributions to the Sustainable Apparel Coalition.

For Staplcotn, the Trust Protocol does at least three things that are strategically very important for our business. First, it helps our growers to tell their story and thus maximize opportunities with buyers. Second, it puts a focus on sustainability, which is closely aligned to the sustainability of our future supply of cotton. Finally, it offers our customers a reliable program to document their supply chains, which makes our product offering more comprehensive. We look forward to watching the Trust Protocol grow and evolve through the years and will do our part to make it a success.

Bayer's commitment to cotton: the natural choice

Jessica Christiansen,
Global Cotton, Sorghum & Alfalfa Manager, Bayer Crop Science

Growing up, I lived in a rural community and was active in many different areas of school, sports, and worked for small businesses in town. What I quickly realized, even at a young age (because it was further instilled in me by my parents and grandparents), is the power of commitment. Success comes through commitment. When I came to work at Bayer, I found that success in our cotton business is intertwined with our commitment to farmers. Their victories in fields around the world are our victories. Their challenges become our next problem to solve. And to do that every day we commit to breeding cotton varieties to maximize yield potential in specific growing regions and conditions, to supporting the latest innovations and technologies through continued support of our broad licensing strategy of biotech traits, and to continuing our substantial investments in the industry through a robust pipeline.

Serving a global market

You may know that Bayer Crop Science supports the global cotton market. What may surprise you is how we provide high value for large growers as well as small holder farmers, each in their own way. Growers across Africa, Mexico, Australia, India and Brazil all rely on our traits and crop protection. In Greece, Turkey and Spain, Bayer provides crop protection within those countries' non-GMO markets and delivers seeds via licensees. And Bayer's Bt cotton is the first biotech trait to be launched in the countries of Kenya, Nigeria and Malawi. Our business works to empower smallholder farmers so they may

reach their full potential by fostering reliable growth for their businesses and livelihoods, with cotton being an important crop for their economic independence and success. Our company goal is to reach about a hundred million smallholder farmers, with cotton helping to achieve that aspiration.

In the United States, where approximately 15,000 farmers grow cotton, we are the #1 seed brand and trait platform used by the #1 global lint exporter. Our US farmer customers are fast technology adopters, so we support them by providing the latest germplasm, biotech traits, crop protection products and digital tools to make their growing and harvesting operations more efficient. Likewise, our farmers in Australia and Brazil have embraced technology and our crop solutions to increase their yields.

Delivering world class innovation

Perhaps no example underscores our commitment to the cotton community better than Bayer's robust pipeline featuring the strongest germplasm and biotech traits in the industry. For more than a decade, Bayer, through our Deltapine brand, has advanced new genetics at a rate that is second to none with the release of more than 40 new varieties that have set new industry standards for lint yield and fiber quality in the US. Below is a summary of the innovations that have enabled our producers to increase yields and farm responsibly across a variety of environments:

- Herbicide tolerant traits such as **Roundup Ready®, Roundup Ready® Flex and XtendFlex® technologies (from 1997, 2006 and 2015)** enable higher yield potential and better quality lint while optimising crop protection inputs.
- **DryTough™ dryland cotton varieties** perform superbly in dry environments with no to low irrigation or limited rainfall.
- The high fiber quality characteristics of **Deltpine Select™ varieties** allow lint to be made into a wider variety of materials, thus providing a better return for the farmer.

Germplasm, selected via sophisticated breeding technology and providing a high level of naturally occurring protection in the plant, protects cotton from diseases such as bacterial blight, verticillium wilt, bronze wilt, and pests, including nematodes.

Our best-in-class breeding programme, in combination with the development of novel insect and weed control technologies such as ThryvOn Technology, will help provide solutions to the challenges facing growers for the coming decades. ThryvOn™ Technology will be the industry's first cotton biotechnology trait to provide season-long protection to the whole plant against tarnished plant bugs and thrips species through built-in trait technology. With Bollgard® 4 (pipeline product) farmers around the world will benefit from season-long protection through multiple modes of action against key lepidopteran pests. And, our fourth-generation of herbicide-tolerant cotton (pipeline product) is designed to help farmers control the pre- and post-emergence of grasses and broadleaf weeds in their fields through the use of glyphosate, dicamba, glufosinate and at least one additional mode of action.

Digital tools in agriculture are quickly becoming standard for our farmer customers, as field-specific data and analytics enable more customized, prescriptive farming. Bayer has the Climate FeildViewTM platform available for cotton growers in the US and Brazil, and in Australia it is in the beta testing phase. We continually test a wide variety of partner digital tools that may enable smarter cotton farming.

Setting new standards of sustainability

Everything we do with farmers in mind we do under an umbrella of sustainability. Right now, agriculture is at the center of discussions around climate change. As a sector, it is a major contributor to climate change accounting for nearly one quarter of all global greenhouse gas emissions. At the same time, the farmers we depend on for food, feed and fiber are among the most affected by the increase in adverse weather events, such as floods and drought that impact their yields and livelihoods. But agriculture is not simply a contributor to and victim of climate change, it has the potential to help solve the climate crisis through the widespread adoption of climate-smart practices that not only reduce emissions, but also remove carbon from the atmosphere.

At Bayer, we are committing to a 30% reduction of field GHG emissions from the most emitting cropping systems that our company serves. To help achieve that, Bayer has become the first agriculture company to offer farmers all the necessary technology for agricultural decarbonization such as seeds and traits, crop protection and digital solutions, cost-efficient Monitoring, Reporting and Verification (MRV), and the certification according to internationally recognized standards through programs like the Bayer Carbon Program (North America and Latin America), the Bayer Carbon Initiative (Europe) and the Australia Soil Carbon Initiative in Asia Pacific. Farmers participating in our carbon initiatives take advantage of short-term financial benefits as well as improved soil health through climate-smart practices they implement.

Specific to cotton, the Field to Closet initiative (a partnership between Jernigan Global and Bayer) has clear objectives to reward growers for sustainable cotton production, increase demand for cotton, and to provide consumers visibility from the cotton farm to the final garment. And in Australia, Bayer is partnering with Goanna Ag to offer cotton growers digitally enabled water-smart solutions in an effort to help the industry reach their goal of a 12.5% increase in water use efficiency by 2024, while also increasing cotton lint yield by 10%.

We want to make our vision of "health for all, hunger for none" a reality, and sustainability must be a key enabler of that. Producing higher-yielding crops with fewer natural resources and inputs is what we have always strived to do. Achieving those targets is not something that we will merely dabble in. It will be at the core of our business operations to fulfill society's demands, and even more importantly our planet's need for more sustainable agriculture. As the leader of the industry, it is our responsibility to drive this forward. We will do this by providing new products, products with a low environmental impact, better training and active promotion of sustainable practices supported by digital technologies – even if those products are not ours. We are in the business of helping farmers run sustainable farming for generations to come.
https://www.cropscience.bayer.com/
https://www.dekalbasgrowdeltapine.com/en-us/deltapine.html

Cotton fits what your consumers are looking for: material that's comfortable, versatile and sustainable. This natural fiber is grown from the earth and can be reused, recycled and even returned to the earth. It's a great fit for your sustainability goals – and when you choose to use cotton, you give consumers a reason to choose you.

Cotton. Natural, responsible, good.

Learn more about cotton's circular life cycle at cottonleads.org/circularity.

COTTON LEADS℠