



Cotton tales

Cotton is universally regarded as a 'good' textile, but are its ecological credentials really up to scratch?

Kate Fletcher investigates

PEOPLE think – and intuitively feel – that cotton is a 'good' fibre for the environment. It is the single most popular textile fibre – we consume almost 20 million tons of the stuff in the world each year and there are well over a million references to cotton on the web.

It has a rich and influential history and is produced and consumed globally. Yet cotton's production and consumption is frequently environmentally damaging and socially divisive, with major impacts in terms of land, water, chemical use and people's health and well-being.

It is too simplistic to say that cotton (or even organically grown cotton) is good for the environment. But neither is cotton all bad. The cotton story is a really useful way to begin thinking about the lifecycle, to ground what can be sometimes be seen as abstract concepts in an entirely real, earthy hairy fibre.

Lifecycle thinking is central to decision making in ecodesign as it represents the complete range of impacts (on people and the environment) associated with a product. Each part of the lifecycle, beginning with design, continuing through manufacturing, distribution and consumer care, affects all other parts. And so to prevent shifting resource consumption and pollutants between different lifecycle stages, the 'whole' has to be considered. The mercerisation of cotton is a good example of how more impact in one area can lead to less impact in another part of the chain. Mercerising greatly increases its lustre, strength and dye absorption properties of cotton. It involves dosing the cotton fibres with a solution of sodium hydroxide and the process itself uses energy, water and emits a strongly alkaline waste water which has to be treated prior to discharge. However after being mercerised, cotton takes up dye far easier, resulting in dye savings of up to fifty per cent. Its fibre strength is also doubled, meaning that the fibres are likely to be more durable. Thus it is only by seeing the big picture, that a non-critical and slightly obscure chemical process may be seen to bring positive effects.

COTTON CULTIVATION

The total area of land dedicated to cotton growing has not changed significantly since the 1930s but in that time

output has tripled. Intensive cotton production causes a range of environmental impacts, mainly in cotton producing nations. These range from reduced soil fertility, water pollution, loss of biodiversity and health problems associated with exposure to pesticides.

Cotton is vulnerable to insect attack and is normally grown as a monocrop. To sustain it, large quantities of pesticides and fertilisers are needed, some of which are acutely toxic and are nerve poisons and others which deoxygenate the water to such a state in which it can no longer support animal life.

In addition, cotton is a thirsty crop. It is estimated that for every kilo of cotton produced between 7,000 and 29,000 litres of water (depending on climatic conditions) are needed.

Water used for cotton crop irrigation is diverted from other purposes, such as food production, and can adversely affect the water balance as has been seen in the area surrounding the Aral Sea, for example.

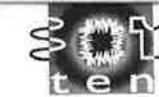
While alternatives to conventional cotton growing exist (such as organically grown and genetically modified varieties), their lifecycle implications are unclear, particularly where difficult trade-offs need to be made, such as between pesticide use on the one hand and land availability on the other.

Two types of genetically modified (GM) cotton have been introduced in the last few years: Bt-cotton which contains a gene that enables the plant to produce its own pest-killing toxin, and herbicide resistant cotton developed to tolerate specific herbicide applications. The purported benefits of both of these varieties lie in the reduced levels of pesticide application required.

However, like all GM technology there are concerns about pest resistance and that these genes will transfer to, and become established in, wild relatives of the cotton crop, with major implications for biodiversity.

In contrast, organically grown cotton is produced in agricultural systems which do not use synthetic pesticides, fertilisers, growth regulators or defoliants and makes up a tiny part of the annual market (<1%).

Its development is still at the experimental level with lower quality and lower yields than for conventionally grown fibre. It has shown that the environmental costs of growing conventional cotton are roughly twice those of organic cotton.¹



'Cotton's production and consumption is frequently environmentally damaging and socially divisive, with major impacts in terms of land, water, chemical use and people's health and well-being'

The benefits arising from the differences between the two techniques effects on soil erosion, pesticide use and water consumption.

It is also worth noting that production and processing systems which take account of environmental and social health of the lifecycle are important to the organic movement. Meaning that it is not enough for cotton to be grown organically and then processed in a conventional, polluting system.

COTTON PROCESSING

Cotton contains many impurities (seeds, dirt and plant residues) and in order to convert the cotton crop into useful textile fibres which can then be further processed, it requires ginning. About one third of the raw material is cotton fibre, the rest is seeds and impurities which is machine picked – so practice in the field influences health, safety and environmental issues in the factory.

After ginning, the cotton fibre is spun and knitted or woven into fabric.

Most yarn and fabric is manufactured by mechanical methods and key issues here are energy use, waste production and the generation of dust and noise. These impacts occur for all fibre types, not just cotton, as do many of the processes in fabric finishing. While some finishing processes are essential (such as the removal of size from woven fabrics), other processes, such as bleaching and dyeing can be dispensed with. The implicit suggestion here is that we can 'do without' colour. However, eco design also has a major commitment to people and their well-being and colour and its cultural, psychological and spiritual is a crucial part of this.

Around half of all cotton is dyed with reactive dyes. While these dyes have good fastness and produce bright shades, they have an especially poor exhaustion rate and can, in the worst case, leave up to 50% of the dye unfixed, which is then flushed away. These losses are an integral part of the dyeing process and are not as a result of poor dyeing.



To join the TEN discussion group, email: mailbase@mailbase.ac.uk with no subject, but with the following in the main text:

join TEN
firstname
lastname (your details)