

COTTON FIBRE QUALITY EVALUATION AND RESEARCH IN SOUTH AFRICA

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Abstract

Even though cotton production in South Africa is very small by world standards, it is backed by one of the best agricultural, textile R&D and cotton quality evaluation infrastructures in the world. This paper briefly discusses cotton production, quality evaluation and R&D in South Africa.

Introduction

Cotton growing in South Africa dates back to about 1690 when the first cotton seed was planted, although there is evidence that wild cotton was grown here and made into clothes before the year 1500. In 1846, American Upland (*Gossypium hirsutum*) cotton seed from America was planted, although after 1870 the large scale production of cotton came to a virtual standstill and was only resumed at the start of the twentieth century, the first gin being erected in 1905. Cotton was officially declared an agricultural crop in 1939. Cotton was first processed into textiles in South Africa towards the end of the 1940's. Today, cotton growing in South Africa is facilitated by various statutory measures and supported by a comprehensive infrastructure.

Cotton production and consumption statistics (for South Africa and Swaziland) since 1959 are given in Fig. 1, while the main cotton growing areas are shown (shaded) in Fig. 2. It can be seen that consumption has almost without exception exceeded production and that production has dropped in recent years, mainly due to drought conditions and farmers moving to other crops because of better economical returns. This year, for the first time in 7 years some cotton lint was exported. Strategies are in place which are aimed at increasing production to 84 mkg by the year 2005, with about 30% of this expected to come from small scale farmers.

Some 121000 hectares were planted with cotton in South Africa (90000 ha) and Swaziland (31000 ha) during 1998. At present, some 49% (21000 ha, virtually all of which is in South Africa) of South African and Swaziland cotton is

produced under irrigation and the balance of 51% (100000 ha) under dryland conditions. Of the cotton, 45% (53% if Swaziland is included) is hand picked and 55% machine (spindle) picked. Cotton lint yield in South Africa presently averages about 954 kg/ha under irrigation and 203 kg/ha under dryland conditions. There are some 3800 cotton growers in South Africa, of which 1100 are classified as commercial (large scale) farmers and 2700 small scale farmers. Employment in the South African Cotton pipeline currently stands at approximately 115000 people, 81000 of which are in the growing and ginning sectors and the remaining 34000 in the spinning and weaving sector. South Africa's textile manufacturing industry (i.e. yarn and fabric manufacturing) employs some 79 000 people while its clothing industry employs some 138000 people.

The present cultivar composition of the South Africa Cotton Crop (including Swaziland, Botswana and Namibia) is shown in Fig. 3.

Cotton Marketing and Quality Evaluation

The South African cotton crop is traded in a free market environment today, trade taking place in terms of agreed norms and standards, with no restrictions, although grading standards do apply to seed cotton and lint. To attach a market value to the product and to apply this in practice in the industry, the cotton is grouped into various grades and classes according to their instrument and subjectively assessed characteristics. Seed cotton is sold to the ginners, the sale taking place in terms of the existing Seed Cotton Grading Standards applicable to hand-picked and machine-picked cotton and linked to the South African Grading Standards for lint (Table I). The South African Cotton Grades are related to the USDA Standards in Table II.

Following the dissolution of the South African Cotton Board at the end of 1997, a non-profit making company, Cotton South Africa (Cotton SA), was formed to continue with the essential services, such as the rendering of information services, the stimulation of the production and the usage of cotton and the enhancement of the marketability of cotton through research, quality standards and norms as well as training. It also acts as industry forum and administration of statutory measures.

The Quality Control Section of Cotton South Africa is involved in the grading and classification of the South African cotton crop. This function used to arise from a previous Industry Cotton Marketing Agreement in which the prescribed norms and specifications concerning quality control are explained and is still applied in the now free market environment. It provides a comprehensive HVI testing service to ginners, spinners and other relevant organisations, issuing grading certificates to ginners for marketing purposes. Grading and classification services to growers and to the Tobacco and Cotton Research Institute (TCRI) are also provided.

Agricultural R&D

In 1913, an experimental station for providing advice to farmers was established in Rustenburg, while in the early 1920's the Empire Cotton Growers' Association founded a research station to provide a service to farmers, it being taken over by the Department of Agricultural technical Services in 1949. The earliest records traced relating to pest control are those of 1926 and the 1930's were characterised by research on cotton pests. Today, agricultural R&D is provided by the Tobacco and Cotton Research Institute (TCRI) of the Agricultural Research Council (ARC) which is located in Rustenburg, which concentrates on breeding improved cultivars. The main focus areas in their cotton breeding programme are breeding high yielding cultivars under either irrigation or dryland (rainfed) conditions. A prerequisite for any new cultivar is that the fibre quality must be acceptable, with a GOT in excess of 38%, micronaire between 3,5 and 4,5, HVI strength in excess of 26 cN/tex and staple length in excess of 27 mm.

Breeding sub-programmes are aimed at breeding high yielding short season cultivars under irrigation which have tolerance to Verticillium wilt and resistance to Bacterial wilt and nematodes. Breeding for high yielding cultivars under dryland or rainfed conditions are aimed at smooth leaf cultivars, suitable for mechanical harvesting with high tolerance to water stress and tolerance to Verticillium wilt and resistance to Bacterial wilt and then hairy leaf cultivars with resistance to insects, especially "Jassids" and tolerance to Verticillium wilt and resistance to Bacterial wilt. New cultivars are also brought into the country and their merit for growing in South Africa evaluated before they are considered for release.

The TCRI undertakes its cultivar evaluation trials at 10 locations scattered all over, and representative of, the various South African Cotton growing regions.

In recent years, research involving biotechnology has also been undertaken. The most exciting recent development in South Africa is the introduction of the Bollgard Insect Protected Cotton which will be commercially available and grown during the 1998/99 season.

Delta Pine's new varieties (NuCOTN 37B & 35B), containing the Bollgard gene by Monsanto, are being thoroughly tested and the response by leading farmers has been very positive, the technology being of particular advantage to small scale farmers.

Cultivars being introduced in South Africa are Sicala VI, Siokra, Sabie, HS44 and CA233 which will probably replace certain existing cultivars, the aim being to minimise the number of cultivars being planted.

Textile R&D

Cotton Textile related (i.e. post farm-gate) R&D in South Africa is carried out by the CSIR Division of Textile

Technology (Textek) located in the coastal city of Port Elizabeth in the Eastern Province. Textek is one of the nine divisions of the CSIR which is the largest industry and community related R&D organisation in Africa. Textek has a total staff of 100 (that of the CSIR as a whole being just less than 3000). The CSIR sees itself as the Technology Partner of the South African Industry (both formal and informal), being market driven, earning some 55% of its income from contract projects and services, the balance of 45% coming from the Government as a grant. The CSIR was formed in 1945, with its textile division (then known as SAWTRI) being formed in 1951 by the CSIR and the Wool Growers (Wool Board) jointly. For the first 20 years of its existence it focussed solely on wool and mohair and only commenced cotton related R&D in the early 1970's.

Textek is equipped to process natural fibres, such as cotton, wool and mohair, as well as staple man-made fibres, on the cotton/short staple, worsted and woollen systems, from their raw state to the final product (apparel and domestic textiles), mostly on full scale machinery. It is therefore an entire textile processing and manufacturing factory under one roof, supported by very modern analytical and testing laboratories.

Textek has always been on the forefront of global textile R&D and developments, for example being one of the first organisations outside the USA to acquire an HVI (in 1983) and an AFIS (in 1992). In the field of cotton, its work has concentrated on building a technical data base of South African cotton and relating the cotton fibre properties to spinning performance (open-end and ring) and yarn properties. It very early on adopted the HVI system of testing, recognising its value and global importance, and has played a not insignificant role in its global acceptance, notably by Chairing the Zurich based ITMF HVI Working Group since its inception in 1988 and participating in international cotton conferences, such as the Bremen International and Beltwide Cotton Conferences. Other notable R&D activities, involving cotton, include the processing, dyeing and finishing of wool/cotton blends, flame retardant treatments, liquid ammonia mercerisation and particularly cultivar evaluation in terms of their textile performance. Its services to the South African textile and clothing industry include testing, trouble shooting, quality management systems, training, product development, technology sourcing, development and implementation and contract R&D.

Table I: Seed cotton standards and the equivalent in lint grades after ginning

SEED COTTON (HAND PICKED)	LINT
HX	Deal
HA	Dirk
HB	Doly
HC	Duns
HD	LFY
SEED COTTON (MACHINE PICKED)	LINT
MA	Doly
MB	Duns
MC	LFY
MD	BSG

Seed Cotton which does not conform to HD, in other words graded as below HD or equal to MD, will normally be classified as BSG (Below Standard Grade) in lint form.

Table II: Cotton grades

USDA STANDARDS (WHITE)	SA EQUIVALENT	%
Good Middling	Deal	29.72
Strict Middling	Dirk	17.92
Middling	Doly	26.57
Strict Low Middling	Duns	19.09
Low Middling	LFY	4.98
Good Ordinary	BSG	1.65
	Undergrade	0.07

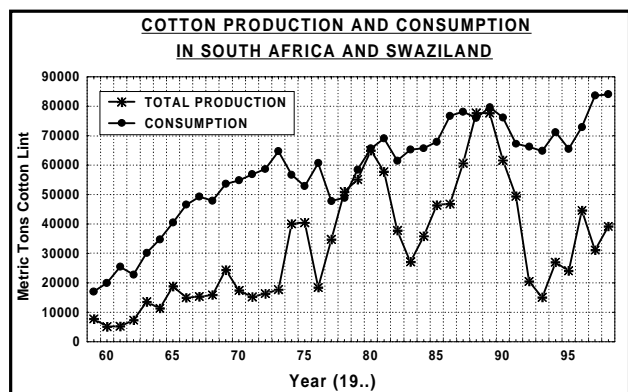


Figure 1. Cotton production and consumption in South Africa and Swaziland

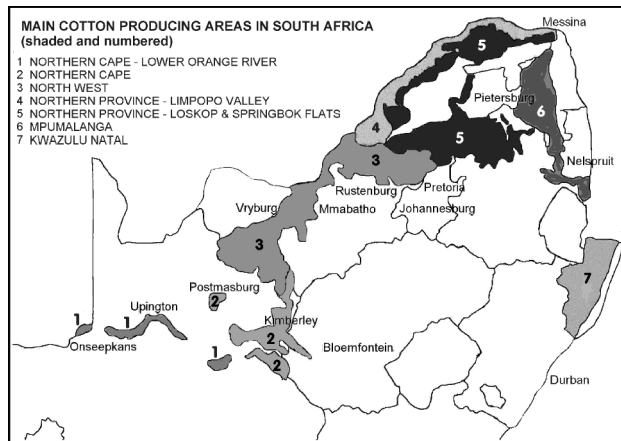


Figure 2. Main cotton producing areas in South Africa (shaded and numbered)

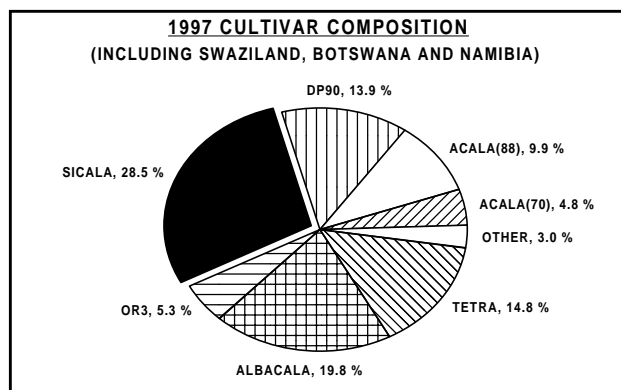


Figure 3. 1997 Cultivar composition (including Swaziland, Botswana, and Namibia)