

4. Textile Production

The reason for attributing value to cotton through quality assessments is to gain premiums (or discounts) from the market on the basis of that cotton's suitability for particular end-uses. In the production of traditional textiles, conversion of fibre to textiles starts with the spinner, for whom price and quality are key attributes of the product they purchase. Price and quality are highly related; higher quality means higher price. Higher quality fibre means higher quality yarns and fabrics (finer, lighter, stronger, more even, cleaner) and generally better productivity in the mill (better machine efficiency, less waste, fewer quality rejections). Here, we use the spun yarn attributes that generate differences between the fabric that is made into a pair of jeans and the fabric that is made into a light summer shirt to illustrate.

Fabric Quality

Leaving aside the important issues of price, colour and fashion, what are key characteristics we expect from these two different garments? For jeans it is durability, strength and abrasion resistance. As a result denim fabric for jeans is relatively thick and heavy. By comparison, for summer shirts, comfort and 'breathability' are paramount and so the fabric is much lighter. These examples illustrate the general point that within the textile industry fabric mass is an important technical specification. Garment manufacturers will specify to the fabric manufacturer what a fabric must weigh in terms of mass per unit area. A typical value for a denim-weight fabric is 400 grams per square metre (gsm), with a light to heavy range from 340 to 500 gsm, whereas light summer shirting fabric has a range between 70 to 140 gsm. In this example, the denim fabric is woven using a thick, coarse yarn and the summer shirting fabric is woven (or knitted) from a finer yarn.

Yarn Count

Actual yarn thickness is difficult to measure accurately and so the textile industry refers to yarn in terms of its mass per unit length, which is called the yarn linear density or more commonly yarn count. Yarn count is typically measured as the mass in grams of one kilometre of yarn. The unit, grams per kilometre, is called tex. An older system of measurement called English cotton count (notated Ne) is used within the cotton spinning industry. This system measures the number of yarn hanks, each of which is 840 yards long, per pound of yarn. In this system a big number implies a fine yarn and a small number implies a coarse yarn. This is the inverse of the tex system. The systems can be inter-converted by dividing 590.5 by the other number. Both systems are used in trade and commonly appear side-by-side in yarn descriptions.

Table 4.1 lists typical yarn counts used in a range of garments and fabrics. In our example above, denim yarns range in count between 60 to 100 tex (grams per kilometre) or Ne 10 to 6 (10 to 6 x 840 yard hanks per pound of yarn), whereas the shirting yarn will range in count between 30 and 15 tex or Ne 20 to 40.

Table 4.1: Typical fabric mass and yarn requirements to manufacture specific garments (gsm is grams per square metre).

Garment	Fabric Mass (gsm)	Yarn Linear Density or Count	
		Tex	Ne
Jeans (woven)	200 - 400	60 - 100	10 - 6
Business shirt (woven)	< 100	5 - 15	120 - 40
T-shirts and hosiery (knit)	120 - 180	15 - 30	40 - 20
Bed sheets (woven)	150 - 250	20 - 35	30 - 17
Towels (woven)	> 500	40 - 80	15 - 7

The most common yarns produced from Australian Upland type cottons are 30 tex (Ne 20) to 12 tex (Ne 50) count yarns, produced on the ringspun system of which at least 60% are combed (see the next chapter on yarn production). These yarns are used to construct a wide range of reasonably high-end woven and knitted fabrics. For comparison, the most common yarns produced from extra long staple (ELS – see definition in previous chapter on cotton history) cottons are in the range of 12 tex (Ne 50) to 7.5 tex (Ne 80), which are used for fine knit, woven apparel fabric, and woven fabric for bed sheets and towels. These yarns can be spun using 100 % ELS cotton or in blends with standard Upland cotton. In recent years there has been a move to coarser Pima yarns, up to 20 tex (Ne 30) and coarser yarns for fabrics such as denim.

Niche Textile Markets

Within traditional textile markets there are niches for organic and environmentally sustainable cotton, coloured cotton, high quality (long and fine) cotton and high-end cotton blends (with other natural staple fibres). Organic cotton, however, should not be confused with naturally coloured cotton, although coloured cotton can be grown organically. Natural coloured cotton occurs in wild cotton plants and breeders have been able to select through cross breeding to improve these cottons. Currently coloured cotton is available in various shades of brown and green and has created a niche market for itself (Figure 4.1).



Figure 4.1: There are many natural colours in cotton lint. This photo shows the various shades of green and red-brown compared with white (called acru). (Photo: CSIRO).

Whilst the volume of fibre in these niches is relatively small, it is notable that strong growth is predicted in nearly all of them and particularly for organic and high quality cotton. The production of organic cotton has increased markedly from a small base in the last five years. In 2001/02 world production was some 10,000 t. Production in 2008 is predicted to exceed 110,000 t. Likewise ELS cotton consumption has increased significantly over the last 10 years from 2,875,000 to 3,964,000 (500 lb, 227 kg) bales. For coloured cotton, prices obtained for the lint, coupled with low yields, inferior fibre quality, danger of contamination with conventional cotton, and the stability of fabric colour has resulted in low production. In 2007 total production was 16 t, mainly brown, from China.

Recent market pushes by the Australian cotton industry into the ELS premium cotton market follows these trends although work remains to properly define the premium that candidate varieties would bring to these markets.

Whilst the bulk of world cotton is sold into traditional textile markets for staple yarn there are a range of non-textile end-uses where cotton fibres are used. These include dissolving fibres for pulp from which cellulose intermediates and synthetic fibres and casings can be made, the production of felts for cushions, pads, automotive upholstery and furniture upholstery, the production of absorbent medical grade cotton for cotton balls and swabs and fibre pulp for specialised papers including fine writing paper, filter paper, currency, sanitary products and battery separators. The markets for these products are typically small in volume and under constant pressure from man-made fibres (MMF) and their intermediates.

Further Reading

Organic Exchange Organic Cotton Market Report (2007).

Technopak Survey of Australian Cotton Markets for the CRDC, October (2007).

