Understanding the impact of Cotton Subsidies on developing countries

WORKING PAPER

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1. Introduction

Cotton trade and production are highly distorted by policy. More than one-fifth of world cotton producer earnings during 2001/02 came from government support to the sector. Support to cotton producers has been greatest in the US, followed by China and the EU. For 2001/02, US combined support to the cotton sector was US$2.3 billion. The EU's support (to Greece and Spain) totalled US$700 million and China provided US$1.2 billion. Subsidies encourage surplus cotton production, which is then sold on the world market at subsidised prices. This has depressed world cotton prices, damaging those developing countries which rely on exports of cotton for a substantial component of their foreign exchange earnings. A number of West and Central African countries raised the issue of the abolition of cotton subsidies at the WTO in May 2003. Cotton subsidies also form the basis of a WTO dispute brought by Brazil against the US on 26 April 2004 in which the panel ruled in favour of Brazil. The expansion of cotton cultivation in many developing countries has played an important role in reducing poverty, where scope for replacing cotton by other crops is limited. These gains have been threatened by the fall in world prices for cotton. Cotton is a minor component of economic activity in industrialised countries, accounting for only 0.12% of total merchandise trade, but its production plays a major role in some Least Developed countries in West and Central Africa. In Benin, Burkina Faso, Chad, Mali and Togo cotton accounts for 5-10% of GDP, more than one-third of total export receipts and over two-thirds of the value of agricultural exports. Even in Côte d'Ivoire and Cameroon (both classified as developing, not Least Developed), which are among the largest African cotton producers, cotton production accounts for 1.7% and 1.3% of GDP. Cotton is also a major component of total exports for a number of non-African developing countries. Cotton exports in Uzbekistan, Tajikistan and Turkmenistan account for 45%, 20% and 15% of total merchandise exports and make a significant contribution to GDP in these countries (8% in Uzbekistan and Tajikistan; 4% in Turkmenistan).

In attempting to model the impact of cotton subsidies on production and export earnings in developing countries, the problem is how to determine:

1) the size of the effects of removing subsidies;
2) the distribution of these effects among producer countries; and
3) the distribution of these effects among groups of poor people within these countries.

One way to analyse the first two issues is to assume a single, unitary market for cotton, in which buyers choose among essentially homogeneous consignments of lint from different producing countries primarily on the basis of price. The removal of subsidies reduces the price received for cotton by producers in subsidising countries. As a consequence, world supply of cotton contracts (subject to assumptions regarding the elasticity of cotton supply in subsidising countries) and the world price of cotton increases (subject to assumptions regarding world elasticities of cotton demand) which induces a positive supply response from non-subsidising countries (subject to assumptions regarding the elasticity of cotton supply in non-subsidising countries).

Models of this type tend to conclude that US subsidies, by virtue of their absolute magnitude (see Chapter 3), are particularly damaging to production and export earnings in developing countries and that, in contrast, the impact of EU support to the sector is

relatively small. Such findings are often used to justify protectionist stances within the EU where support to the cotton sector has a significantly positive impact on EU cotton production, but is argued to have minimal impact on developing-country producers.

There are, however, some uncertainties and difficulties in this approach. In this work we analyse two of these.

First, a key question concerns the structure of the world market for cotton lint. If the assumption of a single, homogeneous global market for cotton is relaxed and, instead, it is assumed that a perfectly fragmented market exists, in which cotton-producing countries can only trade with existing trade partners, countries *only* benefit from reductions in subsidies if they are already competing in a segment of the market whose production is currently subsidised. This has implications for the impact on cotton price and for the distribution of benefits from the removal on subsidies. In order to investigate where cotton falls on the continuum of a fully fragmented to a unitary market, we discuss the markets for cotton in Chapter 2.

Secondly, the ability of developing countries to benefit from the removal of cotton subsidies in the US, China and the EU depends on how strongly they are able to increase output of (and secure demand for) their cotton in response to a higher price. To understand this more fully, we examine in Chapter 5 demand and supply conditions for cotton in the major producer (developing) countries.

Our model, presented in Chapter 4, is an adaptation of the model developed by Goreux (2003), reworked to take these additional factors into consideration.

2. Background: World Cotton Production and Trade

2.1 Global production and consumption of cotton

More than 70 countries produce and export cotton, while many developed and developing countries depend on imports of cotton lint for their spinning and textile industries. World production in 2001/02 was 18.6 million tonnes, down from 19.6 million tonnes in 1995/96, when cotton prices were 50% higher. Eight countries are responsible for 81% of global output: China; the USA; India; Pakistan; Uzbekistan; Turkey; Brazil; and Australia (see appendix 1). Over the last 40 years cotton production has grown at an annual average rate of two percent, to reach 19.1 million tonnes in 2002/03, from 9.5 million tonnes in 1961/62. Most of this growth has come from new producers (see Table 1). The US and the former Soviet Union, the two largest producers in the 1960s, have broadly retained their cotton production levels. Production in a number of East African countries has declined considerably during this period.

Table 1: Main Producers of Cotton

Country	1961		2002	
	Cotton Production (1000s Tonnes)	Share in Global Production (%)	Cotton Production (1000s Tonnes)	Share in Global Production (%)
Australia	2.6	0	795	3
China	800	5	4,900	25
Greece	93.8	0	370	2
India	884	5	1,900	9
Pakistan	324.1	2	1,700	9
Turkey	212	1	850	4
West and Central Africa	116	1	1,160	6
US	3,120	16	3,733	21
Former Soviet Union	1,528	8	1,407	5
Sudan	116	1	59	0
Uganda	67	0	12.8	0

Source: FAOSTAT Agriculture Database (2003)

The past decades have been characterised by major changes in trade flows as a result of a geographical shift in international cotton yarn and fabric production. Asia has become the leading importer of cotton in line with its expansion in spinning and textiles. China's textile industry has been the dominant purchaser in recent years, taking up more than a quarter of global cotton output. Other major users are the EU, India, the US and Turkey, which (along with China) take three-quarters of cotton output. A number of East Asian countries have emerged as important cotton buyers. Indonesia, Thailand, Korea and Taiwan used 130,000 tonnes of cotton in 1960, rising to 1.5 million tonnes in 2002. Although during the last 40 years cotton consumption has grown at an average annual rate of 1.7 percent, growth since the mid-1980s has only been at 0.7 percent. Interestingly, during the last 40 years the world's population has grown by 1.7 percent, implying that the growth in world per capita cotton consumption has been zero. In the absence of any policy reforms by major players, FAO projects that consumption during the current decade is expected to grow by 0.9 percent per year, implying that by 2010 world cotton consumption will be at approximately 22 million tonnes.

2.2 Cotton trade

World cotton trade rose by more than 400,000 tonnes during 2002, reaching 6.2 million tonnes. A further increase in world trade to 6.4 million tonnes was projected for 2003 (ICAC, 2002a).

Most traded cotton lint is handled by trading companies. These have a key position between producers (ginning companies) and spinning mills, although it is also common for spinners to source directly from ginning companies in exporting countries. Traders offer purchasing services when producers want to sell, provide bulk cotton supplies to spinning mills, and arrange transport to destination (Heijbroek and Husken, 1996). Although some consolidation in the trading sector has occurred during the last decade, trade is far less concentrated than in the trade of other agricultural commodities, for example cocoa and coffee. According to a survey by ICAC (Guitchounts, 2003), there are at least '475 firms engaged, at least in part, in international trade in cotton'. Of these, the largest 19 (most, but not all, of which are private companies) handle around one-third of world production, while the next 49 handle just under 20 percent. The number of the largest cotton-trading companies (handling 200,000 tonnes of cotton a year or more) has remained steady at 19 (private and government owned), handling 39 percent of world production in 2000 (ICAC, 2002b).

Since the mid-1990s, the largest trading companies have expanded their operations significantly in terms of increasing the number of supplying countries from which they purchase. They have also increased investment in ginneries and their involvement with in-country marketing. This has happened in a context where many cotton-producing countries in the southern hemisphere have liberalised their markets, and reflects a reaction to deregulation in those countries. After liberalisation of national cotton sectors, international trading companies have found themselves dependent on multiple and often small- and medium-sized local private companies (as opposed to a few parastatals prior to liberalisation). This has prompted international traders to become more involved in producing countries in order to ensure a constant supply to spinners from a variety of origins and of sufficient volume.

There are a number of reasons why trading companies remain key intermediate agents in cotton trade. First, the geographical and economic fragmentation in global cotton production, in comparison with other (e.g. cocoa and coffee) commodity chains means that cotton producers and consumers are many and dispersed. As such, it would be costly for producers and consumers to oversee the entire market and perform all trade functions themselves. Spinners tend to favour blends of different national origins and qualities in order to obtain the blend demanded by their consumers in the textile industry. Therefore, if spinners were to supply their own needs, they would have to invest considerable resources in obtaining market information and managing the sourcing process directly.

Secondly, spinners have increasingly out-sourced their storage functions to the trading segment. For traders, this implies holding large volumes of cotton from various national origins. As a result, working capital costs (and financial risk) are increasingly being transferred to international traders who, on the other hand, reduce risks and increase cash flow by hedging on the futures markets.

2.2.1 Cotton exports

Around one quarter of world production enters into world trade. Some of the largest cotton producers, such as China, India, Pakistan and Turkey, scarcely export as their production is almost entirely for domestic use. In 2001, exports amounted to 5.4 million tonnes, of which the five largest exporters – the US, Uzbekistan, Australia, Greece and Brazil – contributed 70 percent. West and Central African countries accounted for ten percent of total cotton exports in 2001.

Cotton is a major source of income and export earnings to many developing countries (see Appendix 2). The share of cotton in total exports from a number of West and Central African countries is especially high: 65 percent for Benin; 45 percent for Burkina Faso; 42 percent for Mali; and, 34 percent for Chad. Notably, the share is also high for Uzbekistan (45 percent); Tajikistan (20 percent); Turkmenistan (15 percent); Paraguay (8 percent); Kyrgyzstan (8 percent); and Zimbabwe (7 percent).

There has been significant fluctuation in trade from one year to the next, especially at individual country level (see Appendix 3) but world exports have risen by 18 percent in volume between 1991 and 2001.

2.2.2 Cotton imports

Appendix 4 illustrates world imports of cotton in 2001. The main cotton trade flows are from the major exporters to countries in Asia. The latter region has become the leading importer of cotton in line with its expansion in spinning and textiles. In general, the structure of cotton imports is less concentrated than exports. The largest cotton importers are Indonesia, the EU, Turkey, China, Mexico, Thailand and India (see Table 2 and Appendix 5).

The largest increases in cotton demand are taking place in producing countries. In 2002 cotton consumption by China, Turkey, Pakistan and India rose by 670,000 tonnes, contributing to a 500,000 tonne increase in world imports as cotton consumption outpaced domestic production in these countries.

Table 2: Source of Cotton Imports

Importers (% of world cotton imports)	*Sources (% of total imports)*
Indonesia (13%)	Australia (50%); US (30%)
EU[1] (13%)	Uzbekistan (17%); Australia (6%)
Turkey (8%)	US (41%); Greece (22%)
China (7%)	US (57%); Australia (31%)
Mexico (7%)	US (99%)
Thailand (7%)	Australia (33%); US (21%); Zimbabwe (10%)
India (7%)	Australia (15%); Côte d'Ivoire (13%); Benin (11%)

A comparison of changes in the source of imports over time for a number of large importers of cotton shows that in the short term (2000/01-2001/02 – see Appendix 6) market shares exhibit a fair degree of consistency. Taking a slightly longer term perspective (1995/96-2001/02 – see Appendix 7), we still observe consistency in market shares but also the impact of longer-term trends, for example the growth of Australia as a supplier to Asian cotton markets.

Appendix 8 shows cotton import tariffs for all countries. The average world tariff on cotton is 5.3 percent. Cotton tariffs range from 90 percent (for China) to 0 percent (for 64 countries including the EU, Australia and Turkey). Of the other largest cotton-producing countries Brazil imposes a tariff of 9.2 percent, India a tariff of 5 percent, Pakistan 5 percent and Uzbekistan 30 percent. The average tariff for West and Central African countries is 7 percent.

The US charges a specific tariff ranging from 0 cents per kilogram to 31 cents per kilogram on imported cotton (an *ad valorem* equivalent of 14 percent). For certain types of raw cotton, US imports under NAFTA, the Caribbean Basin Economic Recovery Act, and the US-ANDEAN, US-Israel and US-Jordan trade agreements are duty free within quota limits (see Appendix 9). Although AGOA favours imports of textiles containing African cotton, US imports of raw cotton are excluded under AGOA and its GSP for developing countries.

2.3 World Cotton Prices and the Market for Cotton

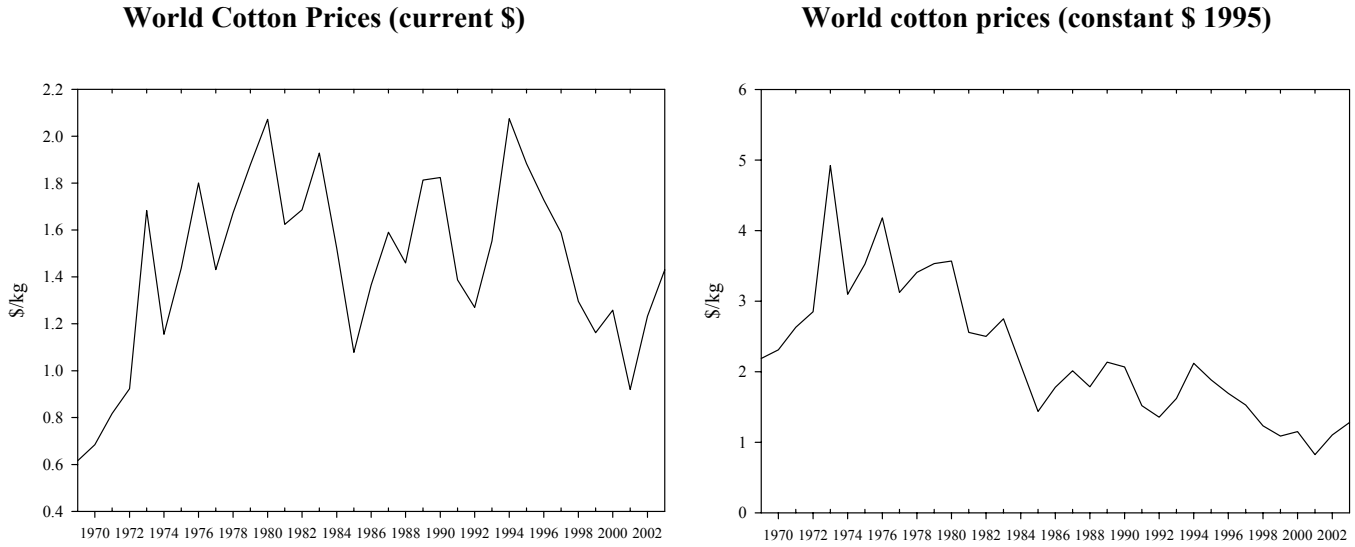
2.3.1 Recent trends in world cotton prices

Cotton remains the world's most important fibre in textile production, with a share of about 40 percent in recent years. World cotton prices have fluctuated since 1990. During the 1960s cotton prices averaged US$2.31 per kilogram. During the 1990s, they averaged US$1.34 per kilogram. The price of cotton expressed in current US dollars fell in the 2001/02 crop year to its lowest annual level in thirty years (see Figure 1).

The low prices in 2001/02 resulted in lower production and higher consumption in the following year. Consumption exceeded production by 1.9 million tonnes in 2002/03 (the surplus being taken from stocks) and the average price for the year was US$1.23 per kilogram (a one-third increase over the previous year) reaching US$1.65 per kilogram by December 2003.

The instability and downward movements in prices have been caused by a number of factors: unpredictable fluctuations in production and exports from India, Pakistan and China; reductions in the costs of production; long-term inroads of synthetic fibres; and subsidies granted by key cotton-producing countries (see Appendix 10).

Figure 1: Index A



Source: Data from ICAC and World Bank Development Indicators (2003)

2.3.2 Analysing prices for cotton

There are a variety of ways to analyse cotton prices, but the Cotlook A Index, published by Cotton Outlook, is the most widely used. It is intended to be an *ex post* record of the level of offering prices on the international raw cotton market and is used by international trading companies, governments and international organisations (e.g. UNCTAD and ICAC) as a measure of the fluctuation of international raw cotton prices. A number of producing countries (e.g. the US) incorporate elements of the A Index into national farm legislation.[2]

It is possible to obtain premiums and discounts on the world price for cotton: for higher or lower grades; due to characteristics of the fibre (e.g. seed variety); and for market criteria, including timing of shipments and forms of sales.

In addition to the A index there are quotations for coarser qualities of cotton – the B Index, which is the average of the three least expensive of nine styles.[3] B-Index quotations move more or less in tandem with the A Index, although price differentials between the A and B Index have widened over the past few years because of individual demand and supply situations in the various quality segments of the markets. Lower demand and higher stocks have placed downward pressure on prices for lower grades of cotton. The Cotlook B Index was two percent below the A Index in 1996, increasing to five percent in 1997, and has averaged ten percent below the A Index since 2000 (Larson, 2003).

2.3.3 Quality characteristics of world cotton

Cotton fibre exhibits considerable variations in quality, some of which are associated with seed variety and with crop management practices, others with post-harvest practices and with ginning. In general, fibre quality is a combination of physical and microbiological attributes like fibre length, fineness, maturity, strength, colour and impurity content. Cotton fibre value increases as the bulk-average fibres increase in whiteness, length, strength and micronaire (Brandow and Davidonis, 2000). Distinctions

based on staple length, strength and micronaire are closely related to national-origin characteristics of cotton. Some quality factors are readily controlled by individual buyers/ginners, e.g. leaf fragments and uniformity. Other quality factors may require sector-wide efforts, e.g. stickiness, polypropylene, certain spots and stains. This implies that both national origin and firm reputation can be important factors in the price received for cotton.

Staple length

Staple length is essentially a function of seed type although (annual) climatic, atmospheric and soil conditions, ginning practices and storage can affect fibre length.

All cotton producing countries offer a spectrum of different fibre lengths. As such, all cotton produced within a particular country cannot be said to be of a particular staple length per se. However, different national origins can be categorised as belonging to one of four distinct 'classes', based on the majority of cotton they produce: extra-fine cotton, fine and high-medium cotton, medium cotton and coarse cotton.

As Figure 2 shows, only a few countries produce and export extra fine (long staple) cotton. US Pima is the leader among the world's extra fine cotton, not least because US cotton has an international reputation of being contamination-free, relative to the other major producing countries such as Egypt and China (Suh, 2002). A shortage of high-quality cotton has resulted in higher price premiums. The premium for extra fine cotton (represented by American Pima) over the A Index was nearly 100 percent in 2000, compared with an average Pima premium during the 1990s of 70 percent (Townsend, 2000).

The majority of the world's cotton production tends to fall into the category of medium cotton quality defined by staple length. This includes the majority of cotton produced in Sub-Saharan Africa. As such, it competes not only with cotton within the region, but also with cotton originating from developed countries.

Figure 2: World Cotton Staple Lengths

Extra Fine Cotton (Long Staple)
US Pima, Egypt, Sudan, Central Asia
Fine and High-Medium Cotton (Strict Middling, 1-1/8'')
US SJV, Zimbabwe, Australia, West and Central Africa
A Index: Medium Cotton (Middling, 1-1/32'')
Saw Ginned Cotton
US California, US Memphis, Australia, Brazil, US Orleans, West and Central Africa, Spain, Uzbekistan, Greece, Mexico, China, Paraguay, Pakistan
Roller Ginned Cotton
Tanzania, Turkey, India, Sudan
B Index: Coarse Cotton (Strict Low Middling)
US Orleans/Texas, Brazil, Uzbekistan, India, Pakistan, Turkey, China, Argentina

Source: Larsen (2003).

Strength

Like staple length, strength of cotton is essentially a function of seed type, although the nature of the ginning process (saw versus roller) can also have an influence. Roller ginning is relatively slow compared to saw ginning but there is less stress on the fibre and the frequency of knotted fibres is reduced.

Colour

Bleaching and dyeing of cotton cannot fully compensate for cotton which is stained or spotted. There is some influence on colour due to seed type, e.g. West African cotton is 'creamy' in appearance but, in general, the whiteness of cotton is determined by (the absence of) spots and stains caused from pests and storage.

Uniformity

Uniformity of cotton concerns sorting and grading processes. Ginners need to ensure that similar fibres are processed. Uniformity is controllable at the primary purchase and ginning stages. Zimbabwean cotton attracts a premium for its reputation of being uniform.

Foreign matter

Contamination, or trash content, is caused by leaf fragments or polypropylene (from sacking) and affects the dyeing properties of cotton. Contamination can spread to large amounts of yarn when cotton from a contaminated source is blended with other bales. At the spinning and dyeing stages it is usually impossible to trace which growth any foreign matter came from and which trader supplied it (hence it is a credence attribute).

In high-speed automated mills there is little opportunity to check for foreign matter, but in countries with low labour costs a team of workers may be employed to visually check cotton bales for contamination. Thus, traditional mills in such countries as India and China will still buy cotton lint with suspected high foreign matter albeit at a heavily discounted price.

Stickiness

Honeydew or stickiness tends to affect whole production areas due to infestation by particular insects. At the spinning stage, sticky lumps may cause entire machines to be shut down in order to be cleaned. Honeydew can be controlled by spraying. Cotton from Cameroon used to have a reputation for stickiness but has overcome this through concerted pest control efforts.

Other factors

In addition to the quality characteristics of cotton lint discussed above, traders/spinners may have a preference for cotton from particular national origins due to differences in supply reliability and costs (and length of time) for shipment. As such, cotton from countries which can regularly supply adequate volumes of lint demanded, and from which transport costs are low, without the likelihood of port holdups, often attracts a premium. Exports of cotton from Australia to Indonesia, for example, attract such a premium because shipping is quick (often less than seven days), reliable and cheap (especially if 'empty return containers' are available). In contrast, intra-African shipments of even short distances are often subject to delays and higher costs.

2.3.4 Substitutability of cotton from different national origins

Within staple length categories, substitutability between national origins rises as staple lengths fall. This is because (i) fewer countries produce cotton of a longer staple length and (ii) spinners are more concerned at higher staple lengths to maintain blend consistency.

In general, even within staple length categories, there is some cost to switching between similar growths of different national origin. This means principally changing settings on spinning machines and there is some trial and error involved.

However, where a sufficient price differential emerges most spinners will switch the source of their cotton. In this regard, some spinners are perceived as being more conservative than others in their national choices. For example, Thailand is viewed as being conservative as compared with China and India, which are perceived by traders to be more price sensitive.

2.3.5 Cotton quality in Sub-Saharan Africa

Traditionally, cotton lint originating from West and Central Africa has been of either high-medium or medium quality. On average, West and Central African cotton lint commands a 9.3 percent quality premium above the A Index, where part of the premium derives from a very low count of knotted and short fibre content. Further, the region's lint has a reputation for (relatively) low levels of contamination (Levin, 1999; Goreux and Macrae, 2002).

Roller gins, as opposed to saw gins, are superior in terms of maintaining fibre length during the ginning process, an attribute for which textile producers have been inclined to pay a premium. As such, Uganda and Tanzania have traditionally occupied a unique position as being two of only a handful of countries exporting roller ginned lint (more than 80 percent of traded cotton is saw ginned). Since liberalisation, however, Tanzania (and to a lesser extent Uganda) has lost this unique position. At least half of the new private ginneries in Tanzania are saw gins, which conventionally produce lower-quality cotton, to which no premium is attached *per se* (Gibbon, 1998). Poor harvesting practices and storage facilities at farm level are also problems in the sector which have caused serious contamination of seed cotton. This has been reflected in lint quality and has influenced the broader reputation of Tanzanian cotton and the premiums and discounts with which it is associated. According to ITMF (2001), Tanzanian lint is now ranked as the twelfth most contaminated out of thirty national origins reported.

On the other hand, Uganda still maintains a niche market position by supplying mainly roller-ginned cotton lint (only four out of approximately 35 operational gins are saw gins) and the quality is still considered relatively high compared to Tanzanian cotton lint (Lundbaek, 2002). Nevertheless, Uganda's production of cotton lint remains relatively low.

The ability to maintain quality control upstream in the marketing chain is significantly higher in the Zimbabwean and Zambian concentrated market systems. In both countries, the majority of the ginning companies impose uniform grading procedures at the primary purchasing stage, according to nationally defined standards (Zulu and Tschirley, 2002). Apart from a detailed grading system, the dominant ginners have taken a leading role in controlling the problem of lint contaminated by polypropylene. Other factors behind the

sectors' ability to maintain higher-quality cotton lint is the nature of competition for seed cotton and composition of ginning companies. The dominant ginning companies in Zimbabwe and Zambia (three companies controlling around 90 percent of the seed cotton market) have made large fixed investments in ginneries and have developed input credit schemes in order to obtain sufficient supply of high-quality seed cotton. In Zambia, the two largest ginning companies (Clark and Dunavant) only compete in one province (and only against each other), while Dunavant has a dominant market position in the other provinces.

Against this background, Zambia and Zimbabwe have the most secure position in relation to crop reputation in Anglophone Sub-Saharan Africa. Ginning companies are able to offer high volumes of a range of standardised and homogeneous cotton lint quality without the risk of contamination. During the last decade, Zimbabwean cotton lint has commanded a premium around ten percent above the A Index. Zambian lint also obtains a significant premium above the A Index. However, the reputation of Zimbabwean lint as being contamination free has recently been questioned by some Asian and South African spinners and the premium has declined. This might be associated with weather-related factors, as the last two seasons have been drought years. It could also indicate that the price differentials between the higher grades have narrowed, which may reduce incentives for farmers to grade properly before selling their produce (Hanyani-Mlambo *et al*., 2003).

2.3.6 Measuring the quality of cotton

Since the late 1970s spinners have searched for improved consistency of fibre measurement and have imposed higher demands for quality. This has followed on from two distinct developments. First, new technologies in high-speed yarn spinning make detailed measurement of the strengths of fibres more important (Bradow and Davidonis, 2000). Second, increased competition in spinning and textile markets has led to product differentiation (and more sophisticated textiles) as a basis for competition.

This led to the development of a new system of mechanical classification – the so-called High Volume Instrument (HVI) – able to measure virtually all main fibre characteristics giving users more exact descriptions of the relevant properties of the cotton lint. Since 1993, samples from all cotton bales produced in the US have been HVI classified prior to sale. More recently, the entire Australian, Brazilian and Israeli cotton crop has been HVI classified, while HVI machines have been installed in several African countries.[4]

As a result, two tendencies are predicted. First, a trend towards contractual agreements, based on arrangements between individual companies, stating that cotton lint is supplied according to HVI specifications (Daviron and Gibbon, 2002). In this case, producers/ginners bypass international traders by selling directly to spinners offering detailed HVI assessments of the quality of cotton lint, based on the spinners' demands for specific qualities.

Secondly, there is a tendency towards quality management based on *ex post* selection. For instance, contaminated cotton lint, which traditionally caused problems in the spinning process (and downgraded cotton production from countries with these properties), can be blended into a mix harmless for the spinning process, provided that a spinner knows the exact level of contamination in the bale of cotton lint (Mor, 2001). Nevertheless, the

degree of inter-substitution and flexibility in blend formulas remains lower than for coffee and cocoa, where processors have become decreasingly dependent on national origins. Most spinners normally favour specific blends of different national origin in order to obtain desired yarn properties. Thus, while the HVI system provides a potential means to facilitating a higher degree of substitution between different cotton lint qualities, the reputation of national origins is still an important source of differentiation. This is largely due to uncertainties surrounding the reliability of test results and dependency on testing samples as opposed to assessing entire bales of cotton lint. Reliable test results depend critically on calibration methods and procedures as well as demanding at least accurate control and measurement of atmospheric conditions, in particular relative humidity and temperature.

2.4 Conclusion

The role of trading companies, the existence of market prices, and the increasing reliance on quality measurements suggest an integrated market for cotton. But the direct relationships between suppliers and consumers, the close correspondence of some characteristics of cotton from particular suppliers and the conservatism of some buyers all confirm that it is not completely unitary.

3. Cotton Subsidies and their Impact

3.1 Government support to the cotton sector

Cotton prices have been depressed by government support to cotton exporters, notably in the US, China and the EU. Price distortions caused by government interventions in the cotton sector have been declining over time, but they are still significant. In 1999/2000, eight countries had distortionary policies affecting 52 percent of world cotton production. This was down from 1986 when 25 countries had distortionary policies, affecting 69 percent of world production (Valderrama Becerra, 2000). Cotton-producing countries with little or no intervention include: Argentina, Australia, El Salvador, Guatemala, Israel, Nicaragua, Nigeria, Paraguay, Peru and Venezuela.

Table 3 summarises government assistance to cotton production. For 1999/2000 the average level of assistance across all subsidising countries was US$0.58 per kilogram (equivalent to 48% of the world price). Interventions by Brazil, Mexico and Egypt have only a minor impact on the world cotton market. They have relatively low levels of assistance and their production amounts to a small proportion of world output.

Table 3: Government Assistance to Cotton Producers*

	1999/2000	2001/02	1999/2000	2001/02
	US$ per kilogram		Assistance US$ million	
US	0.75	0.47	2065	2300
China	0.43	0.23	1534	1200
EU	1.39	1.37	844	700
Greece	1.36	1.30	638	n.a.
Spain	1.50	1.67	206	n.a.
Turkey	0.24	n.a.	198	150
Brazil	0.07	n.a.	44	
Mexico	0.20	n.a.	28	
Egypt	0.09	n.a.	20	
Total			**4733**	**4350**

*Direct support to producers
Source: Valderrama (1999); ICAC (2000)

3.1.1 US

The US is the second-largest cotton producer and by far the largest exporter. Consequently, its policies exert a strong influence on the world cotton market. A number of commodity (including cotton) programmes exist in the US. The objectives of these programmes have evolved around two themes: raising farm incomes and preserving small farms. The budgetary outlays for most of these programmes are authorised by Congress every few years through various Acts, more commonly known as Farm Bills.

In the early 1960s, the US storage policy aimed to reduce fluctuations in cotton prices on the world market. This policy was reformed because it did not fit with free-market principles and was expensive. As a result, the US cotton stockpile fell from 134 percent of utilisation (exports plus use by the national textile industry) in 1965 to about 30 percent by 1970 and to 20 percent by 1990 (USDA, 2001).

The 1985 Farm Bill replaced support managed through public stockholding with a price support mechanism known as deficiency payments.

The 1996 Farm Bill marked an important stage in US subsidy policy by introducing direct payments to producers which were decoupled from production. The Act (which encompasses all agriculture including cotton) aimed to spend US$47 billion between 1996 and 2002, with US$35 billion as direct income payments to farmers. Since world prices have been lower than anticipated when the 1996 agricultural law was passed, Congress has had to make additional appropriations to prevent the price received by cotton farmers from falling below the price target of US$1.59 per kilogram retained in the 1996 and 2002 Farm Laws. By the end of 2000 an additional US$22 billion was spent topping up farm incomes. An additional US$11.5 billion was proposed for 2001.

The main channels of support under the 1996 Farm Bill were decoupled payments, market price payments, insurance, export subsidies and emergency payments.

For decoupled payments, by signing a Production Flexibility Contract (PFC) a farmer who produced a quantity of cotton during a reference period ending in 1995 received in 1996, and in each of the five subsequent years, a payment determined by this. These were designed to compensate cotton producers for the loss of some market price support under the 1996 Farm Bill. In 1999/2000 these payments totalled US$623 million.

Market price payments, which consist of market assistance loans and loan deficiency payments, are designed to compensate cotton farmers for the difference between the world price and the loan rate (i.e., a support price) when the latter exceeds the former. Cotton loan rates are determined according to a statutory formula that compares domestic and world prices. The minimum loan rate is US$1.10 per kilogram and the maximum is US$1.14 per kilogram. Producers must have their cotton ginned and placed in a Community Credit Corporation (CCC) approved warehouse. Cotton placed under a marketing assistance loan may be forfeited to the CCC when the loan expires. Terms of the loan are usually for ten months.

An Adjusted World Price (AWP) for cotton is calculated, based on Northern European cotton prices adjusted to US base quality and average location. Eligible farmers will take out a loan with the CCC on their cotton at time of ginning, with the value of the loan based on their level of production valued at the loan rate. When the loan is repaid, the loan repayment rate is the lower of the loan rate or the AWP. This guarantees that farmers receive at least the loan rate for their cotton. If, for example, the AWP is US$0.88 per kilogram at the time the loan is repaid, the farmer need only pay back at the rate of US$0.88 per kilogram, having earlier taken out a loan at the loan rate of US$1.14 per kilogram. The difference is made up by the government programme. Under certain circumstances, interest charges on loans and warehouse charges are also met by the government.

Eligible producers who do not take out the loan can apply for a loan-deficiency payment which, like the marketing loan, is equal to the difference between the AWP and the loan rate when the AWP is below the loan rate.

Export subsidies are made to cotton exporters and domestic end-users of cotton when domestic US prices exceed North European prices and the world price is within a certain

level of the base loan rate. For export-subsidy payments to be made, the US domestic price must exceed the Northern European cotton price by more than US$0.0275 per kilogram for four consecutive weeks, and, secondly, the AWP must be within 134 percent of the base loan rate. The objective of US export subsidies is to bridge the gap between higher US domestic prices and world prices, so that US exporters maintain their competitiveness.

Spending for export subsidies was capped at US$201 million for the 1996–2002 period, but this level was passed by the end of 1998. In 1999 Congress passed the US Agricultural Appropriateness Bill which provided an additional US$200 million in 2000 and US$430 million through to 2002 for export subsidies.

In 2002, the US introduced the 2002 Farm Bill, which is expected to be in place for the next six years. As a result, government assistance could increase from 32 percent of average farmer income under the 1996 Farm Law to 45 percent under the new law, since the new law modifies the nature of several types of subsidies (Shurley, 2002). The 2002 Farm Bill replaced the PFC payments with a direct payment. Payments are based on historical planted area and yield rather than actual production. It also allows farmers to select the 1998–2001 period instead of the previous one, if they believe that they will gain in changing the base. Consequently, a farmer who has increased production in recent years receives more than one who has reduced it. Direct payments are independent of market prices and are set at US$0.15 per kilogram for 2002/03.

The Farm Bill also introduced anti-cyclical measures, which are implemented when the effective price is below the target price. The effective price is the direct payment, plus the higher of the national average market price paid to producers or the loan rate. In 2002/03 the loan rate was set at US$0.52 and the target price was US$0.724. The 2002 Farm Bill continues to offer the loan deficiency payment – issued when world prices adjusted by quality and location are below the loan rate. It is estimated that total direct income and price support in the US amounted to US$2 billion in 2002/03.

3.1.2 EU

Cotton support in the EU began in 1981 when Greece and Spain joined the EU's Common Agricultural Policy (CAP), as cotton cultivation is sizeable only in Greece and Spain. Together Spain and Greece accounted for 2.5 percent of world production and 6 percent of world exports in 2001, but they accounted for 16 percent of world cotton subsidies. In 2001/02, subsidies reached US$979 million estimated to decrease to US$957 million in 2002/03. The strengthening of the euro over the last two years has affected EU support expressed in US dollars: while estimated support for 2002/03 represents a 2 percent decline in dollars, in euros support represents a 5.7 percent decline.

Under the CAP, support is given to cotton producers based on the difference between the market price and a support price. Advance payments, which are made to ginners who pass the subsidy to growers in the form of higher prices, are based on estimates of seed-cotton production. The CAP also influences the quantity of cotton produced by setting a maximum guaranteed quantity of seed cotton for which assistance is provided – 782,000 tonnes for Greece and 249,000 tonnes for Spain.

The EU reformed its cotton programme in 1999. While the support price and the maximum guaranteed quantity of seed cotton for which assistance is provided have been

maintained, penalties (i.e., reduction in subsidies) for excess production over the maximum guaranteed quantity have increased. Under the reformed policy, for each 1 percent of excess production, the level of subsidy is lowered by 0.6 percent of the support price as compared with 0.5 percent prior to 1999.

The support price for cotton is set at €1.063 per kilogram. In the last two years, Greece exceeded its quota by a great deal more than Spain and received a price 28 percent lower than Spain because of higher penalties.

In addition to output subsidies, EU cotton producers also receive subsidies on inputs such as credit for machinery purchase, insurance and publicly financed irrigation.

3.1.3 China

China's intervention in its cotton sector began in 1953 with the introduction of the First Five Year Plan. The central planning policies adopted then were based on those of the Soviet Union and remained in place for the next 35 years. The central government set production targets and procurement quotas through Chinatex, a public agency. A measure to boost cotton production was taken in 1978 by increasing the price of cotton as well as supplying more fertiliser to cotton farmers. A second boost came in 1980 with the partial abolition of the communal production system under the Household Responsibility System which gave land-use rights to individual farmers.

The Chinese government sets a reference price for cotton, but since 1999 has introduced reforms to allow actual prices to be negotiated between buyers and sellers – the price can now go somewhat below the reference price. The reference price for 1999/00 was set at an equivalent of US$1.21 per kilogram, some 30 percent below reference prices for 1997/98. Prior to these recent reforms, state cotton companies were obliged to buy the entire cotton crop at national procurement prices.

Procurement prices are generally set above world prices and provide producers with price support. Total price and income support in 1998/99 in China was estimated at US$2.7 billion.

The Chinese government is attempting to reduce the large stocks of cotton and to broaden marketing distribution to allow state mills to purchase cotton directly from farmers. In some sense the reforms have worked: the level of China's stocks has fallen from 4.7 million tonnes in 1997 to 1.8 million tonnes by 2001. The stocks-reduction policy of the government of China has resulted in local prices declining more rapidly than international prices, and government expenditures to assist cotton growers are estimated to have declined from US$1.2 billion in 2001/02 to US$750 million in 2002/03.

Cotton exports are subsidised through direct payments made by the central government to exporting agencies. These payments attempt to bridge the gap between higher domestic prices and world prices. In 1999/00 these amounted to US$86 million or US$0.29 per kilogram.

China also maintains tariffs on imports that bridge the gap between domestic and world prices. Following its WTO accession, arrangements cotton tariffs will be reduced by 15 percent, but at the same time a tariff-related quota system is being implemented to manage imports (Research Centre for Rural Economy, 1999).

3.1.4 Support in other countries

Brazil

Cotton farmers in Brazil receive a minimum guaranteed price that is slightly above the world price. In 1998 government subsidies amounted to an estimated US$52 million. Cotton growers in Brazil also receive a preferential interest rate and tax rebates.

In 2001/02, Brazilian domestic prices fell below the minimum guaranteed prices, which were set at US$0.81 per kilogram, and the government spent an extra US$9.6 million to cover the difference. For 2002/03, market prices were well above the minimum guaranteed price, set at US$0.77 per kilogram of lint, and no assistance was offered.

Mexico

A small amount of assistance is provided to Mexican cotton farmers, which in 1998/99 was the equivalent to US$15 million or US$0.07 per kilogram. Cotton growers also receive technical assistance, assistance for crop insurance and assistance for price risk management.

With a drop in world cotton prices, additional assistance was offered in 1999/00 equivalent to US$188 per hectare.

In 2001/02, assistance to cotton growers was provided by the government of Mexico at a rate of US$194 per hectare, equivalent to US$18 million. For 2002/03, the government approved legislation to offer a support price mechanism with a target price of US$1.41 per kilogram, worth US$7 million in aggregate support.

Turkey

The challenge for Turkey has been to provide some assistance to cotton farmers without harming the competitiveness of the textile sector. In 1997/98 minimum support prices were set for the major producing areas which averaged US$0.24 above the world price. Since 1998, the government has implemented a procurement price set at the prevailing world market price, but all cotton growers are entitled to a premium payment based on deliveries of seed cotton to cooperatives or private gins.

Government support for cotton farmers in Turkey was estimated to be at US$212 million for 1999/00. Lower prices moved the Turkish government to offer a premium of US$0.07 per kilogram of lint to cotton growers in 2001/02, equivalent to an extra US$59 million.

Egypt

As prices declined during 2000/01, the government of Egypt provided US$23 million of support per year. In 2002/03, the government budgeted US$33 million to help finance the difference between market prices and prices paid to producers.

Côte d'Ivoire

In Côte d'Ivoire, the government provided US$8 million in emergency assistance to cotton growers in 2001/02, equivalent to US$0.04 per kilogram. In 2002/03, given that political unrest in the country greatly affected the cotton growing region in the north, the government increased assistance to US$14 million or US$0.09 per kilogram.

India

Cotton production policies in India have historically been orientated towards promoting and supporting the textile industry. The government offers a minimum support price for each variety of seed cotton on the basis of recommendations from the Commission for Agricultural Costs and Prices. In all states except Maharashtra, where there is state monopoly procurement, the government run Cotton Corporation of India (CCI) is entrusted with market intervention operations in the event that prices fall below the minimum support price. In Maharashtra, cotton growers are prohibited from selling seed cotton to any buyer other than the Maharashtra State Cooperative Marketing Federation. In addition, the Indian government has also supplied inputs to farmers at highly subsidised rates.

3.2 Cotton subsidies under the WTO

During the Uruguay Round negotiators attempted to separate domestic policies judged to have no direct effect on agricultural trade (green box), from those that did have clear trade and production distorting effects (amber box). Policies in the amber box were subject to a reduction of 20% over 6 years. Direct payments could be moved to the green box provided that they were 'decoupled' from production. This provided freedom to increase domestic assistance levels. The restructuring of the EU's Common Agricultural Policy under the 1992 MacSharry and 2003 reforms moved support from the amber into the blue and green boxes. Green-box support, however, has had a major cost-reducing effect, because the support it provided to farmers allowed them to produce and export more cheaply.

In addition to the green box, three other forms of assistance were not affected by the Uruguay Round reduction commitments. These corresponded to (i) developmental objectives in developing countries; (ii) *de miminis* levels according to which five percent (ten percent in the case of developing countries) of the contributions in the amber box were exempt; and (iii) direct payments for production-limiting programmes or the so-called blue box (mainly used by the EU).

Blue-box measures include payments to farmers for reducing production on the basis of pre-determined areas. Blue box subsidies granted by the EU based on pre-determined quantities of seed cotton have trade-distorting effects, since production in Greece and Spain would fall sharply if the subsidies were eliminated.

The economic impact of the amber box reductions (aggregate measure of support or AMS) was reduced not only by an increase in green-box subsidies but also by several other considerations. First, because of low international prices in the base period, the support allowances afforded very high levels of assistance. Secondly, the levels of reduction in support from the base period could be achieved by transferring payments to the blue box which was free from reduction commitments, although there is a presumption that blue box policies are more distortionary than green box policies. Thirdly, the commitment to reduce AMS at the aggregate and not the product level means that assistance to specific commodities could be increased. Fourthly, the AMS excluded support provided by protection.

3.3 Challenges to Subsidies

In 2003, Brazil was the first country to make a formal complaint under the WTO dispute mechanism about US subsidies, contending that these depressed world prices and were injurious to Brazilian cotton growers, while significantly increasing the US share of the global cotton market. Brazil maintained that the US had doubled the level of subsidies to its farmers since 1992, so that cotton subsidies were not covered by the immunity granted under the 'peace clause' of the WTO's Agreement on Agriculture. This clause protected countries using subsidies from being challenged under other WTO agreements, as long as the level of domestic support for a commodity remained at or below 1992 levels. Central to the legal challenge were direct payments to US farmers under the 1996 and 2002 Farm Bills, as well as payments under emergency supplemental appropriation bills. The US government argued that direct payments are de-coupled (not linked to current production), not trade distorting and should not have been counted when compared to 1992 levels of support.

On 16 May 2003, Burkina Faso, on behalf of Benin, Mali and Chad, presented the WTO's Trade Negotiations Committee with a new proposal for cotton entitled *Poverty Reduction: Sectoral Initiative in Favour of Cotton.* The initiative called for two decisions to be taken at the Cancún Ministerial meeting in September 2003:

1) The establishment of a 'mechanism for phasing out support for cotton production with a view to its total elimination', which would provide for 'substantial and accelerated reductions in each of the boxes of support for cotton production'; and,
2) The establishment of transitional measures for Least Developed countries: 'until cotton production support measures have been completely eliminated, cotton producers in Least Developed countries should be offered financial compensation to offset the income they are losing, as an integral part of the rights and obligations resulting from the Doha Round'.

According to the proposal – supported by 13 other West and Central African countries[5] – the elimination of subsidies for cotton production and export is their 'only specific interest' in the Doha Round.

The proposal failed with the rest of the Cancún agenda, but on 26 April 2004, Brazil won a landmark victory at the WTO when it was ruled that the US had violated WTO obligations by granting excessive subsidies to its cotton growers between 1999 and 2002, depressing prices at the expense of Brazilian and other growers. The interim decision determined that some US de-coupled payments did provide an incentive for production, and thus were trade-distorting. The decision in favour of Brazil has apparently accepted the principle that it is possible to calculate the damage from subsidies even if they are formally decoupled. The ruling could start a domino effect affecting other agricultural support provided by other developed countries (such as the EU) in cotton and other sectors (such as sugar). The US will appeal against the ruling, but few appeals succeed completely, and future cases would only need to prove damage, not an increase in support, because the Peace Clause expired at the end of 2003.

4. The Impact of Removing Cotton Subsidies on Developing Countries

4.1 Impact of distortions

Numerous previous studies have attempted to measure the impact of cotton subsidies on world cotton prices and production. It is difficult to draw direct comparisons because most analyses adopt different methodologies, examine the impacts on a different set of countries and use different reference years to estimate the effects of subsidy removal. In addition, simulations assuming that all commodity prices are liberalised, not just cotton, are not directly comparable because of both growth and relative price effects. However, the results do serve to provide an initial insight into the magnitude of likely impacts.

The Centre for International Economics (2002) simulates the effect of full liberalisation of textiles trade, as well as that of eliminating subsidies to cotton production and exports of cotton fibre. They estimate that for 2000/01 the elimination of quotas and tariffs on yarns, textiles and clothing would raise cotton prices by 4.1 percent, while the elimination of subsidies would raise them by 10.7 percent.

Quirke (2001) uses the GTAP model to simulate the economic effects on Australian cotton production of the removal of all production and income assistance to cotton producers in China and the US (not the EU), as well as the removal of all tariffs on cotton. The model uses trade and production data for 1999 and assumes US assistance to the cotton sector equal to US$0.31 per kilogram and US$0.59 per kilogram for China. The effects are found to be:

1) a drop in US (-15.9 percent) and Chinese (-19.5 percent) cotton production;
2) an increase in the world price of cotton (13.4 percent); and,
3) an increase in Australian cotton production of 44 percent and a 53 percent increase in the net income of the cotton industry.

The results do not indicate, however, the impact of cotton support on developing countries, either as a group or individually.

The International Cotton Advisory Committee (2003b) uses a short-run partial-equilibrium analysis to estimate the impact of direct subsidies in the cotton sector. This model makes a number of assumptions. First, given that there is no measurement of the supply response to prices in all subsidising countries, it assumes a US elasticity for all subsidising countries. Secondly, demand response to higher prices resulting from a removal of subsidies is measured by the price demand elasticity provided by the ICAC Textile demand model (-0.05). Thirdly, a measurement of the supply response of other countries to higher prices resulting from the removal of subsidies is assumed to be 0.47. The analysis concludes that average cotton prices in the absence of subsidies would have been 30 percent and 71 percent higher in the 2000/01 and 2001/02 seasons respectively.

The Food and Agricultural Policy Research Institute (2002) also examines the impact of reforms in the cotton market. The FAPRI modelling system is a multi-market, world agricultural model. The model is extensive in terms of both its geographic and commodity coverage. The FAPRI model produces world prices by equating excess supply and demand in the world market and is driven by two major groups of exogenous variables. First, policy indicators in the model can be altered for policy analysis.

Secondly, the model incorporates forecasts of macroeconomic variables, such as gross domestic product, inflation rates, exchange rates and population. The cotton simulation holds these constant. The FAPRI model assumes complete liberalisation of all commodity sectors, i.e., removal of trade barriers and production and export subsidies. For cotton, world prices increase by 15% over the 19 year period of the simulation, as compared with 2002 levels. US cotton production, consumption and net cotton exports decline by 11 percent, 2 percent and 13 percent respectively. EU cotton production falls by about 79 percent and net cotton imports increase by 143.1 percent. As world prices rise, Africa increases its cotton exports by 12.3 percent above the baseline level.

The IMF economist Tokarick (2003) uses a partial equilibrium estimate removing support for cotton and other commodities. Agricultural support is represented by four types of measures in the model: tariffs, export subsidies, production subsidies and input subsidies. The model was used to simulate removal of each type of support. Support measures for cotton were constructed from budget data maintained by the US Department of Agriculture. Four elasticity parameters were used: the domestic price elasticity of demand; the domestic price elasticity of supply; the import demand elasticity in the rest of the world; and the export supply elasticity in the rest of the world. Demand elasticities were assumed to equal -0.75 and supply elasticities were assumed to equal 1.5. Each of the four simulations was performed on a multilateral basis and, as such, all countries were assumed to liberalise at the same time. For cotton, the model predicts that removal of price support would lead to a 0.8 percent increase in world price, and removal of production subsidies would lead to a 2.8 percent increase in world price. No estimates are provided for the effect of removing input subsidies in the cotton sector.

One of the most influential studies is undertaken by Goreux (2003) who uses a partial equilibrium model to estimate the impact of cotton subsidies on export earnings in West and Central Africa. The results from this model were used by Benin, Chad, Burkina Faso and Mali in their submission to the WTO in which they argued that export subsidies in the cotton sector reduced world prices by 15.2 percent and West and Central African export earnings by US$250 million for 2001/02. The model assumes:

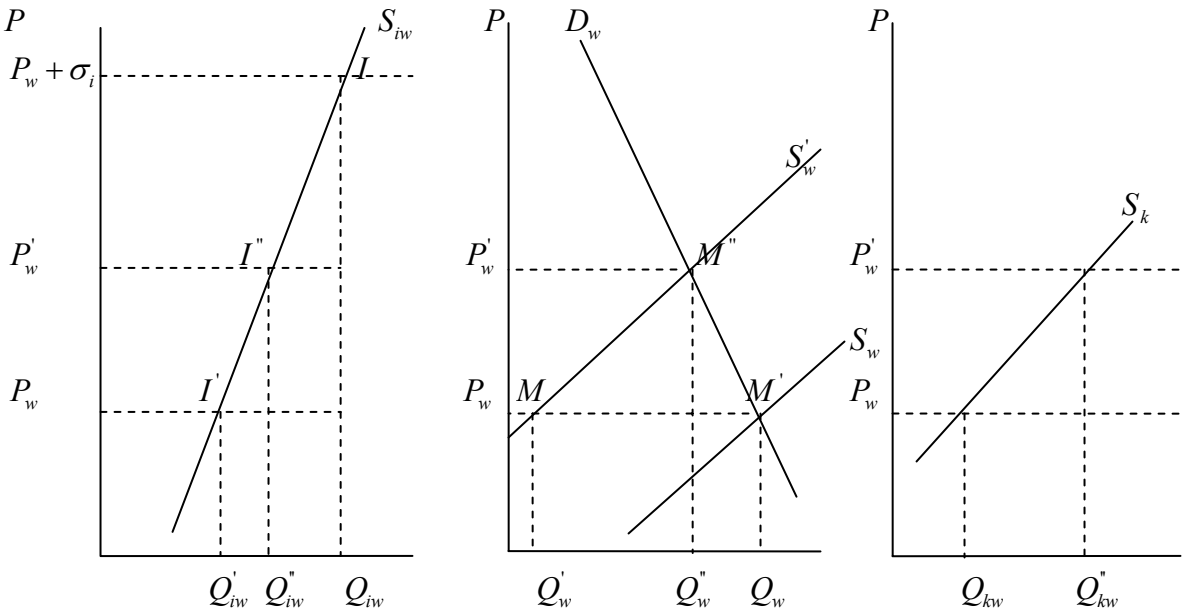
1) trade and production data for 1999/00;
2) subsidies for 1999/00;
3) world prices for 1999/00 (US$1.16 per kilogram);
4) a single world market;
5) a price elasticity of supply equal to +0.5 and a price elasticity of demand equal to -0.1; and
6) perfectly free entry and exit of all producers.

The presentation of the partial equilibrium model used by Goreux (2003) is reproduced below in terms of demand and supply curves. Figure 3 relates to producer country *i* where cotton is subsidised; Figure 4 represents the world cotton market, *w*; and Figure 5 relates to producer country *k* where cotton is not subsidised.

The world market for cotton, with subsidies, is illustrated in Figure 4. The equilibrium point M' is at the intersection of the world demand curve (D_w) and the supply curve to the world with subsidies. This defines the price P_w and the size of cotton production with subsidies.

Figure 3, shows the supply curve (S_{iw}) of cotton-subsidising country *i* to the world market. With subsidy σ_i, equilibrium point *I* corresponds to price $P_w + \sigma_i$ and quantity Q_{iw}. Without subsidy, producers in country *i* only receive P_w and produce $Q_{iw}^{'}$. The equilibrium point moves left from *I* to $I^{'}$ and production for the world market is reduced by $Q_{iw}^{'}Q_{iw}$.

Figure 3 **Figure 4** **Figure 5**



Moving back to Figure 4, without the subsidy in country *i,* the supply curve faces the world market shifts left from equilibrium Q_w to $Q_w^{'}$, with the size of $MM^{'}$ corresponding to the quantity of cotton withdrawn from the market due to the removal of subsidies in country *i.* Since the world demand curve D_w remains unchanged, the new equilibrium point is $M^{"}$ corresponding to price $P_w^{'}$ and quantity $Q_w^{"}$.

Moving back to Figure 3, the new equilibrium is point $I^{"}$ because the new price $P_w^{'}$ is higher than P_w but lower than $P_w + \sigma_i$. This leads to an increase in production from $Q_{iw}^{'}$ to $Q_{iw}^{"}$. In Figure 5, non-subsidising country production to the world market increases from Q_{kw} to $Q_{kw}^{"}$. The income increase for the cotton sector of non-subsidising country *k* results from two components. First, country *k* now sells the quantity Q_{kw} at price $P_w^{'}$ instead of P_w. Secondly the country now sells $Q_{kw}^{"}Q_{kw}$ at price $P_w^{'}$.

4.2 The structure of the world cotton (lint) market

Previous attempts to model the impact of subsidy withdrawal on world cotton trade and producer incomes, discussed in the previous section, have assumed a single, unitary market for cotton in which buyers choose between essentially homogeneous consignments of lint from different producing countries on the basis primarily of price. In section 2.3 we presented some information on the cotton market. On the basis of that, here we consider the extent to which this assumption of a unitary lint market fits the evidence.[6] As will be shown in the following section, the overall impacts of complete subsidy removal (in terms of world price adjustment) are greater and the distribution of the resulting benefits more favourable to poorer countries in a unitary market than in a fragmented world cotton market. However, the impact of the removal of EU cotton subsidies on producers in poorer countries is greater in a fragmented world cotton market.

Economic models of the world cotton market focus on producing and consuming countries. With widespread liberalisation of cotton sectors, however, there are generally several exporters operating in a given producer country and often a larger number of spinners in consuming countries. In between are a large number of international trading companies (see Section 2.2), whose expertise lies in being able to satisfy the year-round demands of particular spinners for particular types of lint, through well-developed contacts with a range of suppliers (exporters and/or ginners).

As with all commodities, cotton comes in a range of qualities (see Section 2.3.3). Indeed, the number of attributes that can distinguish one consignment from another is high. The highest class of cotton (extra fine/Pima) functions almost as a market apart from the remainder.

Spinners' decisions on where to source lint are influenced by quality attributes of the lint product. Some of these are largely determined at national level, through the seed varieties developed in a particular country or the agro-climatic conditions prevailing there, or through national factors outside the control of participants in the cotton sector (e.g. port efficiency). Others are under the control of individual ginning and exporting firms (e.g. control of most types of foreign matter). Some are most readily controlled at sectoral level (e.g. the honeydew that causes stickiness or polypropylene contamination). Where a national cotton sector is dominated by one or two firms, their efforts may be sufficient to ensure that these factors are adequately controlled throughout the sector. However, where sectors consist of numerous small players, central coordinating action may be required (Poulton *et al.*, 2004) and that particular quality attribute can be considered effectively out of the control of individual ginners and exporters.

In light of the above, it is easy to see how national origin (particular growths of cotton from particular countries) becomes important in world cotton trade. While the types of cotton within a given quality category are broadly substitutable for each other (given that they share basic characteristics, such as staple length and fineness), there are plenty of reasons why a spinner may prefer one to another. Even confining consideration to purely physical characteristics of the lint, different national origins generally require slightly

different settings on spinning machines and successfully adjusting a factory to new settings involves a process of trial and error. Hence, spinners tend to be conservative (a description used by traders): once they have hit on a particular blend of different lint types that suits the product that they are making, they like to stay with it if they can. Modifying the blend to incorporate a new national origin is done only if necessary (see section 2.3.4).

This tends to produce 'stickiness' in the world cotton market: today's trade flows are a good initial indicator of tomorrow's. However, market shares can and do change over time (see section 2.2). Most notable is the recent rise in import penetration by Australian lint, reflecting its rise to prominence during the 1990s as a supplier of Asian markets, based on a superb quality reputation. Central Asia (where water shortages have led to production problems) and Pakistan (a victim of drought in 2001/02) have both lost market share.

Hence, there are limits to the 'stickiness' in world markets. Different lint sources are imperfectly substitutable, but not completely so. If a particular cotton sector runs into difficulties (e.g. the quality control problems encountered by various African sectors immediately after liberalisation) or if a new source appears that can supply lint at lower prices than more established competitors (Brazil is the best current example[7]), then some spinners will eventually decide to modify their blend in response to the change in relative prices.

The world cotton market is best characterised by monopolistic competition. Particular national origins are valued by particular spinners, who have evolved blends incorporating them. Thus, small changes in relative prices will not induce changes in trade flows. However, when a larger margin opens up or when a particular supply source becomes less reliable in either quality or quantity, many spinners will, however reluctantly, decide to switch.

Lack of data means that it is not possible to model this monopolistically competitive market with any accuracy. However, an anecdotal example, provided by one trader, relating to West African and Australian lint, is that Australian lint may be preferred by some Asian spinners with a price premium of up to US$0.13 per kilogram, owing to its impeccable quality and quick supply time to Asia. If the margin exceeds this (due, for example, to recent shortages of Australian lint as a result of a persistent drought), then these spinners may switch to West African lint.

The approach taken in the following section is to model both a unitary market and a perfectly fragmented one (i.e., no switching beyond existing supply sources within a given import market, whatever the change in relative prices). The dynamics of the actual monopolistically competitive market fall somewhere between these two extremes. The impact of subsidy removal will therefore fall between the outcomes predicted by the two alternatives modelled. We cannot say where exactly, although it is probably fair to assume that reality is nearer to the unitary model than to the fully fragmented one[8], and that in the long-term the market moves towards the unitary end.

4.3 Supply Elasticities

Most previous models have assumed the same supply elasticities for all countries, but analysis of the principal suppliers (see Chapter 5) suggests that this is wrong. In particular, the West and central African countries may have high supply elasticities. We therefore test the sensitivity of the results to different supply elasticities.

4.4 Modelling the effect of the removal of subsidies on export earnings in West and Central Africa

In this section, we simulate an adapted version of the Goreux (2003) model, assuming a single world market for cotton. We then proceed to test the robustness of the model by relaxing the assumption of a single world market. Instead, we assume that the market for cotton is fragmented into individual-country cotton markets, between which the price of cotton can differ and in which the entry of new and exit of existing producers is prohibited.[9] The algebraic formulation of the fragmented market model and the sequence of steps is presented in Appendix 11.

For the purposes of our model, we assume a constant price elasticity of demand equal to -0.1[10] and estimate a price elasticity of supply for world cotton production, based on ICAC production and price data, equal to 0.5. In addition, however, we also use estimated individual supply responses for a number of developing-country producers (see Section 5.10) and assume supply constraints for Australia,[11] Tajikistan, Turkmenistan and Uzbekistan.[12]

Our model uses bilateral trade and production data for 2001[13] and assumes that the price of cotton in each individual cotton market before the removal of subsidies is US$1.16 per kilogram. We also use subsidy data for 1999/00 (see Table 4).

Table 4: Subsidies ($ per kilogram)

	95/96	96/97	97/98	98/99	99/00	00/01	01/02
US	0.0022	0.1694	0.15268	0.4906	0.7458	0.3476	0.4664
China			0.4378	0.5962	0.4268	0.4356	0.2266
Greece			1.936	1.848	1.364	1.276	1.298
Spain			1.826	1.958	1.496	1.892	1.672

4.4 The effects of cotton subsidies

Four simulations of the effect of removing subsidies relative to the base year were carried out using different assumptions regarding the structure of the world market and price elasticities of supply (see Table 5). Under all the price of cotton rises substantially by 18-28%.[14]

Table 5: Cotton Model Simulations

Simulation	Structure of world market	Price elasticities of supply	Predicted Final World Cotton Price ($/kg)	Predicted increase in World Cotton Price (%)
S/U	**Single**	Uniform: 0.5	1.37	18
F/U	**Fragmented**	Uniform: 0.5	1.39	20
S/D	**Single**	Differentiated Australia: 0 Brazil: 0.6 Burkina Faso: 0.6 Cameroon: 0.6 Côte d'Ivoire: 0.6 Egypt: 0.35 Mali: 0.6 Sudan: 0.35 Tajikistan: 0 Tanzania: 0.6 Togo: 0.6 Turkmenistan: 0 Uganda: 0.6 Uzbekistan: 0 Zimbabwe: 0.6 ROW: 0.5	1.42	22
F/D	**Fragmented**	Differentiated Australia: 0 Brazil: 0.6 Burkina Faso: 0.6 Cameroon: 0.6 Côte d'Ivoire: 0.6 Egypt: 0.35 Mali: 0.6 Sudan: 0.35 Tajikistan: 0 Tanzania: 0.6 Togo: 0.6 Turkmenistan: 0 Uganda: 0.6 Uzbekistan: 0 Zimbabwe: 0.6 ROW: 0.5	1.48	28

Before the elimination of subsidies, world production of cotton is equal to 20.41 million tonnes (see Appendix 14). Of this, only 26 percent is traded. Non-subsidised producers receive US$1161.60 per tonne for cotton sold in all markets, while US, Chinese, Greek and Spanish producers receive US$1907.60, US$1588.40, US$2525.60 and US$2657.60 per tonne respectively, as a result of the subsidies provided by their governments.

Initially, the US, China, Greece and Spain produce 10.29 million tonnes of cotton equivalent to 50 percent of world production (see Appendix 15). West and Central Africa, in contrast, produces 829 thousand tonnes of cotton (see Table 6).

Table 6: Production of Cotton in West and Central Africa before the Elimination of Subsidies

Country	Cotton Production (tonnes)	Earnings from cotton production ($ thousands)
Benin	107,334	124,679
Burkina Faso	59,308	68,892
Cameroon	83,865	97,418
Central African Republic	11,100	12,894
Chad	46,087	53,535
Congo	9,315	10,820
Côte d'Ivoire	88,034	102,260
Gambia	100	116
Ghana	7,672	8,912
Guinea	1,330	1,545
Guinea-Bissau	2,949	3,426
Liberia	40	46
Mali	251,748	292,430
Niger	6,889	8,002
Nigeria	149,595	173,770
Togo	3,575	4,153
Total	*828,941*	*962,898*

The first effect is that without subsidy US, Chinese, Greek and Spanish producers receive only US$1161.60 per tonne of cotton. As a result, US production falls by 22 percent, Chinese production falls by 14 percent, Greek production falls by 32 percent and Spanish production falls by 34 percent. The supply of cotton is reduced for the world market (single market simulations) or for country markets in which subsidised producers sell (fragmented market simulations). The removal of subsidies results in a reduction of cotton supply equal to 1.92 million tonnes (see Table 7).

Table 7: Initial Fall in US, China, Spain and Greece Cotton Production as Subsidies are Removed[15]

Country	Initial Cotton Production (tonnes)	Cotton Production All Simulations (tonnes)
US	4,396,041	3,430,593
China	5,312,602	4,543,135
Greece	481,348	326,441
Spain	102,608	67,837
Total	*10,292,599*	*8,368,006*

The reduction in cotton supply from previously subsidised producers leads to price increases in the world market (single market) or country markets (fragmented market) in which these producers operate. For these, price increases are larger for country markets which used to consume high proportions of subsidised production.

The price rise or price rises induce higher supply from initially non-subsidised and subsidised sources. As a result, world cotton production increases (see Table 8) to between 20.07 million tonnes (simulation F/U – a net reduction of 1.7 percent from the

initial level) and 20.40 million tonnes (simulation F/D – similar to the initial level of production).

Table 8: Final Impact on World Cotton Production when Subsidies are Removed (Percentage change in parentheses)

Country	Initial Cotton Production (tonnes)	Final Cotton Production Simulation S/U (tonnes)	Final Cotton Production Simulation F/U (tonnes)	Final Cotton Production Simulation S/D (tonnes)	Final Cotton Production Simulation F/D (tonnes)
World	20,412,866	20,078,721 (-1.6%)	20,067,769 (-1.7%)	20,299,500 (-0.6%)	20,404,106 (0.0%)
US	4,396,041	3,725,708 (-15.2%)	4,033,182 (-8.3%)	3,798,252 (-13.6%)	4,329,527 (-1.5%)
China	5,312,602	4,933,957 (-7.1%)	5,174,077 (-2.6%)	5,030,026 (-5.3%)	5,172,145 (-2.6%)
Greece	481,348	354,523 (-26.3%)	385,121 (-20.0%)	361,426 (-24.9%)	438,160 (-9.0%)
Spain	102,608	73,672 (-28.2%)	82,924 (-19.2%)	75,107 (-26.8%)	93,855 (-8.5%)
US+China+Greece+Spain	*10,292,599*	*9,087,860 (-11.7%)*	*9,675,304 (-6.0%)*	*9,264,811 (-10.0%)*	*10,033,687 (-2.5%)*

Cotton production in the US, China, Greece and Spain now ranges from 9.09 million tonnes under simulation S/U (45 percent of world production) to 10.03 million tonnes under simulation F/D (49 percent of world production) representing a net decrease of between 1.2 million tonnes and 259 thousand tonnes.

Table 9 shows increases in cotton production and export earnings from cotton in West and Central African countries as a result of the removal of cotton subsidies. Cotton production in West and Central Africa increases between three percent (simulation F/U) and 12% percent (simulation S/D). Earnings from cotton production for West and Central Africa rise between US$94 million (10%) and US$360 million (37%) from an initial level of US$963 million.

Table 9: Production of Cotton in West and Central Africa after the Elimination of Subsidies

	% change in Cotton Production (Tonnes increase in parentheses)				% change in Cotton Production Earnings ($ millions increase in parentheses)			
Country	**Sim S/U**	**Sim F/U**	**Sim S/D**	**Sim F/D**	**Sim S/U**	**Sim F/U**	**Sim S/D**	**Sim F/D**
Benin	9%	4%	11%	6%	28%	15%	36%	20%
Burkina Faso	9%	5%	13%	8%	28%	17%	39%	25%
Cameroon	9%	5%	13%	9%	28%	18%	39%	27%
Central African Republic	9%	4%	11%	5%	28%	13%	36%	16%
Chad	9%	4%	11%	6%	28%	15%	36%	25%
Congo	9%	0%	11%	0%	28%	0%	36%	0%
Côte d'Ivoire	9%	5%	13%	7%	28%	15%	39%	21%
Gambia	9%	1%	11%	1%	28%	3%	36%	3%
Ghana	9%	3%	11%	4%	28%	10%	36%	12%
Guinea	9%	0%	11%	0%	28%	0%	36%	0%
Guinea-Bissau	9%	2%	11%	2%	28%	5%	36%	5%
Liberia	9%	8%	11%	10%	28%	27%	36%	34%
Mali	9%	2%	13%	2%	28%	5%	39%	7%
Niger	9%	1%	11%	1%	28%	3%	36%	3%
Nigeria	9%	1%	11%	1%	28%	2%	36%	3%
Togo	9%	11%	11%	18%	28%	37%	39%	57%
Total	*9% (71,310)*	*3% (24,494)*	*12% (99,920)*	*5% (35,836)*	*28% (271)*	*10% (94)*	*37% (360)*	*14% (134)*

Increases in cotton production and earnings arising from the removal of subsidies under the different simulations vary considerably among the other major (non-subsidised) cotton producers (see Appendix 16 and Table 10a).

Table 10a: Production of Cotton in Other Major Producer Countries after the Elimination of Subsidies

	Final Cotton Production (Tonnes) (Percentage increase in parentheses)				Final Cotton Production Earnings ($ millions) (Percentage increase in parentheses)			
Country	**Sim S/U**	**Sim F/U**	**Sim S/D**	**Sim F/D**	**Sim S/U**	**Sim F/U**	**Sim S/D**	**Sim F/D**
Australia	915,025 (9%)	898,476 (7%)	842,545 (0%)	842,545 (0%)	1,254 (28%)	1,191 (22%)	1,200 (23%)	1,150 (17%)
Brazil	946,884 (9%)	879,719 (1%)	985,178 (13%)	884,753 (1%)	1,297 (28%)	1,043 (3%)	1,403 (39%)	1,063 (5%)
India	2,166,023 (9%)	2,030,307 (2%)	2,208,198 (11%)	2,036,382 (2%)	2,968 (28%)	2,444 (5%)	3,144 (36%)	2,466 (6%)
Mexico	105,670 (9%)	113,497 (17%)	107,728 (11%)	120,148 (23%)	145 (28%)	180 (59%)	153 (36%)	214 (90%)
Pakistan	1,988,714 (9%)	1,846,361 (1%)	2,027,437 (11%)	1,849,488 (1%)	2,725 (28%)	2,182 (3%)	2,887 (36%)	2,196 (3%)
Turkey	978,078 (9%)	950,868 (6%)	997,122 (11%)	961,621 (7%)	1,340 (28%)	1,232 (18%)	1,420 (36%)	1,276 (22%)
Uzbekistan	915,554 (9%)	859,193 (2%)	843,032 (0%)	843,032 (0%)	1,254 (28%)	1,040 (6%)	1,200 (23%)	1,028 (5%)

In absolute terms Australia, Brazil, Turkey, India, Mexico, Uzbekistan and Pakistan receive most of the increase in total world cotton earnings as a result of the removal of

cotton subsidies, ranging from 68 percent (simulation F/D) to 73 percent (simulation S/U) – see table 10b.

Table 10b: Share of World Increase in Cotton Production Earnings after the Elimination of Subsidies

	Increase in cotton earnings as a % of world total			
Country	**Sim S/U**	**Sim F/U**	**Sim S/D**	**Sim F/D**
Australia	8.4%	20.8%	7.7%	14.3%
Brazil	8.7%	3.0%	9.0%	4.2%
India	19.9%	12.4%	20.2%	12.5%
Mexico	1.0%	6.5%	1.0%	8.4%
Pakistan	18.3%	5.4%	18.5%	5.7%
Turkey	9.0%	18.1%	9.1%	19.1%
Uzbekistan	8.4%	5.9%	7.7%	4.1%
West and Central Africa	8.3%	9.2%	8.5%	11.2%

Table 11 compares the results from our model with those of Goreux (2003). Although the results are not directly comparable (we use production data for 2001 instead of 2000 and trade and production data from different sources), simulation S/U predicts very similar impacts on world price, world production and earnings foregone by West and Central African cotton producers.[16] In contrast, the results for simulations F/U, S/D and F/D differ quite markedly from those of Goreux due to the different underlying assumptions used in each.

Table 11: Comparison of Results with Goreux Model

After removal of subsidies:	**Goreux (2003) (S/U)**	**Sim S/U**	**Sim F/U**	**Sim S/D**	**Sim F/D**
Cotton price	$1.34 per kilogram (15.2%)	$1.37 per kilogram (18%)	$1.39 per kilogram (20%)	$1.42 per kilogram (22%)	$1.48 per kilogram (28%)
Change in world cotton production	-268,000 tonnes (-1.4%)	-334,145 tonnes (-1.6%)	-345,097 tonnes (-1.7%)	-113,366 tonnes (-0.6%)	-8,760 tonnes (-0.0%)
Change in US cotton production	-600,000 tonnes (-16.2%)	-670,333 tonnes (-15.2%)	-362,859 tonnes (-8.3%)	-597,789 tonnes (-13.6%)	-66,514 tonnes (-1.5%)
Change in China cotton production	-315,000 tonnes (-8%)	-378,645 tonnes (-7.1%)	-138,525 tonnes (-2.6%)	-282,576 tonnes (-5.3%)	-140,457 tonnes (-2.6%)
Change in Greece cotton production	-118,000 tonnes (-27%)	-126,825 tonnes (-26.3%)	-96,227 tonnes (-20.0%)	-119,922 tonnes (-24.9%)	-43,188 tonnes (-9.0%)
Change in Spain cotton production	-39,000 tonnes (-29%)	-28,936 tonnes (-28.2%)	-19,684 tonnes (-19.2%)	-27,501 tonnes (-26.8%)	-8,753 tonnes (-8.5%)
Change in others cotton production	804,000 tonnes (7.3%)	870,594 tonnes (8.6%)	272,198 tonnes (2.7%)	914,422 tonnes (9.0%)	250,152 tonnes (2.5%)
Earnings foregone by: ($ millions)					
Benin	38.0	35.0	18.3	44.5	24.5
Burkina Faso	27.3	19.3	11.9	26.5	17.0
Cameroon	19.8	27.4	17.6	37.5	26.6
Central African Republic	2.3	3.6	1.7	4.6	2.0
Chad	18.5	15.1	8.2	19.2	13.4
Côte d'Ivoire	43.3	28.7	15.4	39.3	21.3
Ghana	3.5	2.5	0.9	3.2	1.1
Guinea	2.8	0.5	0.0	0.6	0.0
Mali	49.3	82.2	14.9	112.7	20.6
Niger	0.3	2.3	0.2	2.9	0.3
Nigeria	15.0	48.8	3.2	62.0	4.4
Togo	14.5	1.1	1.5	1.6	2.3
Total	*234.6*	*266.5*	*93.8*	*354.6*	*133.5*

4.5 The effects of individual country subsidies

A second set of simulations were carried out to estimate the impact of individual country cotton subsidies, using the same variants in markets and supply elasticities, but three scenarios for subsidy reduction:

1) only the EU eliminates its subsidies (see Appendix 17);
2) only the US eliminates its subsidies (see Appendix 18); and,
3) only China eliminates its subsidies (see Appendix 19).

Table 12 (see over) summarises the broad consequences for cotton production. In terms of implications for world production, the removal of Greece/Spain subsidies has the least effect and the removal of US subsidies the greatest.

In terms of the distributional consequences on cotton-producing countries in West and Central Africa, Appendices 20-22 illustrate the impact on cotton production and earnings as a result of removing individual country subsidies under the four simulation scenarios. These are summarised in Table 13.

Table 13: Results for the Elimination of Individual Country Cotton Subsidies on Cotton Production in West and Central Africa

Simulation	*Removal of all subsidies*	*Remove of EU subsidies*	*Removal of US subsidies*	*Removal of China subsidies*
Initial level of subsidies ($ millions)	4200	700	2300	1200
Cotton earnings in West and Central Africa before removal of subsidies ($ millions)	962.9			
Increase in Production (tonnes)				
S/U	71,309	6,474	34,154	26,972
F/U	24,495	9,215	14,695	409
S/D	99,919	8,383	45,587	35,703
F/D	35,835	13,757	21,042	535
% Increase in Earnings				
S/U	28%	2%	13%	10%
F/U	10%	4%	6%	0%
S/D	38%	3%	16%	13%
F/D	14%	6%	8%	0%
% of total loss in earnings from removal of all subsidies				
S/U	100%	8%	46%	36%
F/U	100%	38%	59%	1%
S/D	100%	8%	43%	33%
F/D	100%	40%	56%	1%

Under all simulations the US is responsible for the greatest loss in cotton earnings from West and Central Africa. This result is not surprising, given that the aggregate support the US grants to its cotton producers is the highest in the world. Of greater interest are the significant losses in West and Central Africa attributable to EU subsidisation of Greek and Spanish cotton farmers and the relatively small losses as a result of Chinese cotton subsidies, although these are higher than EU subsidies, under the simulations which assume a fragmented world cotton market. The high impact of Greece and Spain can be explained because these countries actively compete with cotton production from developing countries in third markets. The subsidies they receive per unit of cotton production from the EU are also the highest in the world (see Table 4).

Table 12: Results for the Elimination of Individual Country Cotton Subsidies on World Cotton Production

	Removal of Greece/Spain subsidies				Removal of US subsidies				Removal of China subsidies			
	Sim S/U	*Sim F/U*	*Sim S/D*	*Sim F/D*	*Sim S/U*	*Sim F/U*	*Sim S/D*	*Sim F/D*	*Sim S/U*	*Sim F/U*	*Sim S/D*	*Sim F/D*
Initial World production (tonnes)	20,412,866	20,412,866	20,412,866	20,412,866	20,412,866	20,412,866	20,412,866	20,412,866	20,412,866	20,412,866	20,412,866	20,412,866
Initial Greece/Spain production (tonnes)	583,956	583,956	583,956	583,956	583,956	583,956	583,956	583,956	583,956	583,956	583,956	583,956
Initial US production (tonnes)	4,396,041	4,396,041	4,396,041	4,396,041	4,396,041	4,396,041	4,396,041	4,396,041	4,396,041	4,396,041	4,396,041	4,396,041
Initial China production (tonnes)	5,312,602	5,312,602	5,312,602	5,312,602	5,312,602	5,312,602	5,312,602	5,312,602	5,312,602	5,312,602	5,312,602	5,312,602
% change in world production	-0.2%	-0.2%	-0.1%	0.0%	-0.8%	-0.9%	-0.4%	0.0%	-0.6%	-0.7%	-0.4%	-0.7%
% change in Greece/Spain production	-32.0%	-20.5%	-31.9%	-9.7%	4.1%	0.9%	4.9%	1.0%	3.3%	0.0%	3.8%	0.0%
% change in US production	0.8%	0.2%	0.9%	0.2%	-18.7%	-8.6%	-18.1%	-1.9%	3.3%	0.2%	3.8%	0.2%
% change in China production	0.8%	0.0%	0.9%	0.0%	4.1%	0.2%	4.9%	0.2%	-11.7%	-2.9%	-11.2%	-2.9%

The relatively minor impact of China's cotton subsidies on West and Central Africa, and developing countries more generally, can be explained because 90 percent of Chinese cotton imports originate from the US and Australia – the two largest exporters of cotton. As a result, most absolute gains from the removal of Chinese cotton subsidies accrue to these two countries in our model.

In terms of individual country impacts in West and Central Africa, the simulations which assume a single world market for cotton produce similar proportional gains for all countries. However, under the assumption of a fragmented market US cotton subsidies account for the greatest losses in Benin, Burkina Faso, Cameroon, Central African Republic, Côte d'Ivoire, Ghana, Guinea-Bissau, Liberia, Mali, Nigeria and Togo (see Appendix 21). Losses owing to EU subsidisation of Greek and Spanish cotton farmers are greatest for Chad, Gambia and Niger and significant (more than 50 percent of losses due to US subsidies) for Benin, Burkina Faso, Cameroon, Central African Republic, Côte d'Ivoire and Ghana (see Appendix 20).

5. Factors Affecting the Supply of and Demand for Cotton

The ability of developing countries to benefit from the removal of cotton subsidies in the US, China and the EU depends on whether they are able to increase output of (and secure demand for) their cotton in response to receiving a higher price. To understand this more fully, this section examines demand and supply conditions for cotton in the major developing country producers.

The following sections discuss developments in the cotton sector in the main producer developing countries.

5.1 Long-term determinants of supply

This section explores the data assembled for the purpose of analysing price transmission and supply response in different African cotton sectors during the period 1966-2002. It explains differences in the way in which sectors have been organised within this period and highlights other factors that may have influenced observed price transmission and supply response during this time. In doing so, it provides a justification for basing current supply-response estimates primarily on data from the 1990s, rather than on the longer period (1966-2002) originally intended.

5.1.1 Francophone West Africa

In general, Francophone West African states have enjoyed reasonable macroeconomic stability. As members of the CFA Franc zone, their currency was first pegged to the French Franc and then to the euro. The real exchange rates of CFA Franc zone member states began to appreciate in the late 1980s, leading to a 50 percent devaluation of the CFA Franc (from FFr1=CFA50 to FFr1=CFA100) in 1994. Amongst other things, this gave a short-term boost to seed cotton prices, expressed in domestic currency terms (but not in US dollar terms).

Until the last few seasons, all Francophone West African countries retained a state-controlled, single-channel cotton market system. These systems delivered a comprehensive range of services to producers but were accused of being inefficient and high cost and hence depressing seed cotton prices paid to producers. Reform is now proceeding gradually in a number of countries, driven by intense pressure from the World Bank, among others. However, the nature of reform depends on the country in question. In Côte d'Ivoire, the former state monopoly system has been broken up into three regional monopolies, with concessions given to both public and private players. In Benin, several private ginneries now exist, although they buy agreed quotas of seed cotton at an administratively fixed price. In Burkina Faso, while the single-channel marketing system has been retained, farmers have been given a much greater say in how the system is run.

More generally, during the late 1990s, producer representatives began to play an increasingly 'political' role within the cotton sector in some countries, including lobbying for higher producer prices. The combination of internal and external pressure means that

it is now widely accepted within Francophone countries and their cotton sectors that producers should receive 50-60 percent of the world price of cotton lint. This, plus the undermining of some previous price stabilisation mechanisms during reform, means domestic prices could in future move more closely in line with international prices than they have in the past.

Meanwhile, in Mali, Côte d'Ivoire and Benin, governments provided a degree of subsidy to the cotton sector when world prices collapsed to historic lows in 2001.

Benin

Benin underwent fundamental political and economic reform around 1991 in response to a growing economic crisis. However, minor reforms to the state-controlled, single-channel cotton system were only contemplated at the end of the decade.

Burkina Faso

Burkina has retained its single-channel cotton market system, with all its coordination benefits, but has brought additional stakeholders, including farmer organisations, into the ownership and management of the system. Some observers see the Burkina sector as the best performing of the Francophone sectors at present (see Fok and Tazi, 2003).

A single seed cotton price prevails in Burkina, announced in February or March each year, i.e., prior to planting. A multi-stakeholder committee is responsible for setting the basic seed cotton price. This takes into account international prices, but also current production costs and the desire to provide producers with some price stability. This basic price is then supplemented by an increment designed to distribute to producers 40 percent of any profit achieved by the single-channel market system in the previous season.

Appendix 13 (Chart 1) shows that there has been a high degree of price stabilisation within the Burkina cotton system throughout the past few decades. Seed cotton prices, expressed in constant 1990 CFA francs, received a boost from the devaluation in 1994 and have since then benefited from the increasing role played by producer representatives within the sector.

Meanwhile, there is some evidence that seed cotton production has responded to prices in the 1990s. The Pearson correlation coefficient for current (nominal) price and production for 1990–2001[17] is .76 (significant at one percent level) and that for constant 1990 prices and production is .65 (significant at five percent level). Coefficients for area planted and price are weaker, but that between current (nominal) price and area planted for 1990–2001 is still .56 (significant at six percent level).

Cameroon

There has as yet been little reform of the cotton sector, which remains controlled by the parastatal SODECOTON. However, seed cotton prices show greater variability over time than those in other Francophone countries. This reflects the greater instability in the economy as a whole, associated with higher inflation and an oil boom in the 1980s (and hence currency overvaluation), and perhaps also poor management of the cotton

parastatal. Prices expressed in local currency terms jumped in 1994 in response to the devaluation of the CFA franc and to high world prices. They fell back the following year, but have remained around their 1995 level despite the subsequent fall in world prices (Appendix 13 – Chart 3).

Meanwhile, there is some evidence that both area planted to seed cotton and seed cotton produced have responded to prices (announced in advance) in the 1990s (Appendix 13 – Chart 4). The Pearson correlation coefficient for current (nominal) price and area planted for 1990–2001 is .93 (significant at one percent level) and that for constant 1990 prices and area planted is .55 (significant at six percent level). Figures for production and price are almost identical.

Côte d'Ivoire

In Côte d'Ivoire, the 1970s was a period of high domestic seed cotton prices, but also double-digit inflation. It is possible to interpret the 1990s price data as showing some link between international lint and domestic seed-cotton prices until the collapse in world prices forced this link to be broken (Appendix 13 – Chart 5).

Meanwhile, there is some evidence that area planted to seed cotton has responded to price (announced in advance) in the 1990s (Appendix 13 – Chart 6). The Pearson correlation coefficient for nominal price and area planted for 1990–2001 is .81 (significant at one percent level) and that for constant 1990 prices and area planted is .59 (significant at five percent level).

Mali

Despite coming under intense pressure from, among others, the World Bank, Mali has so far largely declined to liberalise its cotton sector. However, during the late 1990s producer representatives played an increasingly 'political' role within the sector, including calling for producers to boycott planting in 2000 when prices were not high enough. If external scrutiny of the performance of the Malian cotton sector remains high and producer pressure is sustained within the sector, domestic seed cotton prices could track world prices more closely in future than in the past (Appendix 13 – Chart 7).

Meanwhile, with ready access to support services, producers are able to respond to increased seed-cotton prices. Over the period 1988–2001, the correlation between seed cotton production and price (in 1988 CFA Francs) was 0.82 (Pearson correlation, 2-tailed), significant at the one percent level. There is some debate as to whether cotton production will plateau in the main cotton zones, due simply to the high share of land already under cotton and the already (by African standards) commendable yields.[18] However, producers at present are continuing to expand output to confound sceptics.

Togo

In Togo, it is possible to interpret price data from the mid-1980s onwards as showing a weak link between international lint and domestic seed-cotton prices. However, increasing domestic pressures for higher seed-cotton price and the collapse in world

prices forced this link to be broken towards the end of the 1990s (Appendix 13 – Chart 9).

Meanwhile, there is evidence that both area planted to seed cotton and seed cotton produced have responded to prices (announced in advance) in the 1990s (Appendix 13 – Chart 10). The Pearson correlation coefficient for current (nominal) price and area planted for 1990–2001 is .89 (significant at one percent level) and that for constant 1990 prices and area planted is .88 (also significant at one percent level). Figures for production and price are almost identical.

5.1.2 Other Sub-Saharan African countries

Anglophone and Lusophone African countries have all liberalised their cotton sectors at some point since 1985. The liberalised sectors have evolved different organisational forms with differing results. Poulton *et al*. (2004) identify three main forms of sector organisation post-liberalisation:

- Concentrated (dominated by two or three large players)
- Multiple small players
- Local monopoly

Based on an assessment of six of these sectors (Ghana, Mozambique, Tanzania, Uganda, Zambia and Zimbabwe), they conclude that the concentrated sectors have generally performed best in the areas of quality control, input credit and research and extension support, while performing no worse than the sectors with multiple small players in the area of seed-cotton pricing. While the sectors with multiple small players exhibit intense competition in price setting, in the concentrated sectors price setting is often characterised by price leadership. The firms giving this lead have apparently appreciated the importance of offering attractive prices to producers. However, for the purposes of the current study, competitive price setting may be expected to lead to fuller transmission of international price changes to domestic prices. On the other hand, more readily available input credit and extension support should enhance the capacity of producers to respond to price changes transmitted to them, while better quality control increases the attractiveness of a sector's lint to international buyers.

Neither performance of the local monopoly systems studied had any mechanism for injecting competition into price setting. In Mozambique, in particular, prices offered to producers in recent years have been low. While a local monopoly system should provide companies with the necessary security to invest in quality control, input credit and research and extension support, actual performance is likely to depend heavily on the incentives provided by the rules governing rights to monopoly 'concession areas'. These are weak in both cases and performance may thus continue to be disappointing.

In what follows, sectors are characterised according to the classification given above.

Mozambique (local monopoly)

The Mozambique cotton sector was relaunched in 1989, after collapsing as a result of the ongoing civil war. Initially, three joint venture companies (involving the Government of Mozambique and foreign capital) were given monopoly rights to develop cotton production in three concession areas. Subsequently, other companies have also been given concessions, some of them carved out of the three original areas. Nevertheless, there remains no formal mechanism for injecting competition into the cotton sector. Therefore, 'to protect producers', an administratively set seed-cotton price is announced each year – the result of negotiations between the Ministry of Agriculture, concession companies and the Cotton Research Institute (IAM), with limited input from farmers. In practice, prices paid for seed cotton rarely rise much above this reference price, which – after being set at an unsustainable level in 1996 – has tended to be conservative in recent years.

Chart 11 (Appendix 13) shows how administratively set prices have moved with A-index prices in the 1990s. A-Index prices are an important point of reference for administratively set prices, but the 1996 experience shows that expectations of the A Index can be wrong and/or that other domestic pressures can (occasionally) take precedence. There is no statistically significant correlation relationship between the A Index and either domestic price series over the period covered by the chart.

Given that administratively set prices are only announced shortly before harvest in Mozambique, one would expect seed-cotton production to be a lagged function of prices. This has indeed been the case in the 1990s. The Pearson correlation coefficient for seed cotton price (expressed in US dollars) and the quantity of seed cotton produced the following season, over the 1990–2001 period, is .80 (significant at five percent level).

Nigeria (multiple players)

Nigeria moved to a liberalised system in the mid-1980s. While competition may be good for seed-cotton prices, the liberalised sector has yet to establish mechanisms for ensuring other aspects of service delivery and, in particular, quality control. The reasons for the two post-liberalisation seed-cotton price peaks shown in our data (Appendix 13 – Chart 13) have yet to be established.

Tanzania (multiple small players)

From the mid-1960s until 1994, seed-cotton marketing and ginning in Tanzania was heavily state controlled. There were changes in the nature of the exercising of this control, with key reforms occurring in 1976 (generally considered to have had negative effects) and 1986 (more positive, but with benefits short-lived and/or unsustainable). Management of the cotton sector in the 1980s was also complicated by the macroeconomic instability experienced during this decade. This included rising exchange rate overvaluation in the early 1980s which was gradually corrected during the second half of the decade.

Cotton marketing was liberalised in 1994, with the private sector quickly assuming a dominant role. However, while producers benefited immediately from receiving prompter

payment and a higher share of the world cotton price, the large number of small private buyers and of ginners has largely failed to provide anything in the way of support services (extension, input credit) to producers or to maintain quality control procedures (Poulton *et al.*, 2004). A crisis in the sector in 1998–89 eventually led to the Tanzania Cotton Board playing a more interventionist role in input supply and quality control. There has been some recovery in production since 2000, despite historically low world prices in 2001/02.

It is possible to distinguish three phases in the relationship (or lack of it) between the international cotton lint price and the price paid to Tanzanian seed cotton producers (Appendix 13 – Chart 14). These are as follows:

1. up to 1980: seed-cotton prices expressed in US$ terms show some tracking of rising international prices, but with a significant degree of price stabilisation (a policy of many cash crop parastatals). This relationship is less obvious if constant 1990 TShs seed cotton prices are used instead of US$ prices;
2. 1980–1990: macroeconomic crisis and recovery. Seed-cotton prices expressed in US$ terms lose touch with international reality.
3. 1990s: macro stability, plus cotton-sector liberalisation in 1994. The link between the international lint price and the domestic seed-cotton price is restored. There is no formal mechanism for price stabilisation, although there is evidence that companies absorbed some of the low world prices after 1998, rather than passing all the burden onto producers. For the post-liberalisation years of 1994–2003, the Pearson correlation coefficient between the two price series is 0.63, significant at the five percent level (2-tailed).

It thus appears that, under the current macroeconomic regime and highly competitive seed-cotton buying regime, higher world lint prices will in large part be transmitted to seed cotton producers. Higher world prices in 2002–03 were reflected in a 50 percent rise in nominal seed cotton prices in 2003, as compared to 2002.

Delgado and Minot (2000) found an elasticity of supply of seed cotton of 1.00 in response to changes in the previous season's seed cotton price. Similarly, Chart 15 (Appendix 13) suggests that in the 1990s seed-cotton production activities did respond to the incentive provided by the previous season's prices (expressed in constant 1990 TShs). The Pearson correlation coefficient for seed-cotton price (expressed in constant 1990 TShs) and the quantity of seed cotton produced the following season, over the 1990–2001 period, is .72 (significant at one percent level).

In late 2003, producers were gearing up for a large expansion in area planted in 2003–04 following the attractive seed-cotton prices paid during the 2003 buying season. However, while land remains plentiful in parts of the main Tanzanian cotton-production zone, it is important to recognise that other factors – most notably, access to affordable crop protection chemicals – may also determine the ability of producers to respond to

expanded opportunities. Meanwhile, poor quality control affects the marketability of the resulting lint.

Uganda (multiple small players)

Uganda has been plagued with poor governance and/or conflict for much of the period covered by our data. Cotton-production figures show a major fall between 1973 and 1980. The modest recovery of production in the 1990s has so far only returned activity to 1976–78 levels. Political stability was eventually achieved when President Museveni captured power in 1986; macroeconomic stability was only achieved by the early 1990s, with a major devaluation of the exchange rate taking place through 1987–91.

In the late 1980s an attempt was made to re-launch cotton production through the existing cooperative system. This ran into management problems almost immediately (Dijkstra and van Donge, 2001). Shortly after (1994), the cotton sector was liberalised and, as in Tanzania, private buyers soon came to dominate. As might be expected in a highly competitive sector, seed-cotton prices paid to producers have, since liberalisation, followed world prices quite closely (Appendix 13 – Chart 16). For the period 1991–2001, the Pearson correlation coefficient between the two price series is 0.82, significant at the one percent level (2-tailed).

Dijkstra and van Donge (2001) argue that there was an initial supply response to liberalisation, but – again as in Tanzania – this soon encountered constraints related to the inability of the liberalised sector to deliver support services (high-quality seed, credit for inputs, extension) to producers and to maintain quality control. The sector is still grappling with these issues.

Statistically, the correlation between seed-cotton prices (expressed in 1990 UShs) and production the following season is negative for the 1990–2001 period. The sector has managed a modest expansion despite declining real seed-cotton prices through the decade.

Zambia (concentrated)

Since liberalisation in 1994/95, the Zambian cotton sector has been dominated by two main players, one located only in Eastern Province and the other operating throughout the country's cotton-growing areas. An initial production expansion was halted when the entry of additional small players into the sector undermined repayment of input credit. However, after many of those smaller players exited again as world prices fell, the two main players have been able to work both at restoring credit supply and at improving the quality of the country's lint. Thus, in 2003 production surpassed its previous 1998 peak.

Zimbabwe (concentrated)

Commercial farmers in Zimbabwe have historically been effective lobbyists for attractive prices for their main crops (Jenkins, 1997). Between 1980 and 1994, political considerations also weighed heavily in seed-cotton pricing. Since liberalisation in 1995, Cottco (previously the parastatal CMB) has exercised price leadership, with other companies (just two until 2000) competing more on quality and range of services

provided than on seed-cotton pricing (Larsen, 2002). Nevertheless, there is some evidence that a link has been maintained between the domestic seed-cotton price (expressed in US$ terms[19]) and the A Index. The Pearson correlation coefficient for these two series for 1969-2002 is 0.74 (significant at one percent).

Since 2000, the deterioration in the state of the overall Zimbabwe economy, with high inflation and acute foreign-exchange shortages, has made price data difficult to interpret. If seed-cotton prices are expressed in US$ terms, it appears that producers have been squeezed. As commercial producers have become less important to Cottco, it is possible that their influence over pricing has declined. By contrast, when prices are expressed in constant 1990 ZW$ terms, the opposite appears to be true.

Since 1980, cotton production in Zimbabwe has gradually shifted from commercial production (80 percent of the national total in 1980, around 50 percent in 1990, only ten percent in 2001) to smallholder production. The pace and geographical scope of the expansion of smallholder production has depended heavily on the ability of the main cotton company, Cottco, to invest in provision of support services to new areas. In addition, droughts in 1992, 1995 and 2002 had a devastating impact on production.

Cottco, and more recently Cargill (Cottco's main competitor) operate a sophisticated payments system, under which prices can rise during the buying season. If this occurs, producers who sell early receive backpayments if this occurs. In addition, the opening price for one season is generally the final price from the previous season, giving producers some assurance at planting time of the minimum that they will receive for their crop.

The high level of support services, on the one hand, and droughts, on the other, would be expected to have opposing impacts on the statistical correlation between seed-cotton pricing and production levels. In practice, both (smallholder) area planted and seed-cotton production are moderately, but significantly, correlated with both current and past season's seed-cotton price for the 1990–2001 period. For example, the Pearson correlation coefficient for current seed-cotton price (expressed in 1990 ZW$) and quantity of seed cotton produced, over this period, is .53 (significant at five percent level).

5.1.3 North Africa

Egypt

For Egypt, there is a weak, albeit statistically significant, correlation (0.41, significant at five percent) between the international A-index lint price and the seed-cotton price, expressed in 1990 Egyptian pounds, over the period 1969–2001. The relationship is even weaker, although still apparent, if the seed cotton price in US$ terms (distorted by exchange rate distortions) is used.

Meanwhile, there is evidence that both area planted to seed cotton and seed cotton produced have responded to prices – announced in advance – in the 1990s. The Pearson correlation coefficient for seed cotton price (in constant 1990 Egyptian pounds) and area planted for 1990–2001 is .82 (significant at one percent level) and that for constant 1990 prices and seed cotton produced is .62 (significant at five percent level).

Sudan

As the series for seed-cotton prices in US$ terms in Chart 20 (Appendix 13) illustrates, Sudan has experienced two periods of gradual overvaluation of its exchange rate, culminating in a devaluation in 1981–83 and the introduction of a new currency, the dinar, initially existing alongside the pound, in 1992. From a statistical viewpoint, these events obscure any relationships between international cotton-lint prices and domestic seed cotton prices (in either US$ or constant 1990 pound terms). Graphically, there appears to have been some very loose tracking of A-Index prices by local prices in the 1990s.

Similarly, on the production side, no statistically significant correlations are found between domestic prices and production in the 1990s. However, a surprising correlation is found between A-Index prices and Sudanese seed-cotton prices in the following season. The Pearson correlation coefficient for these two price series for 1990–2001/02 is 0.8, significant at the one percent level (Appendix 13 – Chart 21).

5.2 West and Central Africa

5.2.1 Production

Cotton production in West African countries has increased fourfold since the early 1980s. Cotton has proved to be an economically viable crop with a significant and positive impact on exports, economic growth and rural development. Cotton ginning, input supply, transport and marketing constitute significant economic activities in most of these countries. Cotton-related activities account for a large share of rural employment and exports and generate a significant share of government revenue.

With the exception of Benin, cotton production stagnated or declined in the West African countries in the six years preceding the devaluation of the CFA franc in 1994, but accelerated after the devaluation. Production increased by 16 percent a year on average from 1993/94 to 1997/98, then declined for three years before reaching a new peak in 2001/02 of 983,000 tonnes. Over the past four years, production has increased substantially in Mali, Côte d'Ivoire, Burkina Faso and Cameroon; it declined slightly in Benin and markedly in Chad and Togo (see Appendices 31-37).

The development of the sector has resulted in consistently good-quality cotton, high average crop yields (by international standards) and high ginning ratios. In 1995/96, yields were in the range of 470-500 kg/ha, except in Burkina Faso, Chad and Togo where they were below 450 kg/ha. Ginning ratios in West and Central Africa are between 40 and 43 percent, high by international standards.[20] Several factors have contributed to

successful cotton production in the region: application of appropriate soil nutrient replenishment; pest management and seed varieties well-suited to local conditions; the provision, by the government, and/or the cotton companies, of support services and infrastructure; guaranteed producer prices and output markets; high input-credit recovery rates; and well organised village-level associations (Minot and Daniels, 2002).
In all but two countries (Benin and Côte d'Ivoire), the cotton sector is under the control of a single company that controls the provision of inputs and other services to farmers and that operates as the sole buyer of the entire cotton crop. With the exception of Burkina Faso, national governments are majority stakeholders of these companies.

The competitiveness of the region's cotton sector is evidenced by the low level of costs as compared with other countries, and by strong growth in production over the last two decades. The recent decline in world prices has illustrated the level of competitiveness of West African cotton. Although subsidies in the order of US$50 million were required for the zone as a whole to cushion the effect of falling world prices, the national cotton sectors would have been profitable had the international price exceeded US$1.10 per kilogram. Few other countries can produce cotton profitably at this price level.

Table 14: Consumption and Production of Cotton in West Africa

	Area	Production	Initial Stocks	Imports	Consumption	Exports	Final Stocks
	000 Ha	000 Tonnes					
1980/81	588	199	90	0	38	172	86
1981/82	507	188	86	0	37	146	90
1982/83	544	235	90	0	34	184	109
1983/84	635	267	109	0	34	230	113
1984/85	686	306	113	0	35	216	146
1985/86	782	339	146	0	34	317	145
1986/87	821	400	145	0	37	339	158
1987/88	883	396	158	0	39	371	164
1988/89	1061	483	164	0	35	442	175
1989/90	1001	448	175	0	35	432	140
1990/91	1074	515	140	0	34	464	166
1991/92	1193	502	166	0	33	489	146
1992/93	1164	521	146	0	26	471	147
1993/94	1133	495	147	0	27	492	122
1994/95	1358	560	122	2	31	583	75
1995/96	1457	653	75	3	33	589	116
1996/97	1703	774	116	2	38	694	158
1997/98	2066	909	158	0	43	788	238
1998/99	2154	837	238	0	38	792	244
1999/00	2016	840	244	0	34	753	298
2000/01	1647	686	298	1	33	737	234
2001/02	2245	983	234	0	33	737	456
2002/03, est.	2132	881	456	0	21	793	523
2003/04 for.	2170	900	523	0	28	982	412
2004/05 for.	2220	959	412	0	34	945	390

Source: ICAC Statistics.

5.2.2 Demand
Over 90 percent of cotton produced in West and Central Africa is for export. Exports in 2002/03 peaked at 793,000 tonnes.

5.2.3 Expected production
Production is expected to increase rapidly in 2003/04 in several West African countries, most notably Mali, Burkina Faso and Cameroon, each of which seems likely to produce a record crop. Based on current estimates of 900,000 tonnes, aggregate output would approach the previous peak achieved in 2001/02. The timely arrival and satisfactory distribution of seasonal rains has allowed producers to maximise their cotton plantings in most countries and has increased yield expectations. Rainfall has persisted a little too long in some areas, mainly in central and southern parts of the West African cotton region, though any impact on quality is likely to be limited in terms of the overall crop.

5.2.4 Expected domestic demand
Over 90 percent of cotton produced in West Africa is for export. As a result, the region is not predicted to import cotton in 2003/04 and domestic consumption is likely to remain similar to levels experienced in recent years (around 30,000 tonnes).

5.2.5 Expected exports
Spurred by the recent rise in international cotton prices, December 2003 proved to be a very active period of export sales, to the extent that some West and Central African countries have committed most or, in certain cases, all of the prospective 2003/04 cotton outturn. Although the adverse movement of the US dollar/CFA franc exchange rate has eroded returns to some extent recent sales have been more profitable than for a considerable time. Efforts are now focused on the considerable logistical challenge of exporting both the 2002/03 cotton crop, for which shipping instructions began in December 2003, and new crop cotton for shipment in the first few months of 2004. Much of that cotton has been destined for China. Cotton exports from West Africa are expected to reach a record level of 945,000 tonnes, with the largest increases coming from Côte d'Ivoire and Mali.

5.3 China

5.3.1 Production
Cotton is one of the most important cash crops in China, accounting for one percent of GDP. China is the largest producer and consumer of cotton in the world. Since the 1980s there have been around 50 million cotton farmers in China; the cotton-sown area has fluctuated at around 5 million hectares (5.057 million hectares in 2003). China's cotton yield has increased dramatically over the last 40 years. In the 1950s, the average yield was 225 kilograms/hectare. In the 1980s this increased to 750kg/ha and is currently at 1177kg/ha. In 2002/03 China produced 4.92 million tonnes of cotton (see Appendix 23).

Cotton is grown in most of China's provinces, municipalities, and autonomous regions. The major producing areas can be divided into three regions: the Yellow River Valley, the Yangtze River Valley and the Northwest. China's cotton production has shown important regional changes, including wide year-to-year variations in production in the Yellow River region and a gradual but steady growth in Northwest production.

Expansion of China's cotton production in the late 1970s and early 1980s took place primarily in the Yellow River region. Encouraged by government support policies, the Yellow River region's share of production rose dramatically from 30 percent in 1978 to over 60 percent in 1984, when China's cotton production peaked at 6 million tonnes. Since 1991, production in the Yellow River region has declined largely due to a severe worm infestation as well as to increased labour costs in the region and changes in relative crop returns. Most cotton produced in the region is shipped by lorry or rail to nearby textile mills.

Production in the Yangtze River region has been more stable than in other regions. Since 1978, production has varied at between 1.2 million and 1.9 million tonnes. The region's share of national production fell from 60 percent in the late 1970s to 27 percent in 2000. The abundant water in the Yangtze region provides transportation for cotton, both on the river itself and on a network of canals.

Northwestern production has steadily increased and now accounts for a third of China's total cotton production. The Northwest mainly grows upland cotton, with high quality colour and fibre properties owing to its favourable climate conditions compared with eastern regions. The Northwest's remote location makes transportation vital. More than 70 percent of the cotton crop is shipped to eastern provinces or to foreign destinations. High yields, low production costs, improved transportation, relatively few pest problems and a strong government-led push to develop Western provinces have served to encourage production.

5.3.2 Demand

Growth in China's cotton production has not kept up with textile output growth. From 1990 to 2000, annual cotton output fluctuated at around 4.4 million tonnes while use of cotton in yarn production grew by 25 percent. Comparison of regional shares of yarn and cotton production for 1999 indicates that most Northwestern cotton is shipped eastward for spinning, while the Yangtze region spins a significant quantity of cotton produced in other regions. The Yellow River shares of yarn and cotton production are similar, suggesting that most cotton produced there is also spun within the region.

Since 1960, China has been a net importer of cotton. However, when China exported large quantities, as it did in 1986/87 and 1999/2000 world prices fell sharply. When cotton prices reached a peak in 1994/95, China imported 884,000 tonnes which represented 18 percent of national consumption and 13.6 percent of world imports. China could have avoided importing in that year since its stocks, which amounted to two million tonnes at the beginning of the year, reached 2.8 million tonnes by the end of the year.

Starting in 1999, China initiated a new policy aimed at reducing stocks and encouraging domestic mill use and exports. China has avoided large cotton imports by drawing down domestic cotton stocks and increasing the use of synthetic fibres. More than two million tonnes of stocks have been auctioned through the China National Cotton Exchange. As a result, at the beginning of 2002 stocks in China were estimated at 2.6 million tonnes (ICAC, 2002a).

Upon joining the WTO, China's tariff rate quota for cotton imports was initially set at 743,000 tonnes with an in-quota tariff of one percent. This will be expanded to a final quota of 894,000 tonnes by 2004. One-third of this quota will be moved through China's government buying agencies. If China imports the full quota in 2004, this amount will equal 20 percent of Chinese production (eight times its cotton imports in 2001/02).

5.3.3 Expected production

China is currently experiencing low cotton yields due to problems with disease and unusually bad weather, most notably in the eastern and central parts of the country. Heze, a major cotton producing area, has experienced the biggest drop of nearly 40 percent. Other districts have recorded losses in the range of between 10 percent and 35 percent. However, as substantially more (up by 22.5 percent) land has been cultivated this year, current cotton production forecasts for China in 2003/04 predict only a modest decline compared to last year (from 4.92 million tonnes to 4.8 million tonnes). Production is forecast to increase to 5.9 million tonnes in 2004/05 (Cotton Outlook, 2003a).

5.3.4 Expected domestic demand

With textiles expected to be one of the chief beneficiaries of China's accession to the WTO, further growth in yarn production and demand for domestic cotton is expected. Yarn output in 2003 was 9.21 million tonnes, 14.84 percent up on 2002. With a fall in cotton production predicted for 2003/04, cotton imports are expected to increase to 750,000 tonnes (from 480,000 tonnes in 2002/03) to satisfy domestic demand. Despite increases in production predicted for 2004/05, and the recent rise in cotton prices constraining the growth of China's textile exports, a shortfall in output is also predicted of 536,000 tonnes in the following year.

As of November 2003 China had imported 708,517 tonnes of cotton during the calendar year. The initial tariff-rate quota for 2003 was set at 856,250 tonnes but a supplementary 500,000 tonnes was announced in December 2003, raising the figure to 1,356,350 tonnes, against which actual shipments will presumably continue well into 2004. However, China has recently announced a blacklist system, to begin operation later in 2004, for companies that frequently supply imported goods with safety, hygiene and quality problems. Eight categories have been identified including cotton and textiles (Cotton Outlook, 2004).

5.3.5 Expected exports
With increased demand for cotton and lower production predicted for 2003/04, China's exports of cotton are expected to fall to 150,000 tonnes (from 180,000 tonnes in 2002/03).

5.4 India

5.4.1 Production
India is the third largest cotton producer in the world behind China and the US, accounting for 25 percent of the world acreage but only 14 percent of world production. Cotton production in India accounts for one percent of GDP. Despite historically being one of the largest cotton producers in the world, India has been more or less non-existent on the world cotton market. Following a series of unilateral reforms undertaken in the 1990s, India has started to emerge as a major player in the world cotton market accounting for an average of six percent of world cotton imports in 1999 and for 11.2 percent of all US cotton exports in 2001.

Although the policy reforms were primarily directed towards industry and the international trade regime, the emergence of India as a cotton importer can be partly attributed to its reduction of input subsidies. More recently, India has announced that it intends to reform the cotton and textile sectors, but specifics of what these reforms will be and when they will be carried out were not provided.

The area under cotton cultivation in India increased from 5.89 million hectares in 1951/52 to 7.38 million hectares in 2002/03 (the largest in the world), cotton production from 0.53 million tonnes to 2.7 million tonnes and coverage under irrigation from 9.1 percent to 35 percent (see Appendix 24). However, yields increased from 88 kg/ha in 1951/52 to only 318 kg/ha in 2002/03. This figure is well below the 1177 kg/ha for China and below the current world average of 584 kg/ha. Overall cotton yield throughout India is one of the lowest in the world, mainly because of out-dated technology, inconsistent delivery of quality inputs, including seed, and poor management practices. In addition, rising incidence of the leaf-curl virus and insect resistance to pesticides has also contributed to low yields (Mohanty *et al*., 2003).

5.4.2 Demand
Most cotton produced in India is consumed domestically by the growing textile industry. India became a substantial net importer of cotton in 1999/00 when domestic consumption outpaced production, which began to suffer from bollworm damage. In 2001/02, production in India rose by 300,000 tonnes to 2.7 million tonnes due to better yields. However, Indian consumption was more than 2.9 million tonnes and 400,000 tonnes was imported.

5.4.3 Expected production
As of December 2003 Indian cotton production for the 2003/04 season was predicted to be 2.7 million tonnes, up from 2.35 million tonnes in 2002/03 (Cotton Outlook, 2003b).

The predicted increase in output has largely been due to favourable weather, better management of water and other inputs, and a low incidence of insects which has been reflected in increased yields. India's cotton production is predicted to increase in the future as management of water and other inputs is improved. To some extent, increased production will mean imports will not rise depending on the future demand of India's growing textile industry.

5.4.4 Expected domestic demand

India's textile industry is currently attracting high investment from large companies in South East Asia, driven by the prospect of the removal of textile quotas at the end of 2004. As such, domestic demand for cotton is likely to increase from 2.95 million tonnes in 2002/03 to 2.99 million tonnes in 2003/04. However, for 2003/04 Indian imports of cotton are predicted to be 332,000 tonnes (the majority being from the US), down from 466,000 tonnes in 2002/03, due to increased domestic output of cotton.

5.4.5 Expected exports

Exports for 2003/04 are predicted to remain unchanged over the 2002/03 levels (17,000 tonnes). However, there have been some signs of increased exports (to Bangladesh and Pakistan) facilitated by increases in output. Increased exports have proved less than welcome to domestic textile mills, some of which have repeated a call for a temporary ban on exports.

5.5 Pakistan

5.5.1 Production

Pakistan is the fourth-largest producer of cotton in the world, the thirteenth-largest exporter of raw cotton, the fourth-largest consumer of cotton and the largest exporter of cotton yarn. One million farmers (out of a total of five million) cultivate cotton on three million hectares of land, covering 15 percent of the cultivable area in the country. Cotton production contributes ten percent to GDP.

Cotton production supports Pakistan's largest industrial sector, comprising some 400 textile mills and 1000 ginneries. As such, government policy has generally been used to maintain a stable and often relatively low domestic price of cotton.

Currently, cotton production in Pakistan stands at about 1.6 million tonnes (see Appendix 25). Cotton production reached a peak of 2.2 million tonnes in 1991/92 and a trough of 1.4 million tonnes in 1993/94. Of this, a variable amount depending on the residual from the domestic demand of the yarn industry was exported.

In Pakistan, the area under cotton cultivation increased almost at a constant rate with minor fluctuations from a little over one million hectares in 1947 to 3.1 million hectares in 1996/97. Between 1947 and the peak season of 1991/92, total cotton output increased more than eleven-fold, from 0.2 to 2.2 million tonnes. The most dramatic expansion took place in the 1980s when output tripled from an annual average slightly over 0.7 million

tonnes during the four-year period 1979–82 to 2.2 million tonnes in 1991/92. Seasons which have experienced declines in cotton output have been associated with pest attacks, and with the emergence of pest resistance after a period of growing pesticide use.

5.5.2 Demand

In 2001/02 cotton consumption in Pakistan reached 1.86 million tonnes, driven by rising exports of yarn and textiles and low cotton prices. As such, export orientated mills in Pakistan have increased imports of cotton to cover their demand for higher quality and less contaminated cotton to produce quality fabrics for international markets. In 2001/02, despite increased production, imports by Pakistan rose substantially and reached 191,000 tonnes. Of this, US cotton accounted for more than 100,000 tonnes. Australia, Central Asia and African countries are also major sources of cotton for Pakistan.

5.5.3 Expected production

The current estimate for Pakistan cotton output in 2003/04 is 1.53 million tonnes, down from 1.62 million tonnes in 2002/03 (Cotton Outlook, 2004). Insect infestations have had an adverse impact on potential cotton output.

5.5.4 Expected domestic demand

Domestic consumption of cotton in Pakistan is expected to remain relatively stable at just over two million tonnes for the next few years. However, production is expected to fall further short of domestic mills' requirements in 2003/04, such that heavier reliance will be made on imports of cotton. By November 2003 imports of cotton stood at 85,000 tonnes (projected to increase to 305,000 tonnes by the end of 2003/04). Imports of cotton from West Africa and India are becoming increasingly popular. However, the recent rises in raw cotton and cotton yarn prices are understood to have had a serious impact on the local textile industry, as orders from both domestic and export buyers have tailed off. Moreover, the European Union is considering the reintroduction of anti-dumping duties on imports of Pakistan bed linen. The All Pakistan Textile Mills Association has recently renewed calls for sales tax to be waived on both foreign and domestic cotton. Other textile interests have sought some relaxation on import duty on polyester staple fibres at the expense of cotton (Cotton Outlook, 2003c).

5.5.5 Expected exports

Pakistan exports of cotton are predicted to remain stable at their 2002/03 level (75,000 tonnes) over the next few years. Recently, however, export demand for cotton has been slack due to disputes over pricing (Cotton Outlook, 2003d).

5.6 Uzbekistan

5.6.1 Production

Cotton is the major crop in Uzbekistan and a major economic component in terms of employment and foreign exchange. In 1994 the share of cotton production in GDP reached 26.5 percent before falling to around 10 percent in the last three years. Cotton exports now account for around 45 percent of total exports. In 2002/03 cotton production in Uzbekistan stood at just over one million tonnes, compared to a peak of 1.7 million tonnes achieved in 1988/89 (see Appendix 26). Cotton production has been declining in Uzbekistan since cultivation of cotton has been substituted by foodstuffs on marginal irrigated land.

5.6.2 Demand

Over 80 percent of Uzbek cotton production is for export. However, Uzbekistan's domestic cotton consumption is strong and growing. During the last five years, 14 large cotton-spinning mills have been developed. There have been over 30 investment projects in the textile sector and, as a result, cotton consumption has almost doubled since 1998/99, to over 225,000 tonnes.

5.6.3 Expected production

Some analysts claim that the potential for Uzbek cotton production growth is weak, given government policy and resource limitations. Uzbekistan has not been able to reach its cotton production target over the past several years for a number of reasons, including weather problems, inadequate production incentives, inadequate and low-quality inputs (especially seeds) and a deteriorating infrastructure, especially in terms of irrigation.

This season, the biggest uncertainty surrounding the outcome of the harvest in Uzbekistan is the weather. As a result of bad weather, the most that can now be anticipated for 2003/04 is a crop of around 988,000 tonnes.

5.6.4 Expected domestic consumption

Recent reforms to the cotton sector imply a move towards the privatisation of cotton textile mills in Uzbekistan, or the closure of those that are not profitable. During 2003 a number of joint ventures, were observed, with new investments from China, Turkey, Germany, Australia, Switzerland and Italy. However, Uzbekistan's ability to meet the growth target set by the government (domestic consumption to reach 500,000 tonnes by 2005) is becoming increasingly questionable. Although various joint-venture mills have been established, it is not clear to what extent these additions have offset declines in output from existing capacity.

5.6.5 Expected exports

During 2002/03 approximately 792,000 tonnes of cotton were allocated for export. Exports are predicted to fall to 735,000 tonnes in 2003/04 owing to a reduction in domestic output. Lack of quality control and high contamination are serious problems for foreign buyers. The quality risk involved in buying Uzbek cotton is reflected in lower

prices. In contrast to Soviet times, when quality was assured, the current marketing system has failed to interest farmers and handlers in producing quality cotton.

5.7 Turkey

5.7.1 Production

In 2000/01 Turkey ranked sixth in cotton production with a total output of 880,000 tonnes representing three percent of world production (see Appendix 27). Recent increases in cotton production have been brought about by the completion of the Southeastern Anatolia Project. Since the irrigation of the Harran Plain began in 1994 about 200,000 tonnes of extra cotton have been cultivated.

The cotton industry as a whole represents a significant portion of Turkey's overall agricultural sector. Cotton lint production makes up about one percent of GDP and five percent of total industrial crop production. Textiles make up about 35 percent of total Turkish exports.

5.7.2 Demand

The textile industry in Turkey expanded rapidly during 2001/02, driven by rising exports of textiles and apparel. Turkish exporters have benefited from favourable exchange rates between the Turkish lira and major currencies. About 40 percent of textiles and 70 percent of garments produced in Turkey are exported. The EU remains a major destination for Turkish textile exports. The US share of Turkish textile exports has recently risen to eight percent, following an increase of US import quotas and the elimination of quotas for some items, such as bathrobes. As such, despite increases in domestic production, Turkey continues to import large amount of cotton each year owing to excess demand from the Turkish textile sector. Exports of cotton lint from Turkey have declined in favour of increasing exports of cotton yarn and cotton fabrics.

The quality of cotton grown in Turkey provides a great advantage for the Turkish textile industry. An important portion of the Turkish crop is sold in the A-Index category as the cotton grown in the Aegean Region of Turkey is of the best quality in the world in terms of its fibre features.

5.7.3 Expected production

In 2002/03 cotton output in Turkey fell to 900,000 tonnes from 922,000 tonnes in 2001/02 due to reductions in yields in the Aegean region. Deliveries of seed cotton in 2002/03 were sluggish as many farmers decided to retain it in the hope of obtaining better prices.

5.7.4 Expected domestic consumption

Turkey has witnessed increased cotton consumption in recent years on the back of substantial investment in spinning machinery. However, the yarn market in Turkey has stagnated with the recent increase in cotton prices; textile exporters relying on US dollar-

based markets, have been put at a disadvantage as a result of recent exchange rate movements. Those that focus on European markets have fared better. Uncertainty over the future direction of cotton prices and the depressed nature of the yarn market undermined cotton imports in 2002/03, which fell to 417,00 tonnes (from 604,000 tonnes in 2001/02). A notable feature of this decline is a reduction in cotton purchased from Greece.

5.7.5 Expected exports

Turkey lacks a standardised grading system in cotton. There are grades, and even professional classers, but the system as a whole is not standardised. Trading is at present based on samples of cotton which are physically examined before a transaction takes place. This type of trading is inherently inefficient, since it involves a relatively high transaction cost. The lack of specificity leads to a convolution of information about the level of fibre attributes. Traders are therefore uncertain about the exact quality of cotton that they are purchasing. As such, Turkey's exports of cotton are predicted to remain low (28,000 tonnes) in 2003/04. The Turkish government has recently announced new measures to minimise cotton contamination and to adopt wider-scale use of HVI technology, which will increase demand for its cotton exports.

5.8 Brazil

5.8.1 Production

Cotton production accounts for 0.2 percent of GDP in Brazil. The expansion of cotton production that has been occurring in Brazil over the last ten years suffered an interruption in 2001/02 (see Appendix 28). Falling world prices, both in domestic and international markets, led the country to reduce its cotton-producing area by 14 percent. As a result, the volume of cotton harvested declined to the same proportion. In 2003/04 the situation has been somewhat different: the planted area has declined slightly but lint production has risen by ten percent. This has occurred primarily because research and development institutions have made available to growers seed varieties with not only longer and stronger fibres but also higher yields.

In addition, Brazilian cotton growers have started to employ better production practices to control water, fertiliser, insects and plant diseases. This has resulted in less stressed cotton plants and, consequently, higher yields. More producers are putting harvested seed cotton into modules. This has allowed them timely crop harvesting at a time when it is at its peak quality. Furthermore, careful attention has been paid to ginning, so quality is maintained throughout the ginning process.

Currently, 80 percent of the cultivated area, with 85 percent of cotton production is in the Cerrado region in the central part of Brazil. According to ICAC, the production of cotton in Brazil has maintained one of the highest yield gains in the world (208 kgha/year of seed cotton) during the last ten years. Today it has one of the five highest yields among the major cotton producing countries. Having to be competitive and to meet the high level of quality demanded by the domestic and international markets has required Brazil

to modernise its production, harvesting, ginning and classification equipment. Today, in nearly 80 percent of the cotton area, cultivation practices and harvesting are fully mechanised, and over 80 percent of all cotton is classified and graded by HVI instruments.

5.8.2 Demand

This increase in the efficiency of Brazilian cotton production has been beneficial for Brazilian textile producers, as it has assured them a reliable source of raw cotton at competitive prices. The total consumption of raw cotton in Brazil in 2002/03 was 850,000 tonnes, with domestic production as the main source of demand for most of the cotton consumed in the country.

5.8.3 Expected production

Production in Brazil is predicted to increase to 849,000 tonnes in 2003/04 from 809,000 tonnes in 2002/03, largely as a response to recent increases in the world price of cotton.

5.8.4 Expected domestic consumption

Brazil's imports of cotton (mainly from the US and Paraguay) rose to 80,000 tonnes in 2002/03, from 50,000 tonnes in 2001/02. Import shipments of cotton continue and it is anticipated that some 60,000 tonnes will arrive in Brazil during the first quarter of 2004. This volume will continue to consist largely of US and Paraguayan cotton, but will also include some West African supplies.

However, a recovery of Brazilian cotton consumption in 2003/04 currently appears to be a more distant prospect, despite hopes pinned on an upturn in the domestic economy. Accordingly, predictions for consumption in 2003/04 remain at 2002/03 levels.

5.8.5 Expected exports

Cotton exports from Brazil in 2002/03 were at 170,000 tonnes, up from 147,000 tonnes in 2002/03. The main export destinations were Argentina (37,856 tonnes), Japan (13,674 tonnes), Indonesia (12,122 tonnes), China (6,322 tonnes), Portugal (4,605 tonnes) and Thailand (4,414 tonnes). Cotton exports are predicted to rise to 180,000 tonnes in 2003/04 owing to increased production forecasts. Brazil has also experienced bumper crops of soybeans, sugarcane, coffee and various crops. As a result, there is some concern that transport and shipping infrastructure will come under strain during peak export periods.

5.9 Argentina

5.9.1 Production

Since 1997/98, the Argentine cotton sector has been contracting (see Appendix 29) and now accounts for just 0.03 percent of GDP. Planted area and production in 2001/02 set historically low records, with 165,000 hectares planted with cotton and production of lint at 65,000 tonnes (80 percent less than 1997/98). Lower prices, higher planted area in the

main lint market (Brazil) and reductions in domestic consumption have resulted in reductions in planted area, yields and production.

Argentina increased its ginning capacity significantly between 1994 and 1998 reaching a total of 2.5 million tonnes of raw cotton. Processed volumes, when prices were at or above the long-term average, were at 541,000 tonnes. However, as prices fell, processing was reduced, falling to 186,000 tonnes of raw cotton in 2000/01 (equivalent to a 66 percent decrease). Currently, more than 50 percent of total ginning capacity is idle owing to a scarcity of raw cotton, reduced demand and competition from imported textiles.

5.9.2 Demand

Despite domestic consumption falling, exports of cotton lint from Argentina set another historic low of 10,000 tonnes in 2002/03: a 97 percent reduction on 1996/97, when exports peaked at 290,000 tonnes.

5.9.3 Expected production

A recovery in cotton production in 2003/04 has been predicted, and an increase to 96,000 tonnes, as a result of expected increases in cultivated area driven by the recent upturn in cotton prices. However, planting intentions remain rather uncertain in the face of recent increases in the price of soybeans. Although the price increase in cotton has been stronger, soybean production requires less investment and is more easily financed (with less risk). Moreover, recent storm activity has brought more rain to cotton areas, although the amount of rainfall has varied widely. There are some areas, principally in the west of the Chaco province and east of Santiago del Estero, that were in need of more moisture. However, flooding was reported in December 2003 in parts of south eastern Chaco and Santa Fe, although whether significant areas of cotton were affected is as yet unclear.

5.9.4 Expected domestic consumption

In 2002/03 imports of raw cotton totalled 50,378 tonnes, comprising 38,760 tonnes from Brazil, 8,933 tonnes from Paraguay and 2,685 tonnes from the US. Import substitution by the domestic textile industry is predicted to continue sustaining raw cotton consumption at an annual rate of about 110,000 tonnes. However, the Argentine textile sector has recently reported unease at the volume of textile goods entering the country from Brazil, whose mills are seeking other regional outlets for their production due to slow domestic sales.

5.9.5 Expected exports

Exports of cotton are predicted to increase marginally to 15,000 tonnes in 2003/04.

5.10 Tajikistan

5.10.1 Production

Cotton is by far the most important crop in Tajikistan's agrarian economy, accounting for 20 percent of total exports and 8.2 percent of GDP. In 2002/03, Tajikistan's cotton harvest reached 165,000 tonnes, primarily because of increases in planted areas, better

supplies of inputs and normal weather conditions (see Appendix 30). The Government of Tajikistan has increased support (provision of inputs) for the production of long-staple cotton due to the higher price it commands in international markets. The share of long-staple cotton in total production is 68 percent (113,000 tonnes in 2002/2003).

5.10.2 Demand

Although cotton is fundamental to Tajikistan's economy, the republic's rewards for cotton production under the Soviet system were disappointing. About 90 percent of the harvest was shipped elsewhere for processing. In 1990, the two southern provinces of Qurghonteppa and Kulob produced roughly two-thirds of the republic's cotton, but they processed only one percent of the crop locally. Domestically, there are two yarn production facilities in Tajikistan. One of the facilities is a joint-venture with a US company. The second is still under government control in Dushanbe (Higgiston, 2003).

Today, close to 80 percent of all cotton produced in Tajikistan is exported. In 2002/03 cotton exports were at 140,000 tonnes. Tajikistan's major destination markets for its exports of cotton include Germany, Switzerland, Latvia, Iran, Russia and Belarus. Tajikistan maintains a 10 percent export tax for cotton exports.

5.10.3 Expected production

Production in Tajikistan is likely to remain at 2002/03 levels in 2003/04 due to the early onset of wintry weather. Although total predicted production (165,000 tonnes) is likely to be slightly up on last year, long-staple production is likely to be less than half of the 113,000 tonnes produced in 2002/03.

5.10.4 Expected domestic demand

Domestic demand for cotton is likely to remain small but stable, at around 20,000 tonnes in 2003/04. As in previous years, it is unlikely than Tajikistan will import cotton.

5.10.5 Expected exports

Most of Tajikistan's cotton will remain for export. With low growth predicted for both production and domestic demand in 2003/04, exports are predicted to increase only slightly from 140,000 tonnes (in 2002/03) to 145,000 tonnes.

6. Cotton, Livelihoods and Poverty Reduction

Earlier sections of this report have confirmed that removal of cotton subsidies particularly in the US and EU would have significant benefits for poor countries such as those in West and Central Africa for which cotton production is an important contributor to exports and GDP. Higher world prices as a result of subsidy removal would also translate into both higher production and higher incomes for smallholder producers. This section explores the extent to which higher production and incomes for smallholder producers are likely in turn to translate into poverty reduction benefits in producing countries. In fact, the answer is fairly straightforward. In low income economies where the majority of the poor live in rural areas, an increase in income from export cash crop production is widely recognised to be one of the best short-term measures to alleviate poverty. The section reviews some of the general arguments for this and illustrates these in more detail with the specific example of Benin. It concludes with some observations on the relationship between supply elasticities (as calculated in earlier sections of this report) and the livelihood impacts of changes in production.

6.1 Cash crop incomes and poverty reduction

In low income economies where the majority of the poor live in rural areas, as in much of Africa (IFAD, 2001), an increase in income from export cash crop production is widely recognised to be one of the best short-term measures to alleviate poverty. Thus, for example, examining panel data from 1300 households across Uganda between 1992 and 2000, Deininger and Okidi (2003) found that higher coffee prices over the period were a major factor contributing to reduced poverty levels, with poorer households (by initial asset endowment) benefiting more in terms of income growth than wealthier ones. Similarly, Booth and Kweka (2004) see the poor performance of Tanzania's main cash crop sectors (including both coffee and cotton) as one of the main reasons why rural poverty did not fall in Tanzania during the 1990s, despite sustained per capita GDP growth.

The large impact of increased income from export cash crop production on rural poverty occurs firstly because the direct increases in income tend to be widely distributed within the rural population, including for large numbers of households who fall below recognised poverty lines. Thus, in the case of cotton, Oxfam International (2002) estimate that over two million households (comprising over 10 million people) in West and Central Africa are directly involved in cotton production. There are estimated to be another million smallholder cotton producers in the four largest producing countries in southern and eastern Africa (Poulton *et al.*, 2004). Whilst cotton production tends to be concentrated in certain regions of these countries, within these regions the majority of households are directly engaged in cotton production to a greater or lesser extent. For example, in a 1996 survey on Gokwe North district in Zimbabwe, 350 out of 430 (81%) households were cotton producers (Govereh and Jayne, 2003). In a survey of 300 households in neighbouring Gokwe South and Muzarabani districts in 2002, 265 (88%) had cultivated cotton during the 2001/02 season. In a parallel survey in Kwimba and

Bariadi districts in Tanzania, 221/301 households (73%) had cultivated cotton during the 2001/02 season, whilst a further 51 had stopped growing the crop since 1999, with unremunerative seed cotton prices (as a result of low world prices) given as a major reason for this.[21] Similarly, in a study in Montepuez and Monapo/Meconta in Mozambique in 1995, 472/663 households (71%) had cultivated cotton (Govereh *et al.*, 1999).

It is also worth noting that in several African countries, although not in the Sahel, cotton production is concentrated in poorer regions of the country. Thus, Deininger and Okidi (2003) state that '...[In Uganda] the decline in cotton prices and in the associated agricultural opportunities in the North [were] a possibly major reason for the continued high levels of poverty observed in this region' (p505).

A second reason for the large observed impact of increased income from export cash crop production on rural poverty is that the consumption patterns of smallholder cash crop producers mean that much of their additional income is spent on locally produced goods and services, hence generating large multiplier effects that benefit other poor households. Thus, using a CGE model, Bautista and Thomas (1999) found that a ZW$1 increase in income for smallholder farmers led to an overall increase in income within the Zimbabwean economy of ZW$1.92, due principally to consumption multiplier effects. A ZW$1 increase in income for commercial farmers led to an overall increase in income within the economy of around ZW$1.50. Badiane *et al.* (2002) note that, 'growth linkage research in the West Africa region has shown considerable multiplier effects on employment and income in the rest of the rural economy due to expansions in income from cash crops [primarily cotton]' (p13).

A third reason specifically relevant to cotton is that cotton is a relatively labour intensive crop. Therefore, there may be additional casual employment generated as production expands in response to higher prices. For example, in the 2002 survey of Tanzania in Kwimba and Bariadi already cited, 151 out of 221 of the cotton producing households hired some labour (an average of 31 mandays amongst those hiring) to assist them with their cotton production.

Two less positive aspects of the cotton story are:

- the problem of moderate to high and sometimes inappropriate pesticide application, with consequences both for human health and for the surrounding environment (Maumbe and Swinton, 2003). This is likely to be exacerbated as seed cotton prices rise; and,
- the fact that men often control the proceeds from cotton production, even though much of the labour input is provided by women, hence, the direct welfare benefits from an increase in prices could be very unequally divided (Poulton *et al.*, 2000).

6.2 The case of Benin

Minot and Daniels (2002) explore the impact of cotton export subsidies in the US and EU on rural welfare and poverty in Benin. They argue that, given the impact of subsidies on export revenues and GDP, the impact on rural welfare and poverty will be a function of:

- the number and type of farmers (large or small) who produce cotton;
- the importance of cotton as a source of income for these producers;
- the expenditure patterns of these producers; and,
- the intensity with which these producers use and hire labour for cotton production relative to their labour use on alternative crops.

The importance of cotton to GDP and exports in Benin has already been noted. Minot and Daniels (2002) note that GDP per capita in Benin is only US$380 - above that of landlocked Mali, Niger and Burkina Faso to the north, but below, for example, Cameroon or Côte d'Ivoire. In 1998, 95% of rural households lived below the US$1/person/day poverty line. Using an alternative local poverty line, the rural poverty level was estimated to have fallen from 33% in 1994/95 to 21% in 1998. A major contributing factor to this was believed to be the expansion in cotton production as a result of the 1994 devaluation of the CFA franc plus improvements in the organisation of input distribution and cotton marketing.

The study by Minot and Daniels (2002) is based on data from 899 households, spread across all six departments in the country, which were collected by the 1998 IFPRI-LARES Small Farmer Survey. This found that cotton was grown by one third of all households, predominantly in the center and (poorer) north of the country. It accounted for 18% of the total area planted, 22% of the gross value of crop production (second after maize) and one third of total crop sales in the entire sample. On average cotton farmers planted 2.3ha to cotton, producing 2.6 tonnes (at 1.1 t/ha), with a gross value of US$901. They had larger farms than the national average, but a similar poverty status, as they were located disproportionately in the north.

The study examines the welfare and poverty impact of declines of varying magnitudes in the farm-gate price of seed cotton, but focus on a 40% decline.[22] They report three main findings. Firstly, a 40% decline in the farm-gate price of seed cotton leads directly to an additional 6-8% of rural households falling below their chosen poverty line.[23] Poverty gap and poverty gap squared measures increase even more. An 8% rise in the poverty level means that an additional 334,000 people fall below the poverty line. Amongst cotton producing households, meanwhile, the average fall in income is 21% and the increase in the poverty rate is 22%. Because many of the cotton growers are located in two departments (Borgou and Zou), the overall direct impacts of the decline in the seed cotton price are concentrated in these departments.[24]

These figures only capture the impact on cotton producing households themselves. Other households also lose out substantially from the reduced purchasing power of cotton

producers within the local economy. Minot and Daniels (2002) estimated a consumption multiplier of 3.3, meaning that for every 1 CFA reduction in income and expenditure amongst cotton producing households there is a total reduction in income and expenditure of 3.3 CFA within the local economy. This is probably an overestimate,[25] but the effect is nevertheless real and likely to be substantial.

As noted above, theory suggests that other households might also lose out from reduced demand for hired labour when cotton producers switch into other crops. Perhaps surprisingly, however, whilst cotton production is found to be somewhat more labour intensive – and to make more intensive use of hired labour, in particular – than some competing crops, Minot and Daniels (2002) find that a shift out of cotton to competing crops has a negligible effect on rural labour demand.

They conclude that, '… there is a strong link between cotton prices and rural welfare in Benin. … to the extent that fluctuations in world cotton prices are transmitted to farmers, they will have a significant effect on rural incomes and poverty' (p50-51).

6.3 A note on supply elasticities and livelihood impacts

The available evidence, therefore, indicates that higher cotton production and prices as a result of US and EU subsidy removal would translate into significant poverty reduction benefits in producing countries. It is worth noting, however, that the increased supply of cotton in response to a price rise may come about through producers shifting resources (land, labour, capital) between commodities, rather than as a result of additional resources being mobilised in response to the rise in prices.[26] Where substitution amongst commodities is high, as it is in the Tanzanian cotton zone, the estimated price elasticity may be high, but the net welfare gain from expanded cotton production may be much lower than is initially suggested by the elasticity calculation. By contrast, where - as in Zimbabwe - a comprehensive range of support services is provided by cotton companies to producers, but similar support is not available for production of other crops, producers may be able to respond to higher cotton prices by mobilising additional resources, especially capital, so as to intensify production. Hence, a greater proportion of the incremental income from expanded cotton production will indeed be net gain in a welfare sense.

The relationship between supply elasticities and poverty reduction is an empirical question and one that links into the broader debate as to whether producers are better off with a more competitive sector that delivers high seed cotton prices, but has low capacity to provide production support services, or a more concentrated sector that delivers effective production support services, but where the cost of service delivery may at times be reduced seed cotton prices (Poulton *et al.*, 2004). This is beyond the scope of the current paper. It does not affect the basic finding of this section that higher seed cotton prices through removal of US and EU cotton subsidies will be good news for efforts to alleviate rural poverty in Africa.

7. Conclusions and Policy Implications

It seems plausible that countries paying the most subsidies do most damage. Models developed to investigate the impact of cotton subsidies have found that US support, by virtue of its absolute magnitude, is particularly damaging and responsible for most of the reduction in cotton-earning potential in developing countries. This has been used as an argument for reducing or postponing cuts in subsidies to European farmers, as these appear to have less impact on developing countries. Our results, through a careful examination of the nature of the cotton market, agree but suggest that under certain assumptions subsidies by smaller subsidisers (such as the EU) may be disproportionately harmful to some suppliers, notably to West and Central African countries. This is especially damaging to them since they have the potential to increase supply.

Previous attempts to model the impact of subsidy withdrawal on world cotton trade and producer incomes have assumed a single, unitary market for cotton in which buyers choose between essentially homogeneous consignments of lint from different producing countries on the basis primarily of price. However, the assumption of a single market for cotton may not be correct, especially in the short run, to the extent that national origin is important in world cotton trade, related to quality or market characteristics. Once spinners have hit on a particular blend of different lint types that suits the product that they are making, they like to stay with it if they can. Modifying the blend to incorporate a new national origin is done only if there are large price or supply changes. This tends to produce 'stickiness' in the world cotton market. To illustrate the potential effect of 'stickiness', we made projections on the basis of no substitution among suppliers (fragmented) as well as complete substitutability (single).

Our research shows the overall impacts of complete subsidy removal on supply are greater and the distribution of the resulting benefits more favourable to poorer countries if there is a single market.

World: Under the single market assumption cotton production from subsidised sources falls by 12%. Under the fragmented market assumption subsidised cotton supply falls by only 6%. The reduction in cotton supply from previously subsidised producers leads to price increases in the world market (single market) or in country markets in which these producers operate (fragmented market). For the latter, price increases are larger for country markets which used to consume high proportions of subsidised production.

West and Central Africa: The smaller reduction in world production means that West African production does not expand to the same extent in the fragmented (3%) as in the unitary market (9%). The impact of the removal of EU support to the cotton sector has a greater impact under the fragmented market assumption. EU subsidies account for 38% of the loss of earnings in West and Central Africa under the fragmented market assumption, but only 9% under the unitary market assumption (see Table 13). The loss of earnings attributable to EU subsidies as a percentage of West and Central African current cotton earnings is 4%, with a fragmented markets, instead of 2%.

Previous attempts at modelling the impact of cotton-subsidy withdrawal have also assumed a constant elasticity of supply for all countries e.g. the Goreux model (discussed in Section 4) assumes an elasticity of supply of 0.5 for all countries. In reality, cotton supply response is likely to vary widely between countries, and this research illustrates that the model is sensitive to these parameters.

World: A combination of econometric estimation and qualitative judgements was used to generate an alternative set of supply elasticities for major cotton producing countries likely to benefit from reform. We find that Brazil and West and Central African countries have higher supply elasticities (typically 0.6). In contrast, current water shortages in Australia and Central Asia suggest that the potential for any supply increase in these countries would be limited (assumed 0). Under both market structures, the equilibrium market price is achieved at a significantly higher level, with both cotton production and earnings in non-subsidising countries increasing to a greater extent as a result.

West and Central Africa: The large increases in production which have occurred in West and Central Africa over the last decade suggest that they could respond to higher prices. Therefore, under both the fragmented and single market assumptions, the alternative set of supply elasticities produces a greater impact from cotton subsidy withdrawal on West and Central African production and export earnings, than does the assumption of identical elasticity of 0.5 across all countries. Using differentiated supply elasticities, we estimate that developed countries' subsidies cause losses to West and Central African earnings of 14% or 37%, depending on whether the market is fragmented or single.

In a low income economy where the majority of the poor live in rural areas, an increase in income from export cash crop production is widely recognised to be one of the best short-term measures to alleviate poverty. This is both because the direct increases in income can be widely distributed within the rural population (including to large numbers of households who fall below recognised poverty lines) and because the consumption patterns of smallholder cash crop producers mean that much of their additional income is spent on locally produced goods and services, hence generating large multiplier effects that benefit other poor households. Cotton is a relatively labour intensive crop, so there may also be additional casual employment generated as production expands in response to higher prices. In addition, in many African countries cotton production is concentrated in poorer regions. Therefore, higher cotton incomes can contribute to poverty alleviation in areas where economic opportunities are particularly meagre. Two less positive aspects of the cotton story are: firstly, the problem of moderate to high and sometimes inappropriate pesticide application (with consequences both for human health and for the surrounding environment), which is likely to be exacerbated as seed cotton prices rise; and secondly, the fact that men often control the proceeds from cotton production, even though much of the labour input is provided by women (hence, the direct welfare benefits from an increase in prices could be very unequally divided within households).

While higher prices directly increase incomes and reduce poverty, higher production because of higher supply elasticities for cotton production do not necessarily translate fully into poverty reduction impacts. This is because additional cotton production may

occur at the expense of production of competing crops rather than representing new output from previously underemployed resources; hence the net livelihood benefit is reduced. In some countries, however, the organisation of the cotton production and marketing system assists producers to access finance and inputs for cotton production when these are not available for other crops. Here, there may be a higher net livelihood benefit.

The research does not provide a definitive guide as to the actual structure of markets, but sets out a number of factors used to support the contention that it falls on the continuum of unfragmented to fully fragmented. In terms of the response to a reduction in cotton subsidies, the cotton market is probably more fragmented in the short term than in the long term, so our preferred simulation of the final impact would be simulation S/D (a single market but with higher supply elasticities for West and Central Africa).

Six policy implications are generated from this review. First, under all the assumptions in all the studies, subsidies by the US and the EU depress the world price of cotton and reduce the income of developing countries, particularly those Least Developed countries most dependent on cotton for their foreign exchange earnings. Reducing these subsidies, whether through national action, trade negotiations, or dispute settlements, would increase the income of poor countries and poor people within them.

Second, EU subsidies may be even more damaging to developing countries, and to West and Central Africa in particular, than their share in total export subsidies would suggest because cotton production in Greece and Spain actively competes with cotton production from developing countries in third markets and the subsidies Greek and Spanish farmers receive per unit of cotton production are the highest in the world.

Third, improving price transmission is a crucial determinant of the ability of developing countries to increase supply of cotton in response to any removal of cotton subsidies. This is especially relevant to sectors which are still dominated by state control (including West Africa). Strengthening farmer voice in decision-making may help to overcome this constraint.

Fourth, cotton sectors within developing countries will need to develop effective systems of quality control (often a national issue) along with ensuring supply reliability (a particular challenge for sectors with many small farmers) if they wish to benefit from the opportunities created by the removal of cotton subsidies. In particular, it is important that quality is maintained with any increase in output, so that this increase in output does not suffer a discount. As such, there is a need for such countries to seek appropriate coordination mechanisms for quality control, seed supply, input credit (indirect determinants of quality) and ongoing research in liberalised sectors. If the fragmented-market assumption holds, then quality is a determinant of the market segment within which a countries' cotton is traded. Improved quality may allow a country to 'shift' into a different market segment and receive a higher price and benefit 'more' from liberalisation.

Proposals for reform of the EU subsidy regime specifying that area payments should be differentiated on the basis of quality criteria rather than productivity criteria may reduce the incentive to increase yields and thus increase the quantitative impact of subsidy removal. However, by providing an incentive to improve quality they may result in EU cotton taking an increased share of high-value cotton markets, reducing the share of developing-country exports, which have been improving their quality in response to improved access to credit and inputs.

Finally, once suppliers are established with new buyers/clients, product differentiation (national reputation) within the cotton market will work in a country's favour and protect market share from small changes in price/competitiveness. If they are excluded from new buyers/clients, however, product differentiation will work against developing-country producers. It is therefore important that short-term market fragmentation does not freeze developing countries into their current markets.

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Glossary

AGOA	African Growth and Opportunity Act
AMS	Aggregate Measure of Support
ANDEAN	Bolivia, Colombia, Ecuador, Peru, Venezuela
AWP	Adjusted World Price
CAP	Common Agricultural Policy
CCC	Community Credit Corporation
CCI	Cotton Corporation of India
cif	Cost, insurance and freight
EU	European Union
FAO	Food and Agriculture Organisation of the United Nations
FAPRI	Food and Agriculture Research Institute
GDP	Gross Domestic Product
GSP	Generalised System of Preferences
HVI	High Volume Instrument
ICAC	International Cotton Advisory Committee
IFPRI	International Food Policy Research Institute
IMF	International Monetary Fund
ITMF	International Textile Manufacturers Federation
NAFTA	North America Free Trade Agreement
ODI	Overseas Development Institute
OECD	Organisation for Economic Cooperation and Development
PFC	Production Flexibility Contract
UNCTAD	United Nations Conference on Trade and Development
URAA	Uruguay Round Agreement on Agriculture
USDA	United States Department of Agriculture
WTO	World Trade Organisation

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Notes

[1] Includes intra- and extra-EU trade. Intra-EU cotton trade accounts for 12% of total EU cotton imports.

[2] The daily quotation is an average of the cheapest five quotations from a basket of fifteen upland cottons traded internationally (US California, US Memphis, Tanzania, Turkey, India, Uzbekistan, Paraguay, Pakistan, African 'Franc Zone', Spain, Greece, Australia, Syria, Brazil, China). Changes in the selection of the basket are made solely to reflect shifts in the cottons most frequently traded. Prices are expressed in US dollars per pound, c.i.f. (cost, insurance and freight) for delivery at a Northern European port. Offering prices are monitored each UK business day by editorial staff who have no trading involvement. Since the quotations are intended to reflect the competitive level of offering prices, not the level at which trade actually takes place, a buyer would normally expect to succeed with bids that are slightly lower than the A Index. To some extent the same five cheapest cottons dominate the A Index. African franc zone growths are generally included in the A Index since crop volumes are often large; most of the crop is exported; and, cotton production is competitive. In contrast, freight charges often disqualify Australian cotton from inclusion in the A Index since these push the price of Australian cotton above the cheapest five cottons in the basket of fifteen national varieties.

[3] US Orleans, Brazil, Uzbekistan, India, Pakistan, Turkey, China, Argentina, Syria.

[4] South Africa, Benin, Burkina Faso, Cameroon, Côte d'Ivoire, Gabon, Ghana, Kenya, Madagascar, Mali, Mozambique, Nigeria, Tanzania, Togo and Uganda.

[5] TN/AG/GEN/4. Other countries supporting the cotton initiative include: Cameroon, the Central African Republic, Côte d'Ivoire, Gambia, Ghana, Guinea Bissau, Liberia, Niger, Nigeria, Senegal, Sierra Leone and Togo.

[6] Amongst other sources, this section draws on interviews with Liverpool-based international cotton traders and trade representatives, conducted by Ian Gillson and Colin Poulton on 3-5/12/2003.

[7] Brazil was described by one trader as the "new Australia", following the introduction of large-scale cotton production to the Matta Grosso region around 1995.

[8] In addition to points already made, we note the importance of the Cotlook A Index as an indicator of the world cotton price (albeit with most lint consignments being traded at either a premium or a discount to this, depending on specific attributes). Without some sense of an overall world market, such an indicator would make no sense.

[9] The analysis of a fragmented market makes a behavioral assumption. This assumption implies that if, for example, the US eliminates its cotton subsidies (and US supplies to a market are reduced as a result), then spinners in that market will draw from existing production sources in order to maintain supplies of cotton. However, an equally plausible assumption may be that spinners decide to source from completely different suppliers.

[10] The ICAC and FAO estimate at -0.06 the price elasticity of world demand for cotton. However, this elasticity does not take into consideration demand for stock replenishment (see Goreux, 2003).

[11] Australia faces a major water constraint, currently exacerbated by drought. In this respect, the long term issue is political pressure to reduce water rights for cotton in favour of non-farm and less environmentally damaging uses. As such, cotton production in Australia is unlikely to exceed the levels which it has experienced over the last three years.

[12] Cotton-producing countries in Central Asia face an increasing water constraint as the Aral Sea dries up. The high degree of state control of the cotton sector in these countries also raises questions as to whether cotton production can be increased.

[13] From the FAOSTAT Agriculture Database and COMTRADE database (2003).

[14] The high price increase can be explained by the supply constraint imposed on Australia, Tajikistan, Turkmenistan and Uzbekistan: all large producers of cotton.

[15] The model assumes a fixed elasticity of supply of +0.5 for China, US, Greece and Spain. As such, it is important to note that we have not modeled these supply responses explicitly. The EU supply response, in particular, may warrant further research in order to estimate a more precise impact on EU production following the removal of cotton subsidies.

[16] Simulation S/U makes identical assumptions to the Goreux model i.e. a single world market for cotton and a single price elasticity of supply equal to 0.5 for all producing countries.

[17] FAO price data after 1995 are extremely suspect. The seed cotton price series on which these calculations are based uses figures obtained from Resocot for 1999-2001, plus guesstimates for 1996-98 based on trends in other Francophone countries. (They do cross-check each other's prices!).
[18] Research investment may be more critical to sustaining production growth in Mali than in some other African countries over the next decade.
[19] There is no such link when the constant 1990 Z$ price is used.
[20] By contrast, ginning ratios are closer to 34-36% for similar cotton in India, and in Zimbabwe they are around 39%.
[21] See http://www.wye.imperial.ac.uk/AgEcon/ADU/research/projects/cottonE/index.html#papers)
[22] The world price of cotton lint fell by 40% between January 2001 and May 2002. However, as noted in section 5, it is unlikely that this fall would be fully transferred to the seed cotton price. Indeed, Benin was one of the countries that introduced temporary subsidies to the cotton sector whilst the world price was at such low levels.
[23] Their chosen poverty line was the 40th percentile of per capita consumption expenditure within the 1998 survey. They argued that the US$1/person/day measure is too high for Benin, but that the official local line is too low.
[24] This will be mitigated to some extent if members of cotton producer households seek temporary employment in another part of the country when cotton opportunities are poor. However, Minot and Daniels data do not permit them to investigate this possible response.
[25] The multiplier calculation by Minot and Daniels assumes a perfectly elastic supply of non-tradable goods in response to changes in demand generated by changes in income.
[26] Minot and Daniels compare welfare and poverty impacts of a seed cotton price fall before and after cotton households have adjusted their production mixes in response to the fall. Their methodology for doing this uses estimates of the ("general equilibrium") price elasticity of supply of seed cotton. The higher this is, the greater is assumed to be the producers' ability to shift into other crops in response to relative price changes.