Meeting growing demand for high quality cotton from Chinese mills

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Growth in cotton and cotton textile production since China's accession to the World Trade Organisation (WTO) at the end of 2001 has been dramatic. In the five-year period prior to accession China, even then the largest producer and consumer of cotton in the world, was largely able to meet its cotton needs from domestic production.

But in eight years since accession Chinese cotton consumption (including Hong Kong) increased from 5.9 million tonnes (mt) to 11.6 mt in 2007 and 9.8 mt in 2008. In the same period, Chinese cotton production increased 66 per cent from 4.5 mt in 2001 to an average of 7.55 mt per year in 2007 and 2008 (see Figure 1).

The drivers of these changes can be linked to China's accession to the WTO and China becoming party to the Agreement on Textiles and Clothing, which ensured an end to quotas on textile imports by member countries, thereby opening markets for Chinese textile exports.

Concurrently, China's economy has also moved toward a reliance on market signals to govern cotton supply to mills rather than government decree. The rules of WTO membership have allowed China to fully exploit its very large textile production capacity in a quota-free world.

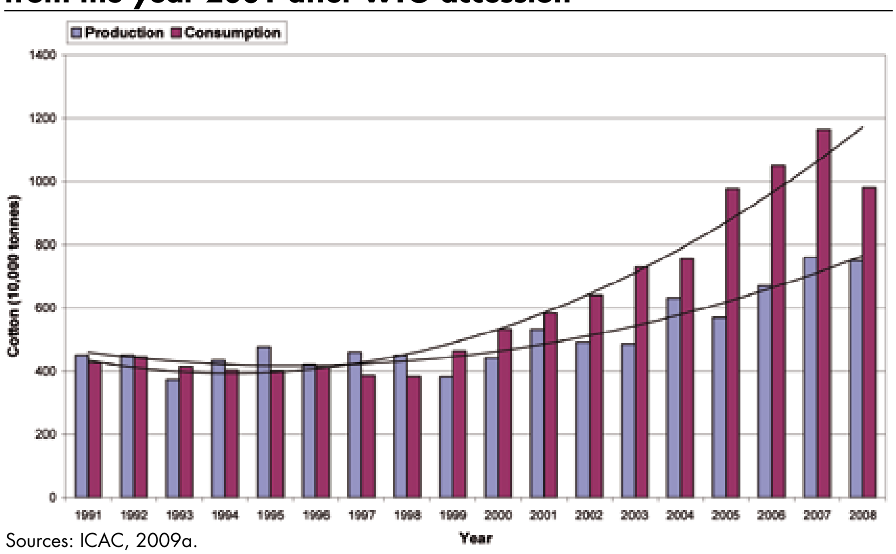
That China has been able to ramp up its mill consumption in such a short time has depended on significant capital injection by state and non-state entities. Since 1999, the number of short-staple spindles installed in China (including Hong Kong) more than doubled from 38.2 million to 89 million positions.

An even greater rate has been observed for the installation of open-end spinning machines, which are more productive than ring spindles – a three-fold increase from 609,000 positions to 1.84 million positions in 2009. According to the ITMF, China currently has 47 per cent of the world's ring spinning and 27 per cent of the world's open-end positions installed.

In the past decade Chinese spinners have used domestic and an increasingly large amount of imported cotton to supply this new mill capacity. Figure 2 shows the magnitude of the increase in cotton imports since China's accession to the WTO.

Before accession, it was thought that capping and reducing local support for cotton production would lead to reductions in the area of cotton planted, which in turn would lead to lower production and higher levels of cotton imports from cotton exporters such as the US, Brazil, Uzbekistan and Australia.

FIGURE 1: Chinese cotton production and consumption since 1991 – note the start of significant growth in mill consumption from the year 2001 after WTO accession



Sources: ICAC, 2009a.

But it has happened that while imports of foreign cotton have increased so too has Chinese cotton production. The increase in Chinese cotton production is interesting because China's WTO accession nominally involved agreements to limit subsidies paid to the agricultural sector (including cotton). The extent to which any reduction in subsidies paid to Chinese cotton growers has occurred is difficult to assess.

While Chinese cotton production has not kept pace with mill requirements the increase has nevertheless been significant – an average annual increase in excess of 380,000 tonnes from 2000 to 2007. On this fact, China's growers would seem to be responding well in the face of unprecedented demand from mills. But much of the Chinese cotton crop does not meet the quality required by mills, particularly those with export markets for their yarn and textiles, so much of it is held over in reserve stockpiles. This is in spite of a range of reforms to the Chinese cotton buying and selling system that extend back to the mid–1980s when central authorities abolished the state monopoly on cotton purchases.

Shortcomings in the quality of Chinese cotton can be attributed to the highly fragmented nature and small scale of cotton farms in China, the small scale of ginning operations and a lack of uniformity and suitability in variety selection. About 45 million Chinese families are engaged in the planting of cotton with an average area of 0.13 hectare (~1 mu) of cotton planted by each family unit.

Moreover, in most cotton growing areas, cotton is planted as a supplement to their principal (mostly food) crops. So within one region in China there can be a wide range in fibre quality that both the region's growers and Chinese post-farm gate market structure are unable to manage effectively.

This suggests that Chinese growers are still largely detached from mill signals for high quality fibre, and are still heavily reliant upon subsidised production.

Growing demand for high quality fibre

Worldwide there is growing demand for higher quality cotton. This demand is not necessarily reflected in the supply of increased volumes of the International Cotton Advisory Committee (ICAC) described 'Extra Fine', 'Fine' and 'High-Medium' growths to mills. But it is reflected in mill demand for improved fibre properties, consistency of supply and lower levels of contamination within these descriptions.

In the end, demand for high quality cotton extends from consumers at the retail level who want less expensive, higher quality goods. Traditionally, high quality in the textile market place has been limited to the echelons of middle class wealth, but modern textile machinery and the increased capacity of the Chinese, Indian and Pakistan textile industries have enabled high quality textile products to be available to a wider population. Indeed, the burgeoning middle class of China have themselves become large customers for new clothing and home textile products.

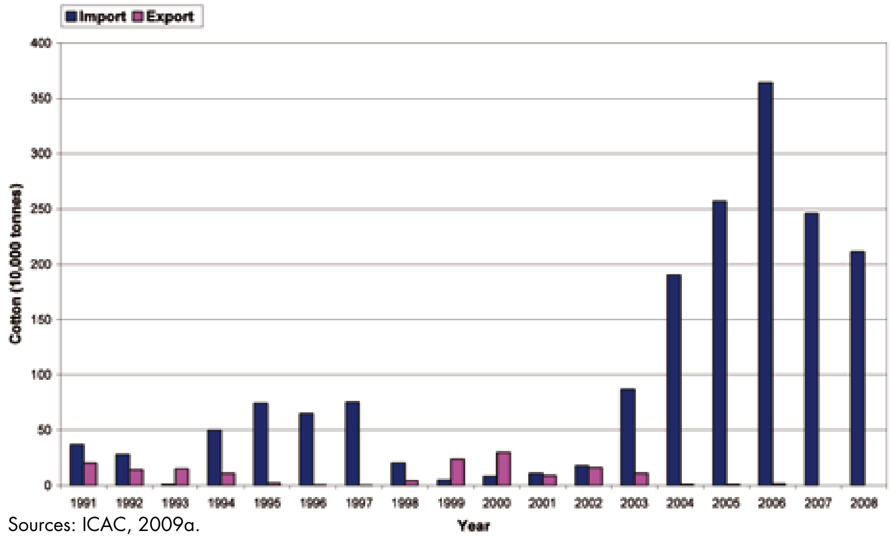
Per capita income in China has trebled in the past 10 years leading to a positive income elasticity of demand for textiles. The effect is seen especially in China's eastern seaboard cities where per capita income is greater and professional workers pursue high quality clothing brands and home textile fashions.

A significant question for Chinese cotton growers in view of these changes is whether or not they can improve, on a large scale, the competitiveness of their cotton in terms of quality. China's current average quality is unable to meet the needs of its now more diversified and export oriented textile industry.

While Chinese mills with import permits import large quantities of foreign growths, a large quantity of Chinese cotton is carried over in store each year. Strategic reasons aside, this means market signals on fibre quality are not being communicated clearly to growers.

The consequence of the large carry-over of cotton has a double edge effect. Firstly, it delays the market price recognition received by Chinese growers for their cotton, which in turn directly affects the quality of cotton produced by growers. Secondly, Chinese mills that do not hold import permits, or cannot afford the import duty on high quality imported cotton, are forced to use this lower quality Chinese cotton. This situation affects the general competitiveness of Chinese cotton textiles because the poorer quality yarn and textile produced by these mills as a consequence of poor fibre quality, affects the perception of Chinese textiles in general.

FIGURE 2: Chinese cotton import and export volumes since 1991 – note significant increase in imports after 2003 since WTO accession in late 2001



Sources: ICAC, 2009a.

Production of high quality fabrics demands fibre that is low in contamination and fibre that is long, strong and fine. Two clear problems exist for Chinese cotton:

- Its average strength is not very high; and,
- Production of premium quality, long staple, high strength cotton is limited.

As shown in Table I, the majority (over 60 per cent) of Chinese cotton is suitable for medium-low qualities of yarn counts Ne 26 and coarser. Notable is the small proportion of Chinese cotton that is long, strong and fine (one per cent). The proportion of cotton in each class by-and-large reflects the current market size for staple yarns, the bulk of which is in the Ne 5 to Ne 30 count range. In the world market, the majority of ring spun yarns produced fall in the Ne 18 to Ne 30 count range.

Long staple Upland and extra long staple (ELS) type cotton suitable for spinning Ne 60 or finer count yarns are nominally in short supply and for these products China is forced to import high quality cotton. Although, increased production of 'Extra Fine' and 'Fine' cotton in the Xinjiang Province in recent years has offset this requirement to some extent.

Also apparent from Table I is the relatively weakness of Chinese cotton used to spin yarns up to Ne 60. The shortfall in the strength of Chinese cotton in these qualities means China must import high quality cotton in order to produce high grade fabrics. Furthermore, while medium-low and low yarn qualities can be spun with fibre that is shorter and weaker, retail consumers and spinners are increasingly demanding higher quality fibre even for lower grade, courser count yarns.

The example of the fibre used to spin denim yarns is pertinent here. While denim yarns have traditionally been spun from poor quality fibre, much of today's retail denim fashion demands high quality, light-weight, blemish-free, almost tailored fabric, which requires higher quality fibre.

In order to meet the demand for quality, Chinese mills have increased their use of imported cotton – from exporting nations such as the US, Uzbekistan, Brazil, Australia, India and West Africa. To facilitate cotton imports, quotas that previously provided protection for domestic Chinese cotton have been progressively cancelled under WTO rules. This has allowed foreign growths, particularly from the US, access to the fast growing Chinese market. In short, increases in the quota of imported cotton allowed into China have effectively

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TABLE I: Proportion of Chinese cotton types used in different types of yarn production

2.5% SL (mm)	Strength (cN/tex)	Micronaire	Usage (%)	Typical yarn quality	Count (Ne)
ELS	32	3.5-3.7	1	Very high	120-80
31	25	3.7-4.2	8	High	60-50
29	24	3.7-4.2	28	High-medium	42-30
27	23	3.9-4.4	48	Medium-low	26-20
25	22	4.4-4.9	15	Low	<18

◁41…CHINESE MILLS

been swapped for access to textile markets in cotton exporting nations as part of on-going free trade agreement negotiations.

COMPARISON OF CHINESE AND AUSTRALIAN COTTON FIBRE QUALITY

Chinese and Australian fibre quality data measured between 2001 and 2005 by high volume instruments (HVI) were compared. For the comparison, Chinese and Australian HVI test procedures are assumed to give comparable test values.

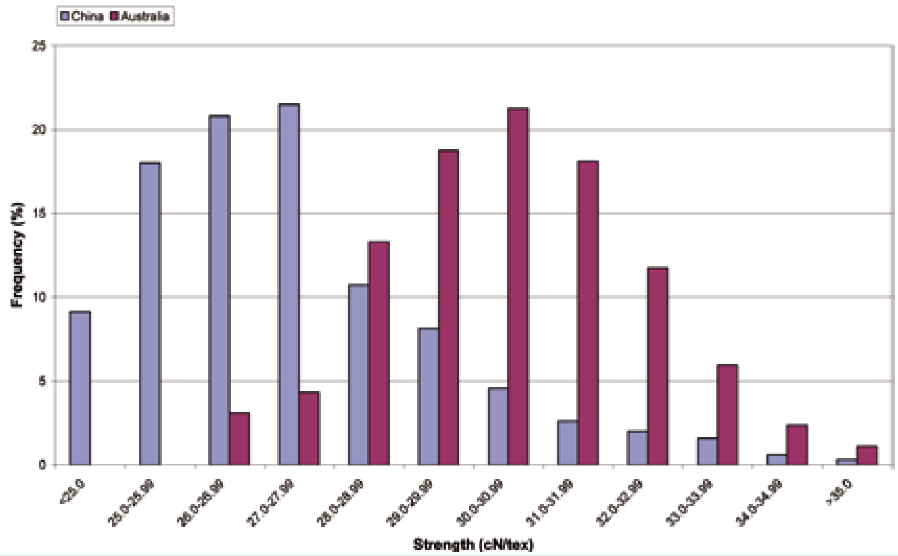
In the comparison we use HVI data on Chinese cotton collected by the Ministry of Agriculture of China Testing Centre as part of a study to investigate the quality of Chinese cotton coming from the three main production areas – the Northwest (Xinjiang), Yangtze River Valley and Yellow River Valley regions. Chinese fibre samples include Upland and Pima-type cotton.

Australian cotton HVI data from the same period was collected from three Australian merchants – their collective results representing approximately 50 per cent of the 12.7 million bales (2.88 mt) produced in this period. The Australian data covers a period in which cotton growing areas experienced very severe drought, which caused shorter and coarser fibres. No notable Pima crop was grown in Australia during this time.

Fibre length and length uniformity

Figure 3 shows the distribution of fibre length in China and Australia cotton produced between 2001 and 2005. During this period the average UHML of Chinese cotton fibre was 29.2 mm (1.149 inches), mainly distributed in the 28 mm and 29 mm segments. The longer 32 mm class accounted for 2.3 per cent of total fibre; while the shorter 26 mm class for 2.3 per cent.

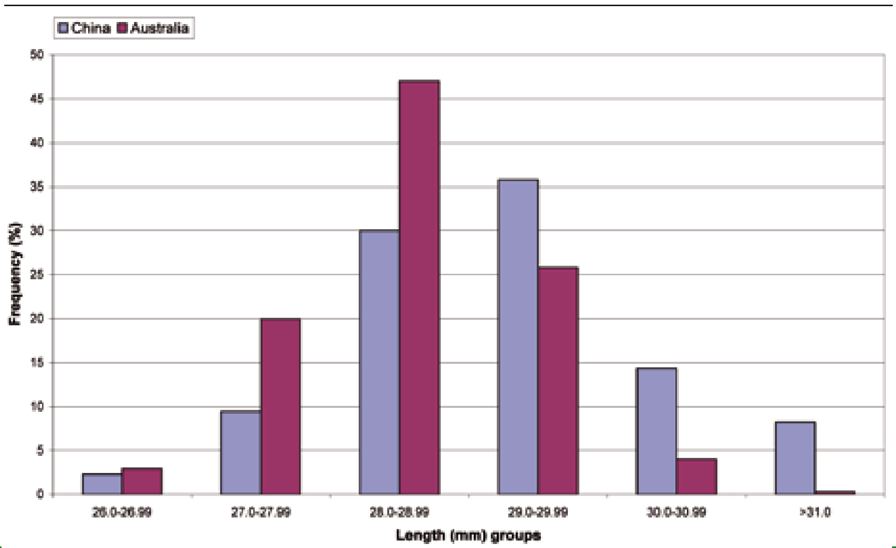
FIGURE 4: Distribution of cotton fibre strength groups for Australian and Chinese cotton between 2001 and 2005



Over the same period, the average UHML of Australian cotton fibre was 28.7 mm (1.130 inches), mainly distributed in the 27 mm, 28 mm and 29 mm segments. The longer 31 mm segment accounted for only 0.3 per cent of total fibre, while fibre length in the 26 mm segment accounted for 2.9 per cent.

Length uniformity of both Chinese and Australian cotton through this period was generally good. Both countries produced long, uniform cotton with Chinese cotton having more consistent length uniformity across all staple lengths (a range of values from 85.2 to 80.0 cf. a range from 86.2 to 77.7 for Australian cotton). Australia is currently conducting research into ways of reducing the breakage of long fibre in its more productive cotton gins. Lower length uniformity is a proxy for higher short fibre content, which is a problem in fine count spinning mills.

FIGURE 3: Distribution of cotton fibre length groups for Australian and Chinese cotton between 2001 and 2005



Fibre strength

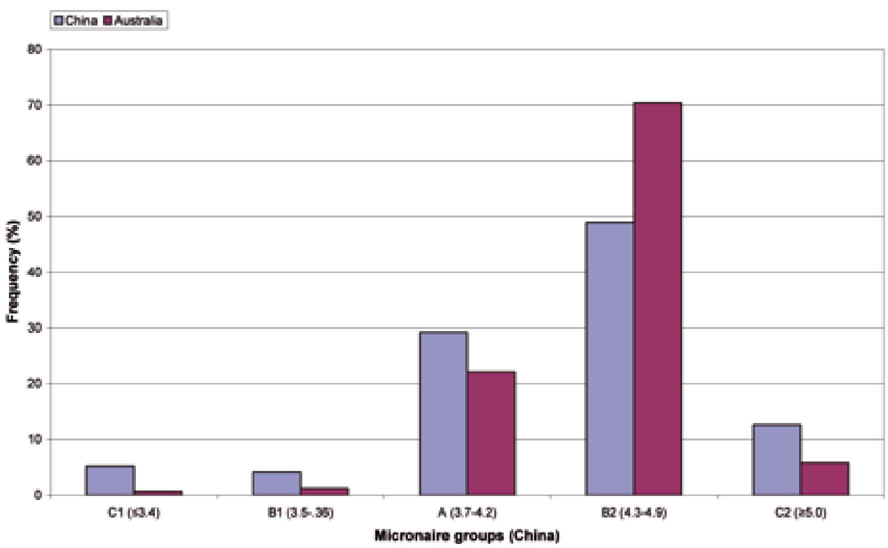
The strength of Chinese cotton fibre was distributed across a wide range of values between 24 and 35 cN/tex – remember the tests incorporated both Upland and ELS type cottons. Over 60 per cent of Chinese cotton was in the 25, 26 and 27 cN/tex segments. The average fibre strength was 27.4 cN/tex which places Chinese cotton at the lower-medium quality level. At this level it is capable of meeting spinning requirements for ring yarns up to but practically not beyond Ne 32.

The average strength value of Australian cotton for the same period was 30.5 cN/tex. Values were mainly distributed in 28, 29, 30, 31 and 32 cN/tex grades. Notable is that more than 50 per cent of Australian cotton has strength values in excess of 30 cN/tex.

Figure 4 shows the distribution of Chinese and Australian cotton fibre strength values.

The differences between Chinese and Australian values are largely a result of the widespread use of irrigation in Australia and of its industry-wide breeding program. The Australian cotton industry initiated a concerted focus on fibre quality in the early 1980s, largely to improve the fibre strength of the cotton varieties being grown at that time. Since that time fibre strength (and length) has been successfully

FIGURE 5: Distribution of cotton fibre in Micronaire groups for Australian and Chinese cotton between 2001 and 2005



improved through increasing selection pressure during breeding.

Micronaire

Average Micronaire values for Chinese and Australian cotton were 4.37 and 4.47 respectively. Figure 5 shows the distribution of values for this period according to the Chinese classification of the Micronaire-value range; A (3.7–4.2), B1 (3.5–3.6), B2 (4.3–4.9), C1 (<3.4) and C2 (>5.0).

According to this classification Upland cotton with Micronaire values between 3.7 and 4.2 is regarded as premium cotton (such as fine and largely mature), with values outside this range construed as being too coarse (>4.3) or too immature (<3.7). Cotton with values less than 3.7 is often regarded as immature and poor quality in terms of processing, particularly in the area of dye uptake, although the Micronaire test is unable to determine this directly. Cotton with a Micronaire value of 4.3 or greater, and particularly greater than 4.6 is often regarded as being too coarse for yarn counts finer than Ne 40.

Notable from Figure 5 is the larger proportion (>70 per cent) of Australian fibre with Micronaire values in the range of 4.3–4.9; compared with less than 50 per cent of Chinese fibre. The high Australian values in this period are attributed to the varieties grown and hot temperatures at the end of the growing season, which enabled more cotton bolls to reach full maturation.

Longer (29, 30 and 31 mm) Upland fibres from both countries tended to have Micronaire values in and around the premium Micronaire range (3.7–4.2). Shorter Australian fibre tended to be coarser than equivalent Chinese fibre, whose Micronaire values were more uniformly distributed across length categories. Before the end of the 2001 to 2005 period examined here, Australian cotton breeders were selecting new varieties on the basis of their fineness and maturity, as well as length, strength, yield and disease resistance.

Reflectance – colour

The colour (reflectance – Rd) of cotton is an important property in terms of cotton trade, but is less important in describing the technical capability of the fibre in the spinning mill, particularly in drawing distinctions between high grades of cotton. Australian cotton is renowned for its bright white colour and subsequent high classing grade values.

Reflectance values were unavailable for more than half the Australian classing results so no distribution analysis was conducted for this property. The average reflectance value of available data between 2001 and 2005 was 78.9, compared with 76.4 for Chinese cotton over the same period. Notable is that average Rd values for Australian cotton in the years 2004 and 2005 exceeded 80 (80.3 in 2004 and 81.1 in 2005) due to excellent finishes to those growing seasons.

CONCLUSION

Given the large volume of lower quality cotton in Chinese strategic stocks, the appearance is that many Chinese cotton growers or growing regions have not responded, or may indeed be unable to respond, to demands for higher quality cotton required for higher quality textile products. The increased volume of high quality cotton imported by China during the period examined here supports this supposition.

Comparison of Chinese fibre quality with Australian fibre quality for the period between 2001 and 2005 to some extent reflects this disconnection, although the average differences, particularly for fibre length, are not large. The results show both countries produce some of the best cotton in the world (such as cotton that is long and strong), although expectedly there is a wider spread of values in Chinese cotton. For the period compared Australian cotton was on average stronger and brighter (30.2 cN/tex and Rd = 78.9) than Chinese (27.4 cN/tex and Rd = 76.4) and average 'world' cotton, using Uster Statistics 2007.

On average Chinese cotton was slightly longer (29.2 mm vs 28.7 mm) than Australian cotton, although the Chinese average includes Pima cotton, which skews the results in favour of Chinese cotton. The length differences also reflect the slower, gentler harvesting and ginning practices used in China. Certainly Chinese length uniformity indices were more consistent across length groups than Australian or 'world' length uniformity indices, although the best Australian cotton (the best 25 per cent) had better length indices than similar ranked Chinese cotton.

No clear comparisons could be made about each country's fibre fineness or maturity, as the Micronaire-value confounds both. The range of Micronaire-values for Australian cotton (3.58–5.08) was narrower than Chinese (3.23–5.14) or world cotton (3.40–5.13) but the Australian data set does not include any Pima cotton, whereas the Chinese and world sets do. The low Micronaire-values associated with Australian cotton are likely to reflect immature rather than fine cotton, while the values for Chinese cotton are likely to be associated with Pima cotton.

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