

Cotton 2040: The Scenarios



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“The apparel sector faces some difficult and complex challenges if it is to transform itself into a vibrant, prosperous and durable industry, and securing a sustainable supply chain for cotton is key.”

— Sally Uren, CEO, Forum for the Future





Cotton 2040 brings together stakeholders from across the globe to integrate existing efforts and speed up the shift to a sustainable cotton industry. Its four scenarios were created by Forum for the Future, with the support of C&A Foundation, as a practical means of engaging key stakeholders to better understand the barriers to scaling up sustainable cotton, explore the risks and opportunities for the industry, and identify where collaborative action is most needed.

The journey to Cotton 2040 began in 2009 when Forum for the Future worked with apparel giant Levi Strauss & Co to develop its Fashion Futures scenarios for a sustainable fashion industry. These scenarios explored how climate change, resource shortages, population growth and other factors would shape the world of 2025 and the future of the fashion industry within it. They have since been used by fashion colleges worldwide to inspire students and by business to challenge existing strategy and provide a platform for innovation.

In 2012, Forum for the Future worked with The Initiatives for Sustainable Cotton (representing organic, Fairtrade and Cotton Made in Africa cotton) using Fashion Futures as the basis to develop future scenarios and a vision for the cotton industry.

Cotton 2040 builds on the insights and learning from Cotton Futures and Fashion Futures, and brings together stakeholders from across the globe to integrate existing efforts and speed up the shift to a sustainable cotton industry. Its four scenarios were created by Forum for the Future, with the support of C&A Foundation, as a practical means of engaging key stakeholders when they met in February 2015 to better understand the barriers to scaling up sustainable cotton, explore the risks and opportunities for the industry, and identify where collaborative action was most needed.

During the workshop, the participants identified major future risks and challenges, and areas for wider collaboration. Forum for the Future is now working with stakeholders across the cotton value chain to co-create and agree cross-industry work-streams to take the action plans forward and align activities towards a sustainable cotton industry for the future.

Key 'certain' factors likely to impact the future of cotton



'Certain factors' are driving trends with highly determined outcomes - that is, we can be relatively certain how they will play out over time.

These feature in all the Cotton 2040 scenarios, though emphasis may vary from scenario to scenario, as might the societal response to them.

Population growth

By 2040 the world's population is expected to reach 9 billion, from a baseline of 7.3 billion in 2015. Forecasters predict that the increase will be almost entirely in the least developed countries, while the population in the developed world will remain largely stable.

This growth will have significant impacts on the labour force and nature of the demand for textiles¹.

Resource scarcity

Key resources needed to support humankind are becoming increasingly scarce, and this only set to worsen as the population grows.

As resource scarcity increases, the costs for these resources are likely to become increasingly high and volatile, with massive impacts on the price of production and supply security. Volatile oil prices, for example, will have a dramatic impact across the clothing supply chain, with a knock-on effect on the cost of polyester (a by-product of the oil industry), pesticides, fertilisers and transport. Cotton production is also likely to become increasingly constrained as water becomes scarcer and pesticides more expensive and regulated.

Increasingly extreme climate change impacts

In developing the four Cotton 2040 scenarios, we have used the RCP6.0 scenario from the 2014 Intergovernmental Panel on Climate Change (IPCC) assessment, which is the higher of the two middle scenarios and assumes no additional efforts to constrain emissions². Based on this version, it is clear the climate change mitigation efforts have had little impact compared to what is needed; for instance, at current rates we will breach the carbon budget needed to keep temperature rises to 2°C by 2034³.

In the latest IPCC report, the link was clearly drawn between manmade climate change and weather extremes such as heat waves, droughts, floods, wildfires, and highlights the exposure human systems and ecosystems have to climate change².

Agriculture is very vulnerable to the impacts of a changing climate, cotton production included, and it is likely to suffer from the predicted rising temperatures, decreased soil moisture and more extreme weather events and flooding². Although effects will vary by region, the overall impact of climate change on global agriculture will probably be negative. This is likely to exacerbate food security concerns in the future, possibly leading to different land use priorities, such as growing food over cotton.

Spread of ICT

Information and communications technology, or ICT, is spreading at an exponential pace. In 2010, less than 1% of online retail sales were made via mobile devices (smartphone or tablet). In 2014, 37% of UK online sales came from these handsets, which represents growth of 4,000% in just four years⁴. In addition, in 2014 sales via desktop computers decreased by 3 billion, representing a switch to m-commerce that is expected to accelerate as mobile devices get cheaper and users become more comfortable purchasing with them.

By 2040, the landscape of ICT will be unrecognisable from what it is today, much like how the large, mainframe computers of the late 20th century were radically different to today's highly-connected, mobile-enabled, always-on world. Through the increased sophistication and spread of ICT, tracking product supply chains is becoming more accurate, less expensive and easier than ever. This increase in the adoption of ICT is shifting consumer expectations, with more demands for transparency and information about products and services.

Other key factors that may impact the future of cotton



Other factors will also have a major influence on the future, but we can be much less certain about their outcomes.

We have articulated these as questions, which we address across the scenarios. They play out differently in each scenario and highlight the different possible outcomes the industry and its stakeholders might have to contend with.

- How will the industry respond to resource scarcity, high/volatile input costs and climate change?
- Where will cotton be grown and used in 2025?
- We know ICT is likely to have an impact on purchasing behaviour, but how will ICT change cotton production?
- What type of cotton will farmers grow?
- Will there be more or fewer people involved in cotton production?
- What effect will changing factors have on the future supply and demand of cotton?
- How will the industry be structured in the future?
- How volatile will the price of cotton be?
- What happens to cotton garments at the end of their life?

Scenarios and why we use them

Although we cannot predict how the world will change over the next 25 years, we can be confident that it will be very different from today.

Future scenarios are a powerful tool to help us imagine different possible future worlds and to better understand how key trends are shaping our world today. They are not predictions or depictions of desirable futures that we wish to promote, and they do not represent our vision of a sustainable future; rather, they aim to challenge, inspire and excite, so that we feel motivated to plan for a better, more sustainable future.

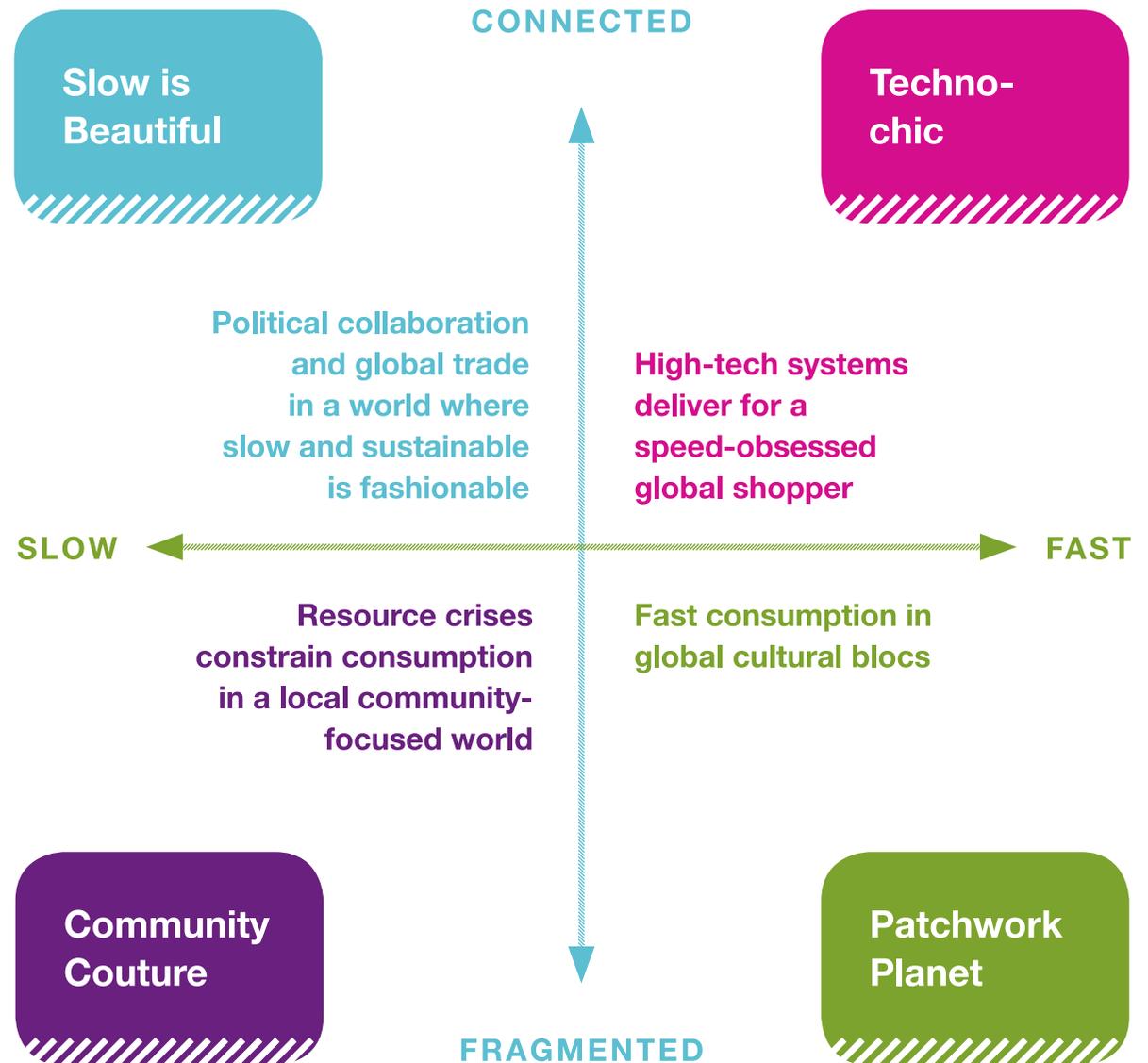


The scenario framework



The scenario framework

These scenarios were built on a framework that Forum for the Future previously developed with Levi Strauss & Co to explore possible futures for the fashion industry. That process identified two highly significant and uncertain factors — the pace of fashion and the connectedness of the world — and used them to generate the following framework of four scenarios. Expert interviews and in-depth research helped us to develop and adapt the future scenarios for the cotton industry to 2040¹.



¹ Interviewees included key cotton and fashion industry experts and stakeholders across the cotton supply chain. We are very grateful to everyone who contributed their time and expertise.

The scenarios: Community Couture

The world is struggling to cope with the impacts of climate change and the price hikes on resources caused by their scarcity, and it splinters. Communities strengthen as many strive for self-sufficiency. Nation states are closed and protectionist, focusing on securing food and energy supply for themselves.

2017

Lack of water disrupts production in factories across some regions in China.

2018

San Francisco opens the world's largest clothing library; the cotton section is the most popular.

2021

India develops the 'LowFlow' community self-sufficiency model – totally off grid, zero fossil fuel and focused on community-level production of key goods and services - which spreads globally. The first small-scale community cotton growing scheme is set up in a LowFlow neighbourhood in Rajasthan, selling its cotton to Delhi's luxury market.

2032

High oil, energy and labour costs push the price of the average cotton T-shirt to \$100.

2035

Small-scale, decentralised renewables have become extremely popular; in most communities over 50% of energy comes from these sources.

2039

The Amazon rainforest has all but disappeared in the panic land grab for food and fuel. A study reveals it has reduced to 7% of its size in 2012.



The scenarios: Community Couture



Land use

Land use is heavily biased towards food production, leaving little room for textile crops like cotton. Where cotton is grown, the farm sizes tend to be small and multipurpose, switching back and forth between cotton and food crops, as well as utilising cotton seed for food. Farms are often cooperatively owned by groups in the community, and almost always include renewable energy integrated with crop production.

Climate change impacts

There is no global agreement to address climate change, and every country tries to cope on its own. Ironically, this is a much more low carbon world; emissions are down significantly simply as a result of lower levels of global growth and industrial activity, as well as the growth of small-scale renewables at the local community level. The cotton industry is responding to climate change and resource issues reactively. Yields are difficult to predict as a result of erratic weather patterns and water scarcity.

Input costs

Input costs are prohibitively expensive, particularly for things like oil and water. As a result, supply of inputs tends to be prioritised for essentials like food. The cotton industry struggles with input cost and supply, which means that production yields are erratic. As a result, it is investing more and more in setting up 'remanufactories' focused on recycling cotton fibres, which are powered by small-scale renewables. The bulk of the cotton crop is organic, simply by virtue of the fact that pesticides and herbicides are so expensive.

Consumer preferences and demand for cotton

Cotton is still highly popular. Designers and manufacturers have simply shifted their focus to creating beautiful remanufactured cotton clothing. Bespoke virgin cotton garments exist, but are reserved for the luxury market. As a result, cotton garments are cherished and handed down to the next generation. When they buy new, people invest in clothing and textiles designed to last. Some have even taken to selling second-hand cotton clothing to boost their income. There is also an emerging market in second-hand luxury for consumers who aspire for better things but have limited spending power and live in a world of limited fabric supply. For the masses, there are plenty of clothes-leasing services (e.g. clothing libraries) and renewal options for existing clothes. Only the relatively wealthy can afford a washing machine; most people use community laundries and catch up with friends or take evening classes while they wait.

Cotton production and price

Cotton demand and consumption is a mixed picture. Virgin cotton fibre is affordable to luxury markets only and there is very little of it, although even luxury consumers have had to adapt to higher prices. 'CottonNu' garments are made from high-quality, affordable cotton from recycled fibres and sold all over the world. Sustainability is not prioritised as such, since people just want their cotton for the best possible price, although ironically we are now living in a more sustainable world simply as a result of extreme localisation of economic activity and lower overall levels of growth. Virgin cotton prices are sky high; second-hand and CottonNu garments are more affordable.

Cotton industry structure

The cotton industry structure has changed radically since the 2010s. Cotton farming has become prohibitively expensive. The best business opportunity in 2040 is cotton recycling and upcycling, and this is where the mainstream of the industry is focused. In order to encourage consumers to support this business model, take-back schemes are plentiful, providing money, vouchers or a service in exchange for used cotton clothing. Labour supply in the industry is plentiful with the masses of climate change refugees providing the bulk of the workforce – especially those that escape the global south where we've seen the most population growth and the most intense and widespread climate change impacts. Some communities, however, have taken matters into their own hands and grow cotton on small plots. Some of the processing of cotton also happens in local/regional community clusters: textile factories are often community-owned and run, and linked to the cotton farming cooperatives; however, this makes for very little volume. A particular challenge for these communities at the farming end is the lack of good quality seed. Because virgin cotton is so prized and so rare, community-owned farms and factories have 24-hour armed guards watching over the premises. The fallout for the communities in traditional garment-producing nations has been harsh, with lots of people out of work as the cotton-producing industry shrinks radically and restructures into a recycling/remanufacturing industry.

The scenarios: Community Couture



The role of government

Governments are fairly closed and nationalistic in their approach: 'protect your own' is the motto of many. Countries stockpile cotton where they can. However, there is a general lack of capacity and meaningful funding to solve many of the challenges of communities, as a result of failing to prepare early for the onset of climate change impacts. This means many governments are paralysed and communities are taking things into their own hands in terms of developing and providing localised solutions. This has created extremely strong community bonds in many places, and a general distrust of governments.

Technology

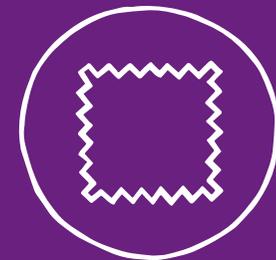
The key technologies employed in the cotton industry are focused on reuse. There have been breakthrough technological innovations in cotton yarn recycling, and recycled cotton fibre has replaced virgin cotton fibre as the mainstay of the industry. There is also investment in closing the loop on water use throughout the cotton supply chain, as well as no-waste pattern-cutting technology. At the farm end, there is a strong focus on developing more resilient, higher quality organic cotton seeds that can survive climate shocks and resource scarcity, and thereby increase the supply of virgin cotton to the market. However, so far this has only had limited success. We are still very connected digitally the world over, and communities use this to share best practice and organise around common cross-border interests. For example, there is a virtual community campaigning to resolve the Himalayan water crisis across India, Nepal, Bhutan, China and Pakistan.

End of life

At end of life, cotton is recycled meticulously. Not one scrap of cotton fabric is disposed of, since cotton fibres are far too valuable. Major CottonNu recycling innovation from Japan means 'as new' cotton garments can be made from recycled cotton fibres. Community recycling centres are opening up linked to nearby factories.

The best business opportunity in 2040 is cotton recycling and upcycling, and this is where the mainstream of the industry is focused.

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The scenarios: Slow is Beautiful

Slow food and fashion are the predominant mindset in this world, with consumption patterns driven by sustainability considerations. Consumption and environmental impact are closely monitored and highly regulated. Cotton has become a high-value product, and with resource scarcity and high input costs, high-quality cotton is looking increasingly like the most sustainable option. Consumers value cotton as a natural premium fibre and are willing to pay more for a smaller number of high-quality cotton products. Consequently, overall levels of production are down, but margins are higher and this sustains the success of the industry.

2016

Successful NGO campaigns mean companies are scared of being seen as unsustainable, and the demand for supplies of sustainable cotton rises significantly.

2020

A global climate deal is signed. Uzbekistan goes bankrupt after its export cotton crop consistently fails to meet sustainability standards on the world market.

2023

The global community creates trade agreements with input from scientists, sorting out the best climates for different crops to grow.

2027

Led by Europe's example, there is strong worldwide investment in renewable energy and infrastructure. Global sustainability standard 'SustainGrade' is launched.

2028

After more than a decade of massive investment in clean-tech by China, the USA and the EU, prices of ecologically-sustainable goods fall below the prices of their unsustainable, resource-intensive rivals across all sectors.

2036

Severe drought leads to water rationing across the world, with priority given to food production and personal consumption rations.



The scenarios: Slow is Beautiful



Land use

Land is prioritised for the production of food over cotton growing. Land is not used to grow biofuel due to early and successful global development of renewable energy that is not land intensive. Many farmers have shifted their crops from fibre to food; cotton is grown in drier regions that have more flexibility and lower input costs, whereas food takes priority in regions where water is more readily available. A global land-use organisation helps to organise international agreements to balance rural land use between food, fibre and forest.

Climate change impacts

The impacts of climate change are evident globally and affect business, policy and everyday life. The cotton industry has responded proactively and through internationally coordinated efforts. Water is increasingly scarce in Asia, South and Central America, and Africa. Seed research and irrigation technology is shared across the globe. Awareness of the interconnectedness of consumption and climate change is high throughout the world and drives sustainable production throughout the supply chain.

Input costs

Labour costs have evened out across the globe due to international minimum wage agreements. Energy is supplied primarily through renewables. The price of oil is high due to high taxes imposed, but this has little effect on the textile industry as fossil fuels have been phased out over the last two decades, both in terms of inputs and as processed into synthetic textiles.

Consumer preferences and demand for cotton

Cotton demand and consumption is sustainable. Brands build in high levels of transparency around where garments come from; 'nutrition labels' detail inputs into each garment. Brands curate and share personal stories around where garments come from and the lives of people who made them. When worn out, garments are recycled or remade into new ones.

Overall consumption is down due to resources constraints and the shift of values away from high-consumption lifestyles to slower, more durable fashion. Despite this, demand for cotton is high as it can be grown sustainably and is a natural fibre. Cotton's main source of competition is from other natural fibres such as flax, viscose and hemp.

The most highly valued type of cotton is virgin organic cotton, which has been taken to scale, encouraged by government support. SustainGrade cotton is the most popular and affordable, which meets an amalgamation of the best sustainability indicators from previous standards on sustainability and often is a blend of virgin and natural fibres. The concept of quality has evolved to take social and environmental factors into account.

Brands build and maintain their reputation as suppliers of fabrics from sustainable, trusted sources, which consumers can verify through easily accessible ICT.

Cotton production and price

Cotton is grown in regions most suited to growing it, particularly in the more arid regions where there is less water available for food production. Technologies are developed to maximise the use of water, such as advanced drip irrigation. The strongest 'hubs' are in India, Africa, North America and Turkey. Tajikistan is a leader in a luxurious high-end, extra-long staple fibre. Subsistence farming has decreased, as larger, more efficient farms have developed. Providing good conditions for workers has become a priority for these larger farms and labour conditions across the industry are monitored and regulated. International agreements on commodity prices mean farmers can have greater certainty on forward prices.

Cotton production levels are down overall, but the quality of produced cotton is significantly higher and designed for longer-term use. This means prices are consistently higher and producers make bigger margins. The industry continues to be successful.

Cotton industry structure

The cotton industry is globally interconnected and collaborative. Brands and retailers are investing more in cotton farming and the development of more sustainable practices, from agriculture to labour. Large clothing recycling plants have gone online around the world, using new technology to recycle cotton garments.

The scenarios: Slow is Beautiful



The role of government

Government has a prominent role globally in co-ordinating efforts, such as where cotton can be grown, what pricing mechanisms can be used, what information should be disclosed, how products can be marketed, and so on. Garments are produced in the most efficient way possible, owing to international trade deals. Work conditions are consistently better due to international agreements on minimum wage and working conditions.

Technology

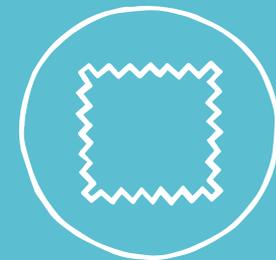
The main technologies used in cotton production are 'appropriate', tailored to the conditions specific to each region. The use of genetic modification (GM) technology is illegal in most countries. Farmers use advanced crop rotation techniques and other sustainable practices. There has been a shift to using heritage seed varieties, and research and development (R&D) focus is on propagating high-quality, condition-specific varieties suitable for organic growing, particularly in more arid regions.

ICT and trusted brand labelling helps consumers get transparent information about all stages of cotton production.

End of life

At the end of life, cotton is recycled in an efficient, streamlined way. Design for end of life is key in the fashion industry, and designers have the tools they need to plan for deconstruction and recycling.

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The scenarios: Techno-chic

The world is healthy, wealthy and ultra-high-tech. We have transitioned to a low-carbon economy earlier than the pessimists thought we would, all thanks to the scaling up of cost-efficient clean technologies. Globally, markets are open with very few trade barriers. Investment in R&D is heavy and distinguishes the winners from the losers in industry. Guilt-free, fast fashion abounds: people believe technology has erased the need to worry about 'overconsumption'.

2017

Fashion designers unveil 'mood-mimicking' clothes which change colour to reflect the wearer's mood. They become a global obsession and are replicated on the high street within days.

2019

The first global 'virtual' fashion week is a huge success.

2025

China ring-fences \$25b, and India \$14b, for R&D for zero-carbon textile manufacturing.

2027

'COO' - the new zero-carbon synthetic fabric - takes the virtual catwalks and online stores by storm.

2031

Carbon emissions and water consumption are down by 50% compared to 2011, exceeding expectations. This is thanks to the scaling up of renewable technologies such as hydropower, wind and solar, as well as massive gains in energy efficiency and CCS technologies coming on board.

2035

The milestone of 100% digital fabrication is marked in Sri Lanka, making the country the most advanced and cost-effective textile producer in the world.



The scenarios: Techno-chic



Land use

Pressures on land have eased somewhat: there have been significant efficiency gains in agriculture and food distribution systems, and in 2040 we live in a world of zero waste. But there are a lot of people on the planet and it takes real effort to keep all the systems working smoothly. Food is grown underground and on vertical farms; but since synthetic fabrics have advanced so much, less land is needed to grow plants like cotton and flax for the production of textiles. Cotton is still grown, but this is a much smaller volume than in the past.

Climate change impacts

We have managed to stay within a 2°C rise in average world temperatures by 2040, and in the process have adapted to lower carbon lifestyles. However, that has not helped ward off the impacts of climate change, which are hitting hard due to carbon emitted before a global carbon agreement was struck and economies transitioned. Day-to-day life is punctuated by increasingly intense storms, wide-ranging wildfires and more drought, among other changes. We need all the technology we can get to ensure people are living comfortable lifestyles, regulating erratic temperatures and investing in expensive infrastructure solutions that protect us from extreme weather.

A smaller, more high-tech cotton industry is responding to climate change and resource issues through technology-focused innovation, as are most other sectors of the economy. Because cotton is an expensive, high-end material, cotton growers are able to invest in GM that ensures drought- and flood-proof seeds. Further up the supply chain, clothes are designed and made to require no washing. Synthetically-coated cotton is the pinnacle of luxury 'natural' fabric.

Input costs

Due to climate changes, more sophisticated inputs are demanded by growers to ensure good yields and healthy crops; but at the same time, these inputs are much more expensive than they were before. Oil is no longer the primary energy carrier, although it is still important in terms of the petrochemicals required to develop the latest generation of pesticides and herbicides. Alternative energy is much more affordable nowadays, particularly in places in the southern hemisphere that have scaled up big solar. However, this advantage is somewhat offset by the high cost of labour in the cotton industry: gone are the days when garment production was done by low-paid, unskilled workers; in 2040 it is all about high-skilled 'agroscientists' and digital fabrication. But the cotton industry still manages to survive and thrive despite lower overall volumes. This is thanks to its high margins and investment in seed technology that reduces dependence on water, pesticides and other inputs. GM technologies are widely used and tightly regulated.

Consumer preferences and demand for cotton

Garments are no longer flying off the shelves, but out of 3-D printers, and are often delivered by drones. To consumers, the shopping experience feels 'guilt-free' from the perspective of environmental impacts, though few ask themselves what unintended consequences such rampant consumption might be having on societies. Global brands are big: there is very little local brand differentiation possible in this hyper-connected world where the line between consumer and producer is blurred, and consumers are used to hacking designs to adapt things exactly how they like them.

Cotton consumption is significantly lower, but steady. It caters to a small niche of people who crave natural, heritage lifestyles

and are rebelling against what they see as a technology-obsessed, alienating society. These consumers are willing to pay good money for a luxury, natural fabric like cotton. The cotton industry has, however, had to adapt to some important developments, such as wearable technology. The most popular cotton products on the market take the natural, wellness trend and spin it into high-tech offerings, such as clothes that purify polluted air, provide nutrients to the wearer and repair themselves when they wear out.

Cotton production and price

Cotton production levels are lower because of tough competition from innovative synthetics. However, the industry achieves high margins because cotton is processed using high-tech methods and is a more luxurious fibre commanding a very high price.

Cotton industry structure

Competition from synthetic fibres has seen the cotton industry shrink dramatically. The industry has had to restructure extensively in the run up to 2040, with a large percentage of traditional players failing along the way. Many lost their jobs, causing a big disruption globally – the transition years were extremely tough, particularly on the smallholders whose livelihoods were not resilient to begin with. But the 'winners' who remain do well for themselves. The industry is more streamlined and efficient than ever before: numerous intermediaries and highly-decentralised production are a thing of the past. The now smaller core has had to professionalise rapidly in order to survive. This means fewer players in the supply chain overall, and larger farms that are directly connected with buyers. Digital tracking systems make it all 100% transparent. High-tech seeds mean cotton is able

The scenarios: Techno-chic



to grow in more places, so farming is typically closer to processing and manufacturing. The notion of sweatshops is no longer familiar in popular culture, not least because production is mostly automated and digitised. The people who still work in the industry are mainly highly-qualified professionals rather than low-skilled labourers. It is a prestigious job to have and these workers have a lot of leverage in the industry. Asia is a key geographic location and bills itself as the artisanal and heritage hub of cotton production.

The role of government

Governments ensure markets are open and trade flows freely; most countries have seen big economic benefits from the ability to share technology and innovation easily across borders, so protectionism is out of favour. However, governments do influence R&D and innovation, channelling investments into areas they see as high priority for economic development. In the context of fibre, this often means supporting the development of alternative, synthetic fabrics that can help achieve national-level goals, such as going zero carbon.

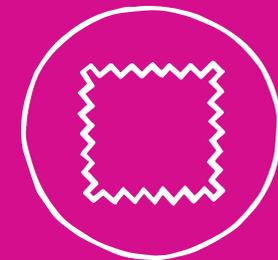
Technology

Sophisticated technology permeates every stage of cotton production and consumption, from high-tech seed development to smart irrigation systems, from digital fabrication methods to wearable technology applications that consumers love. Digital platforms help make the supply chain super-efficient and therefore cost-effective. In an effort to compete with synthetics, the cotton industry has invested heavily to go zero carbon, including in the use phase of the garments it sells to consumers: self-cleaning coatings make clothes washing a thing of the past. Waste is a no-no, since cotton fibres are expensive and therefore the industry goes to great lengths to recycle them. Not to mention that consumers ask for extensive customisation, so the industry has had to structure itself to allow for made-to-order modular production to cut down on waste. Apparel brands provide web-based patterns that allow consumers to customise clothing design, which is then sent on to the local and regional manufacturers to produce.

End of life

At end of life, cotton is always used as a resource for something else. All clothing is designed for degrading, disassembly, remanufacturing and/or reuse. From time to time there are scandals involving synthetic fibre pollution where closed-loop systems go wrong, but clothing waste to landfill is rare.

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The scenarios: Patchwork Planet

Regional self-sufficiency predominates in this fragmented world, which is broken into cultural 'blocs' with unequal economic performance and conflict over scarce resources. Trade is tightly controlled by governments and its barriers (tariffs and quotas) are high.

Some regions produce a lot of cotton for local consumption and trade, though this is offset by other regions which no longer produce any. Where it is grown, cotton production levels are high and the fibre is in great demand. Consumers want fast, flexible fashion that reflects their local identity and supports the regional economy.

The cotton industry is responding to climate and resource shocks in a reactive, patchy way. As climate impacts worsen, the industry is collapsing in some regions and struggling to adapt in others, resulting in increasing resource conflicts between regions.

2016

Eight major coordinated terror attacks in cities across North America and Europe lead to unprecedented levels of security and suspicion.

2017

The World Trade Organisation disbands, buckling after heavy trade disputes between China, the EU and the US.

2020

Oil prices become very volatile; drastic price shifts persuade people to start exploring more local and secure production alternatives.

2021

India imposes its fourth consecutive annual cotton export ban.

2026

Scandal erupts when Greek 'seed spies' are caught trying to steal cotton seed technology in Turkey.

2034

Four years of drought lead to cotton growing being abandoned throughout large tracts of South-East Asia; whole communities, including factories, are deserted as populations of climate refugees leave for cities or more fertile regions.

2039

Resource conflicts erupt between Greece and Turkey, and increasingly in other regions, over food, water and other commodities, including cotton.

The scenarios: Patchwork Planet



Land use

Land use is divided between food production, energy and fibre, usually through strict government control. Where conditions are good, food and cotton are both grown. In many regions, however, food is prioritised, leading to shortages of cotton and people turning to alternative fibres. Some trade agreements enable non-cotton-producing countries to obtain it, though supply can be unreliable due to protectionist policies. The scale of cotton farming is typically larger than it was in the early part of the century, and highly mechanised.

Climate change impacts

The industry is responding to climate change and resource issues in a reactive, self-interested way. Climate impacts are hitting hard, with more extreme weather, increasing water scarcity and falling yields. Disruptive production shocks undermine the industry and regions respond in different ways. As climate impacts have increased, agricultural yields have fallen, particularly in places where there isn't money to invest in adaptation. In these places, the cotton industry has shrunk, as acute food and energy security issues lead to the prioritisation of land use for food, biofuels and solar energy. In some regions the industry has disappeared altogether: cotton growing and production was abandoned in large tracts of South-East Asia after consistent years of drought and floods. Whole populations have become climate change refugees, leaving for the cities and more fertile areas. These regions turn to other fibres or look to import from productive regions.

The more successful countries invest in seed technologies that help their cotton crop adapt to climate change. Some regions, such as China, focus on GM techniques, while others, including India, use highly-specialised plant breeding. Submergence-resistant cotton is the norm in low-lying areas

prone to flooding, for example, and temperature-adaptive cotton predominates in places where there are a lot of extreme heat events.

Input costs

Input costs are moderate, often maintained through government intervention. The cost of oil is high, but most economies have transitioned away from reliance on fossil fuels to more locally-available alternatives. Africa invested heavily in solar technology; other regions rely on nuclear, biofuels, solar and wind. Government controls maintain prices that are affordable. Labour costs are low, due to cheap labour from climate change refugees, the increased mechanisation of farms and production processes.

Consumer preferences and demand for cotton

Cotton demand and consumption is fast-paced and locally-flavoured. Consumers want fashion that reflects their regional identity. Companies provide clothing with a strong local heritage; globally influenced fashions are met with disapproval and suspicion.

Citizens are 'fashion engineers': cheap DIY sets help people make their own outfits and accessories out of locally-available materials. Retailers offer strong local presence and identity, 'fashion upgrades' to local trends, virtual personalisation and fast delivery. Consumers are focused on getting what they want, when they want it, and are less concerned with the sustainability of production.

Where cotton is available, demand is high, and the most popular (and accessible) is locally-grown. This leads to increasing resource conflicts as some regions become less able to produce to meet demand due to climate change

impacts. Some countries in South-East Asia, where demand exceeds local supply, are seeking to capture more cotton from abroad, but supply is volatile due to protectionist policies.

Cotton production and price

Cotton is grown in regions around the world. Many countries celebrate it as a 'local fibre'. The cotton labour force is smaller than it was 20 years ago. Advances in technology mean cotton production is less labour intensive. Many countries have had to invest in technology in order to move manufacturing closer to consumers.

The labour pool and skill capacity varies across countries: in some regions cotton production is thriving, whereas in others it is in decline.

Some Asian countries, where demand is outstripping localised supply, are also seeking to capture more cotton from abroad. Cotton farming is typically done on a very large scale on highly-mechanised farms.

Cotton industry structure

The cotton industry structure is radically different, with national entities playing a dominant role. Global cotton traders' monopolies have been broken up in favour of national and regional players. Global brands still operate, but with region-specific marketing and supply chains.

The scenarios: Patchwork Planet



The role of government

Government intervention is heavy and preoccupied with narrow self-interest. Countries and companies jealously guard their Intellectual Property (IP) against seed theft. Crops in producing regions are often protected by the military, as cotton is seen as a key strategic asset, especially in water scarce regions.

Technology

The key technologies used in the cotton industry are the ones that maximise yield. There is a high degree of acceptance of technological intervention in general. Seed policies are often nationalistic. GM is widely used in many regions to adapt to climate change and water stress (but banned in some regions). Countries guard their cotton seed IP jealously, but despite this seed theft is rife. Cotton coatings reduce the need for washing and ironing, and people use waterless washing machines. Track-and-trace supply chain technologies work in individual regions. There is, therefore, a lot of investment in technologies designed to deliver yield improvements.

Thanks to ICT advances and regionalised production, supply chains are shortened so cotton products arrive on the market swiftly.

End of life

In many regions, cotton and resources are incorporated back into the supply chain at the end of life; however, in some countries it just gets sent to landfill. In other areas, cotton is recycled and combined with virgin cotton for better quality re-usable cotton, or sold to regions that cannot produce their own for recycling and use in their markets.

The cotton industry structure is radically different, with national entities playing a dominant role in the industry. Global cotton traders' monopolies have been broken up in favour of national and regional players. Global brands still operate, but with region-specific marketing and supply chains.





These four scenarios were used by industry stakeholders to identify risks and opportunities facing the cotton industry to 2040, and priority areas for collaborative action.

Details of the priority areas for action being addressed through Cotton 2040 are described in “Cotton 2040: Case for Action”, available on <https://www.forumforthefuture.org/project/cotton-2040/overview>





Cotton 2040 offers a unique opportunity to the industry to address current and future challenges, so that the impact of its actions is more than the sum of its parts. All parts of the value chain need to be involved. If you are a part of the cotton sector, you have a role to play. Join us in the next phase in helping to create a more sustainable future for cotton.

Cotton 2040 is led by Forum for the Future, and made possible through the support of C&A Foundation. It is engaging widely with stakeholders throughout the cotton and apparel industry, including brands and retailers, standards, cotton producers, NGOs and more.



Forum for the Future

Forum for the Future is an independent non-profit that works globally with business, government and other organisations to solve complex sustainability challenges. We aim to transform the critical systems that we all depend on, such as food and energy, to make them fit for the challenges of the 21st century. We have 19 years' experience inspiring new thinking, building creative partnerships and developing practical innovations to change our world. We share what we learn from our work so that others can become more sustainable.

System innovation is at the heart of our strategy. One of our key approaches is creating innovation coalitions, bringing together groups to solve bigger sustainability challenges - including those that work across whole value chains. The Sustainable Shipping Initiative (SSI), Tea 2030, and the Protein Challenge 2040 are just some examples.

Discover our stories and what we've learned about building a sustainable world at www.forumforthefuture.org, or follow us on Twitter (@Forum4theFuture) and LinkedIn.



C&A Foundation

C&A Foundation is a private global foundation that addresses the systemic challenges of the apparel industry. It is working to transform the apparel industry into a fair and sustainable industry that respects the rights of workers, improves livelihoods and conserves the environment. Affiliated with the global clothing retailer C&A, the foundation supports and actively drives initiatives that help transform the way the industry works.

For more information or to get involved, contact Charlene Collison on c.collison@forumforthefuture.org

You can also find information on Cotton 2040 at: <http://www.forumforthefuture.org/project/cotton-2040/overview>