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ABSTRACT OF THESIS

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Title of Thesis Government support in cotton production: Implications for sustainable development

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Cotton trade has been characterised as a "success story" in the developmental process of West and Central African (WCA) countries. However, the agricultural subsidies that the United States (US), European Union (EU) and China provide to their cotton farmers have global trade distorting effects. Several econometric models provide evidence according to which subsidies keep cotton prices at very low levels in the global market while artificially maintaining high production levels in the US, EU and China. As a result, the prosperity of African cotton producers is inhibited. In 2003, four WCA countries (Benin, Burkina Faso, Chad and Mali) presented a proposal to the World Trade Organisation according to which government support in cotton production should be banned. They argued that a liberalised world market for the fiber would allow their producers to increase cotton exports, a fact that would benefit the WCA countries on a macroeconomic level and assist them in their fight against poverty.

Nonetheless, cotton is not a panacea for sustainable development in Africa. While the focus in the four WCA countries is on poverty alleviation, there are serious environmental sideffects as well. Large amounts of pesticides used in conventional cotton production are hazardous both for human health and for the environment. Furthermore, increased production is associated with soil depleting effects and often results in deforestation. Genetically modified (GM) cotton is a new technological solution that has been tested in several developing countries. Although the preliminary results have been encouraging, concerns for the sustainability of GM varieties have been expressed. On the other hand, organic cotton represents a more environmental friendly alternative to the input intensive conventional varieties, even though its economic viability for WCA countries is not yet secured.

The reform process of the global cotton sector should incorporate environmental, social as well as economic parameters. African nations should have the chance to prosper through cotton production while making sure that they do not jeopardise their natural resources.

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List of abbreviations

ATC:	Agreement on Textiles and Clothing
Bt:	*Bacillus thuringiensis*
CAP:	Common Agricultural Policy
CARDER:	Centre d'Action Régionale pour le Dévelopment Rural
CCP:	Counter-Cyclical Payments
CFA:	Communaute Financiere Africaine
CFDT:	Compagnie Française de Développement Textile
CGE model:	Computational General Equilibrium model
CMDT:	Compagnie Malienne pour le Développement des Textiles
Cotton Four Countries:	Benin, Burkina Faso, Chad and Mali
DDR:	Doha Development Round
DFID:	Department For International Development
DP:	Direct Payments
ECG:	Export Credit Guarantee
EU:	European Union
FAIR Act:	Federal Agriculture Improvement and Reform Act
FAO:	Food and Agriculture Organisation
FGT index:	Foster, Greer and Thorbecke index
GDP:	Gross Domestic Product
GM:	Genetically Modified
HDI:	Human Development Index
Ht:	Herbicide tolerant
IMF:	International Monetary Fund
LDP:	Loan Deficiency Payments
MDGs:	Millennium Development Goals
MLA:	Market Loss Assistance
MOU:	Memorandum Of Understanding
NGO:	Non-Governmental Organisation
NGQ:	National Guaranteed Quantity

PFCPs:	Production Flexibility Contract Payments
R&D:	Research and Development
SOFITEX:	Société Burkinabé des Fibres Textiles
SONAPRA:	Société Nationale pour la Promotion Agricole
SSA:	Sub-Saharan Africa
TUA:	Technical Use Agreement
UN:	United Nations
US:	United States
WCA:	West and Central Africa
WHO:	World Health Organisation

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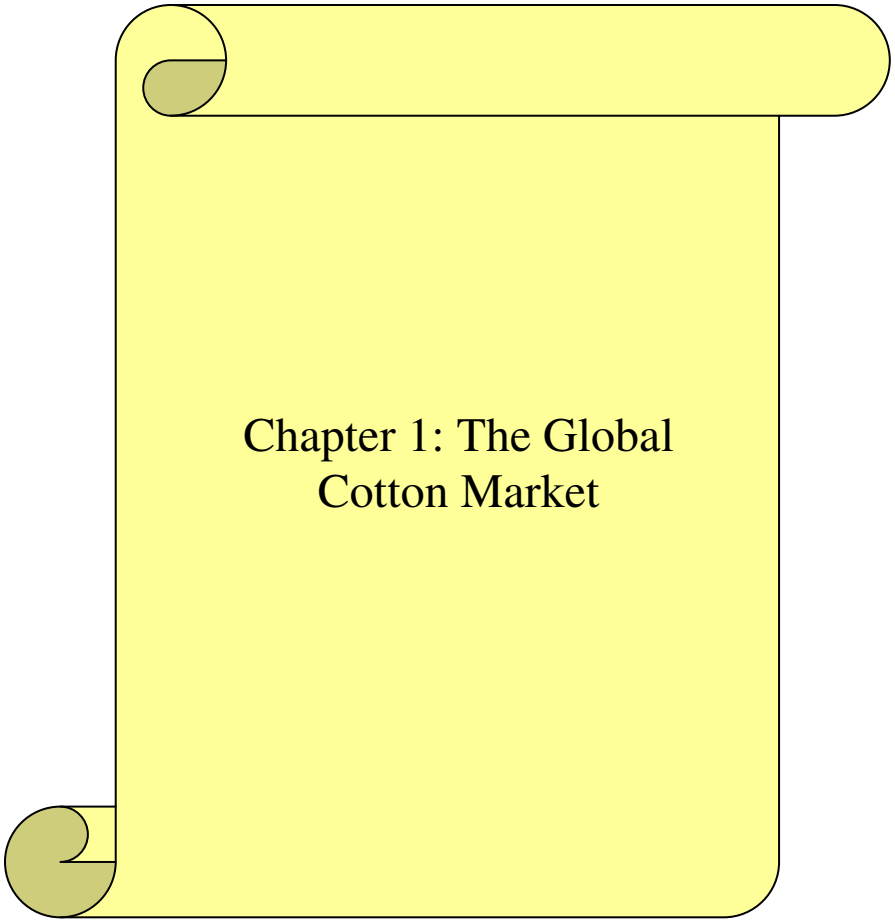

Chapter 1: The Global
Cotton Market

Chapter 1: The Global Cotton Market

1.1 Introduction

The aim of this study is to investigate the impacts that cotton subsidies have on the concept of sustainable development, with particular reference to the West and Central African (WCA) region. Several developing nations have used cotton production and exports of lint fiber as a poverty alleviating mechanism. However, the global cotton market is affected by the government support payments that a number of countries provide to their cotton farmers. The main questions that will be addressed in this study are the following:

1) Do cotton subsidies have trade distorting effects?

2) Will developing countries benefit from a potential removal of cotton subsidies?

3) Are there any adverse environmental effects caused by the cultivation of conventional cotton and what kind of alternatives suited for African cotton producers are available?

This chapter will provide an overall perspective on the importance of cotton for international development, some information about the history of the fiber and finally a general introduction on the global cotton market. A brief outline of all the chapters of the study will be presented at the last section.

1.2 Cotton and the Millennium Development Goals

In the year 2000 the international community came together in the United Nations (UN) Millennium Summit, in which all of the UN member countries signed the Millennium Declaration. With it they agreed to adopt the Millennium Development Goals (MDGs) and work towards their fulfillment (Dahlsten, 2004). The main purpose of the MDGs (listed below in table 1.1) is to promote international development in a way that will enhance the wellbeing of the world's poor. The World Bank (2003) estimates that 70% of the target group of the MDGs lives in the rural areas of Asia and Africa and is heavily dependent on agriculture as a means of earning a living.

The Millennium Development Goals	
1. Eradicate extreme poverty and hunger.	5. Improve maternal health
2. Achieve universal primary education	6. Combat HIV/AIDS
3. Promote gender equality and empower women	7. Ensure environmental sustainability
4. Reduce child mortality	8. Develop a global partnership for development

Table 1.1: The Millennium Development Goals. **Source:** UN (2003b).

Out of that group, the Food and Agriculture Organisation (FAO) suggests that 100 million rural households derive their income, either directly or indirectly, through cotton production (Baffes, 2004a), with 10% of those households located in WCA (Dahlsten, 2004). Hence, one could argue that prosperity in the agricultural sector and particularly the cotton market has the potential of lifting a large number of people out of poverty.

1.3 The origins of cotton

The generic name of cotton is *Gossypium*. The crop belongs to the family of *Malvaceae* and has a large number of wild relatives. Most of them are resistant to drought and indigenous to dry, sub-tropical regions of Africa, Asia, Australia and America. With the exception of *Gossypium herbaceum* var. *africanum*, wild cotton varieties do not bear lint. It is that specific variety which is considered the ancestor of the cotton cultivated today on a global scale. *Gossypium herbaceum* was introduced in America were it was crossed with other wild lintless varieties to produce an entirely new one called *Gossypium hirsutum*. This is the commercially lint-bearing grown cotton found today in many different parts of the world (Stolton and Myers, 1999).

Cotton is very susceptible to frost and thus flourishes in relatively hot regions whose climate combines wet and dry seasons. Once harvested, cotton's pod has to be processed in order for the lint to be separated from the oilseeds. That procedure is carried out in ginneries whose output is seed and lint. Seed can be further used for the production of oil, usually sold to the cosmetics industry. Lint, on the other hand is baled and introduced as an input to the textile factories (EU, 2003a).

Cotton has been known to man since antiquity. However, its popularity was rather low, because of the highly sophisticated and labour intensive processing that was needed in order for cotton clothes to be produced. Even in 1770 it was 10 times faster to produce

a pound of wool than the same amount of cotton (The Economist, 2003). It was not until 1793 and the invention of the ginnery, (a machine that could separate cotton from its seed, thus reducing the cost of lint production) that cotton production was widely commercialised.

1.4 The cotton market

With a faster and more cost-effective production method cotton's popularity surged. During the 19th and 20th century, it became the most widely used textile worldwide (Baffes, 2004b). In the last 40 years in particular the international market has witnessed yet another boost of increasing yields. The result was a global production of 20 million tons (in 2001), a figure that represents twice the cotton yields of 1960 (UN, 2003a). Increase in cotton production has been the outcome of a number of factors, mainly involving the introduction of new and improved varieties, irrigation methods and application of biocides. Average productivity in 1960 was 300 kilograms per hectare while in 2000 it had doubled to 600 kg/h (Baffes, 2004a). An overview of production volumes since 1980 is provided in figure 1.1.

Figure 1.1: World cotton production volumes (1980-2005). **Source**: Compiled by the author using data from ICAC (2002a; 2004), USDA (2005).

Despite the recorded increase in yields the share of cotton in the world fiber market has been declining steadily since the 1960s, due to competition from chemical

fibers and partly from the second hand clothing market (Hansen, 2000). From a share of almost 70% cotton's popularity has decreased to 40% within the last 40 years, as illustrated in figure 1.2 (Baffes, 2004b).

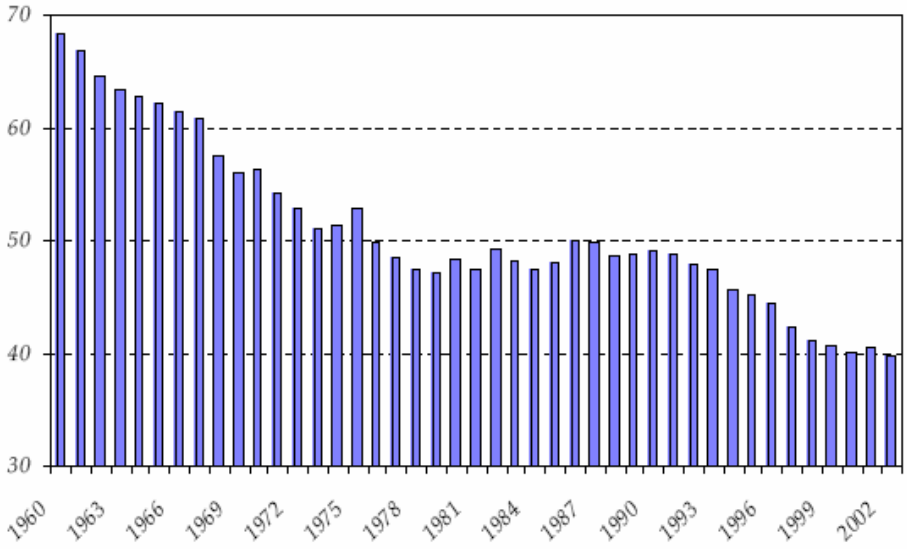


Figure 1.2: Cotton's share in total fiber consumption (percent). Source: Baffes (2004b).

Quality is a key issue in the cotton market. Poulton *et al.* (2003) argue that even when a market is saturated good quality lint is bound to be absorbed by world trade as opposed to low quality products that might have to be sold in lower prices. Furthermore, quality plays an important role in determining the price of the product. According to Ethridge and Hudson (1998) there are approximately 800,000 quality combinations of cotton and each of those can be place on a different price scale. It is therefore vital that the producer holds all the necessary information concerning the properties of his product, in order that he assigns it with the correct monetary value.

1.5 Cotton prices

The Cotlook A Index is the most widely accepted cotton price index worldwide. Calculated by an English information agency based in Liverpool, it is an average of the five lowest prices of cotton in Northern Europe measured in US cents/pound (EU, 2003a; Minot and Daniels, 2005). An overview of the course of prices in the global market is presented in figures 1.3 and 1.4. Figure 1.3 provides a general trend of prices in constant $US/kg, whereas figure 1.4 gives a more detailed analysis of the last 15 years.

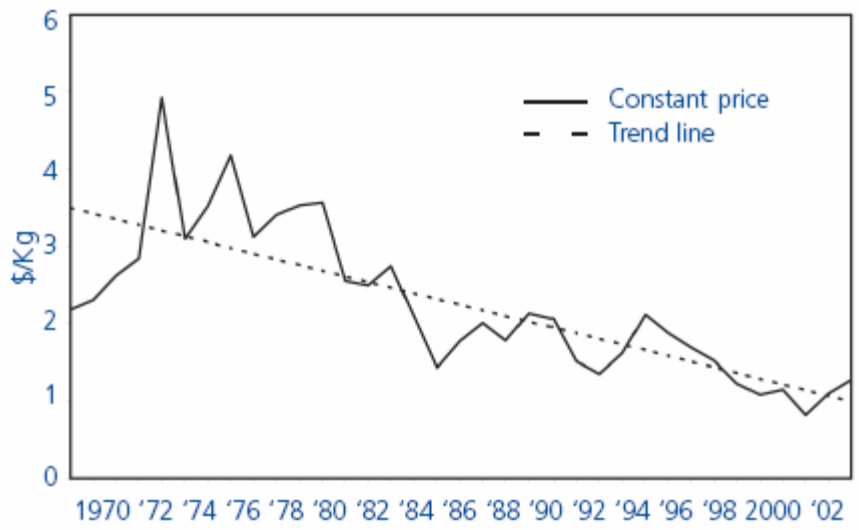


Figure 1.3: Cotton prices in $/kg for the period 1970-2002. Source: ODI (2004)

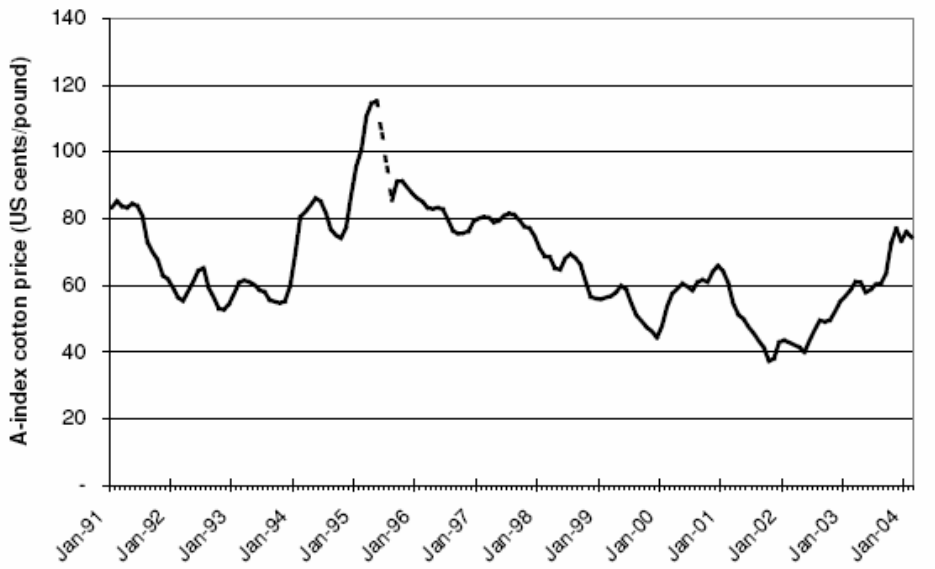


Figure 1.4: Cotlook A Index for the period 1991-2004. Source: Minot and Daniels (2005)

As illustrated the overall trend in cotton prices has been a declining one. Liebhardt (2005) suggests that when adjusted for inflation cotton was sold for $4 per pound in the 1950s. After a steady decline over a 40 year period, prices entered yet another era of severe depreciation at the end of the 1990s reaching a record low price of 43 cents per pound in the period 2001-2002. Minot and Daniels (2005) provide three main explanations for the recently recorded price free fall:

1) **Stagnant demand**: Demand for the fiber has remained steady at the level of 20 million tonnes per year since the mid 1990s, while production has been rising substantially, reaching 26 million tonnes in 2004 (USDA, 2005).
2) **Cotton's demand elasticity**: As a textile, cotton's demand is highly elastic as opposed to other agricultural products like grain that can not be easily substituted. Therefore, a global economic downturn such as the one recorded in recent years can have a rather negative impact on the cotton market.
3) **Competition from synthetic fibers**: Their market share has risen substantially reaching 55% in 1999.

Price volatility is yet another issue. The United Nations Conference on Trade and Development held in Geneva (2003a) acknowledged the intense fluctuation of prices as a key component that has to be addressed in the cotton market. Studies have shown that prices during 1985-2002 have been twice as volatile compared to the 1960-72 period (Baffes, 2004a). A number of unpredictable parameters such as water supply, pest problems and climatic changes all contribute to production fluctuations that enhance price volatility (EU, 2003a).

1.6 Outline of chapters

The analysis of this study will at first focus on the government support regime in three nations that provide the highest amounts of subsidies on a global scale; the United States (US), European Union (EU) and China (Chapter 2). This will be followed by an examination of the WCA cotton sector (Chapter 3). Four countries will be analysed in more detail; Benin, Burkina Faso, Chad and Mali. They were chosen because they brought forward a key proposal in the international cotton trade negotiations. The proposal was submitted in 2003 to the World Trade Organisation (WTO) and called for the removal of trade distorting cotton subsidies. That initiative was based on a wide range of studies that attempted to calculate the impacts that government support payments have on those four, but also several other cotton producing nations. Chapter 4 will provide an outline of these studies in an effort to examine what effects subsidies have on the world cotton market, but also on specific countries and regions. Consecutively, the role of the

WTO will be examined with specific reference to two cases brought to the organisation; the proposal by the Cotton Four countries (Benin, Burkina Faso, Chad and Mali), that was already mentioned (also known as The Cotton Four Initiative) and the case made by Brazil against US support payments. Chapter 6 will investigate the implications of cotton production to sustainable development, with particular reference to the environmental impacts of various cultivation methods. Furthermore, the alternatives of Genetically Modified (GM) and organic cotton will be analysed. The seventh and final chapter will summarise the main findings and provide policy-related suggestions.

Chapter 2: The subsidy regimes in the US, EU and China

"Take away time is memory, and what is left of England? Take away cotton is king, and what is left of America?" in *Les Misérables* (1862) book IV, chapter 4 (Cross, 2006).

Chapter 2: The subsidy regimes in the US, EU and China

2.1 Introduction

Agriculture is a special kind of industry. Its heavy reliance on weather patterns means that there can be seasons with product shortages as well as price variations (Grant, 1997). However, if these variations are extended then the industry can be severely damaged in the long run by a "lower that optimum level of investment" (Atkin, 1993). This argument is used by those in favour of public support programs such as the EU's Common Agricultural Policy (CAP) or the US's Farm Bills, in order to justify its importance in maintaining a viable agricultural market and therefore enhancing food security.

This chapter will deal with the agricultural policies of the three countries that provide the highest support to their cotton producers, namely the US, EU and China. Attention will be paid to the structure of support, production volumes and reform processes in place.

2.2 US

2.2.1 Introduction

The history of US government support to cotton producers dates back to the 1930s, when during the Great Depression subsidy payments intended to assist farmers and increase production (The Economist, 2005). Domestic agricultural aid was originally part of the Agricultural Adjustment Act in Roosevelt's New Deal. Although the programs delivering subsidy payments have changed throughout the years, their main objective, transferring funds from taxpayers to farmers, has remained the same (Baffes, 2004a).

2.2.2 The Farm Bills

Government support is modified every 5-6 years by specific legislative acts known as Farm Bills, the two most recent being the Federal Agriculture Improvement and Reform Act (FAIR Act) of 1996 which was followed by the Farm Security and Rural Investment Act of 2002. The original aim of the FAIR Act was to reduce the amount of government support in agriculture (Cross, 2006). For this reason the Production Flexibility Contract Payments (PFCPs) were introduced. They consisted of subsidies detached from current production levels and were designed to gradually minimize government intervention in agriculture. The PFCPs proved to be a success, at least in the cotton sector, as support payments to farmers were reduced from $700 million in 1996 to $474 million in 2002. Hence, American cotton farmers were being increasingly exposed to the risks of the international market (Isengildina and Hudson, 2001). However, the end of the 1990's saw great reductions in agricultural commodity prices. As a result new subsidy programs were introduced with the scope of protecting US farmers from falling world prices. The 2002 Farm Bill set a guaranteed target price for cotton at the level of $ 0.72/per pound. Depending on the international market price for the commodity, the US government had the responsibility to cover the difference between that price and the $ 0.72 target price (Minot and Daniels, 2005).

2.2.3 Support in relation to prices

Figure 2.1 provides an illustration of the trend of US government support payments from 1994 to 2005 and their correlation with world cotton prices. It is worth

noticing that until the end of the 1990s government support remained at a rather moderate level below $1,5 billion, as world prices were high (at the end of 1997, prices reached $0.72 per pound). However, 1998 was a turning point in the course of events (Cross, 2006).

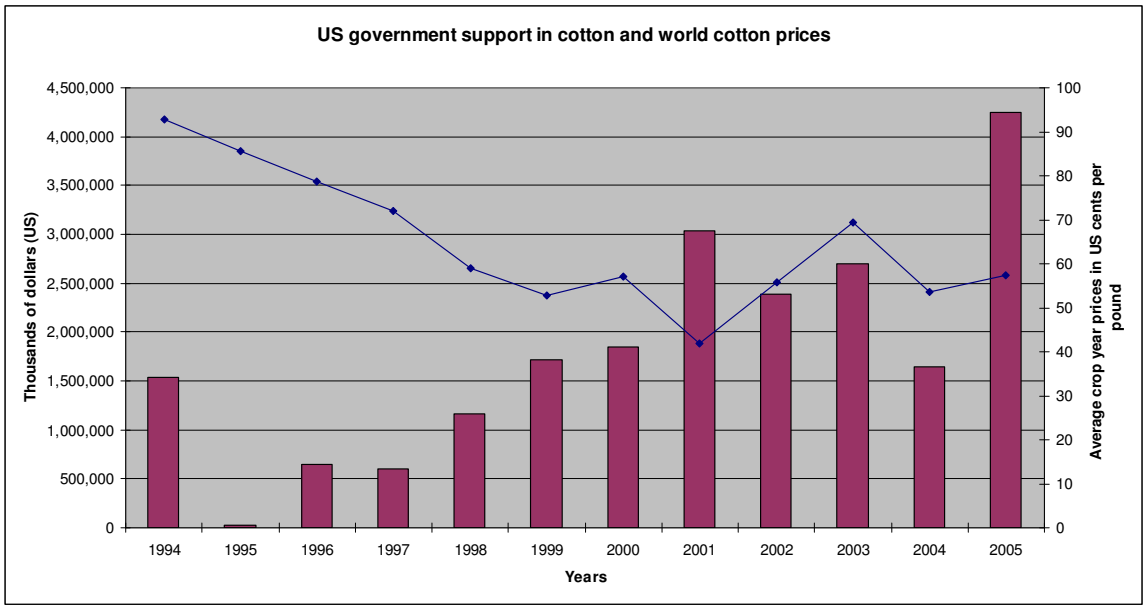


Figure 2.1: US government support to cotton producers in correlation to world prices. Source: Compiled by the author using data from FSA (2006; 2001), EWG (2006) and NCCA (2006).

Prices started to decline rapidly and hence subsidies rose substantially reaching levels as high as $3.1 billion in the year 2001. With prices way below the $0.72 per pound (which was the threshold established by the 2002 legislation, as mentioned above) the government had to commit extensive financial funds towards keeping its promises to farmers for a guaranteed minimum price. Liebhardt (2005) argues that the cotton sector has been gradually enjoying an increased amount of government support. Even though throughout the entire period between 1995 and 2003 US cotton growers had received a cumulative amount of $14 billion in subsidy payments, in 2005 alone, government support reached a record level of $4.2 billion. Cross (2006) suggests that this trend is a result of the powerful lobbying exercised by the National Cotton Council of America.

2.2.4 Production

Increased government support has provided a protectionist environment for the American producers. Knowing that they can sell their cotton at a guaranteed price

regardless of the conditions in the international market, they were not afraid to uptake the risk of investing in machinery and improved cotton varieties that ultimately increased their output volumes. Hence, in the period between 1980 and 2001 US cotton production has almost doubled from 2.4 million to 4.4 million tones. That has made the US the second largest producer worldwide behind China (EU, 2003a). Figure 2.2 displays the production volumes of cotton in the USA for the period between 1980 and 2005.

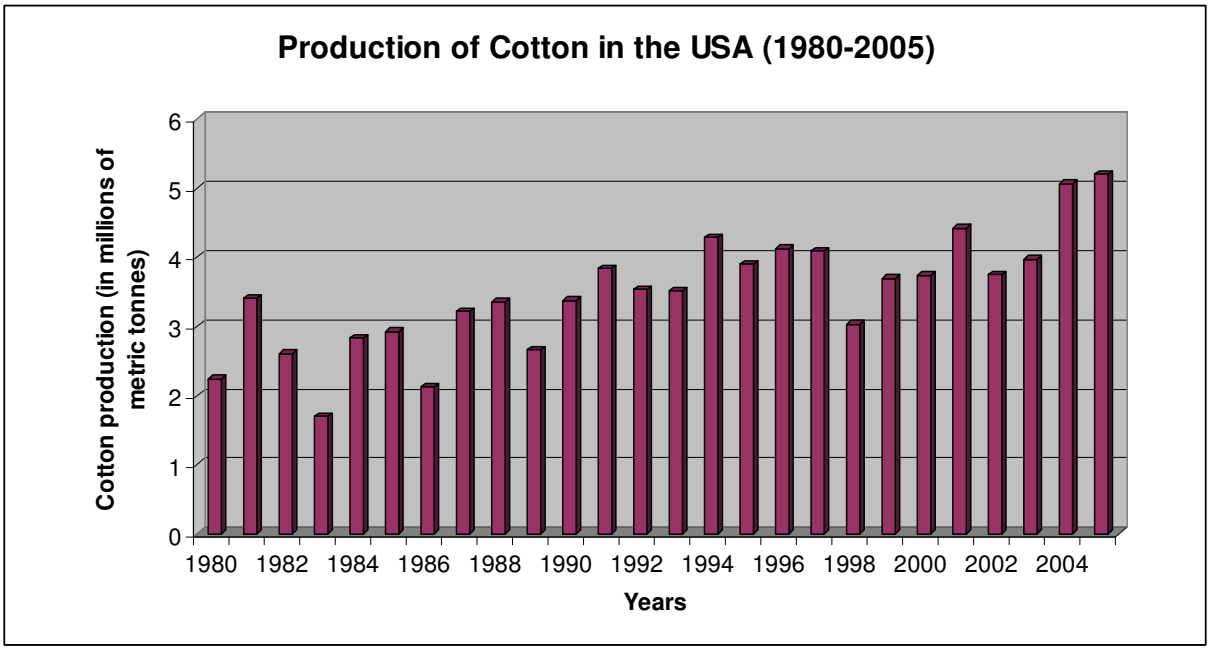


Figure 2.2: Production of cotton in the USA (1980-2005). Source: Compiled by the author using data from USDA (2005) and ICAC (2004; 2002a).

2.2.5 Cost of production

In terms of cost of cotton production the US is by far one of the most ineffective countries. While an average US producer has a cost of approximately $0.68 per pound, his peers in many WCA countries (namely Benin with a cost of $0.30 per pound and Burkina Faso with $0.21 per pound) are twice as effective (UN, 2003a; Oxfam, 2004). An illustration of the above argument is provided in figure 2.3.

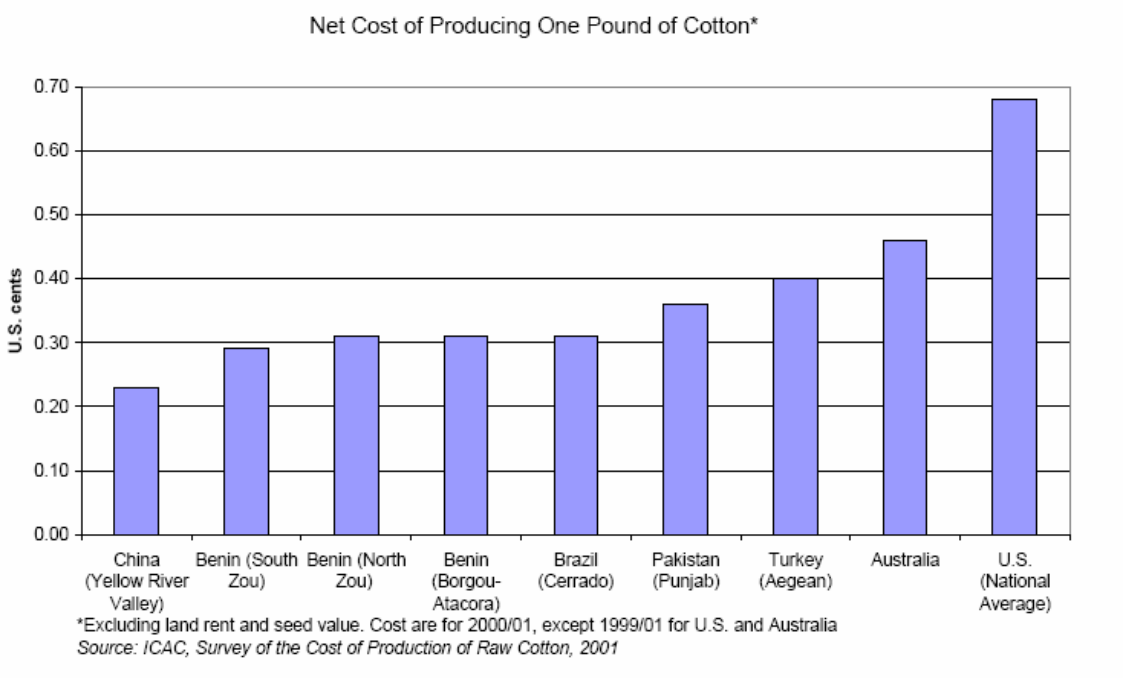


Figure 2.3: Cost of production in US $ per pound for different countries. Source: Oxfam (2004)

2.2.6 World market shares

With a production cost greater than global prices since 1998, subsidies are the main reason that has allowed American cotton farmers to stay in business. Without government support they would have to sell their high cost products at low prices and would experience substantial loses. Furthermore, while most countries have experienced considerable loses in their market share, due to decline trend in prices, the US is the only country with a substantial increase in exports (Oxfam, 2004; Dahlsten, 2004). With a leading position among the cotton exporting countries, the US has witnessed a substantial rise in its export volumes averaging 1.8 million tones in the years 1999-2001 (EU, 2003a). Figure 2.4 presents a ranking of the cotton exporting countries. It is important to note that since 2001 the market share of the WCA countries (identified on figure 2.4 as "CFA zone") has been rising substantially bringing them in the second position of the exporting countries behind the US for the year 2003.

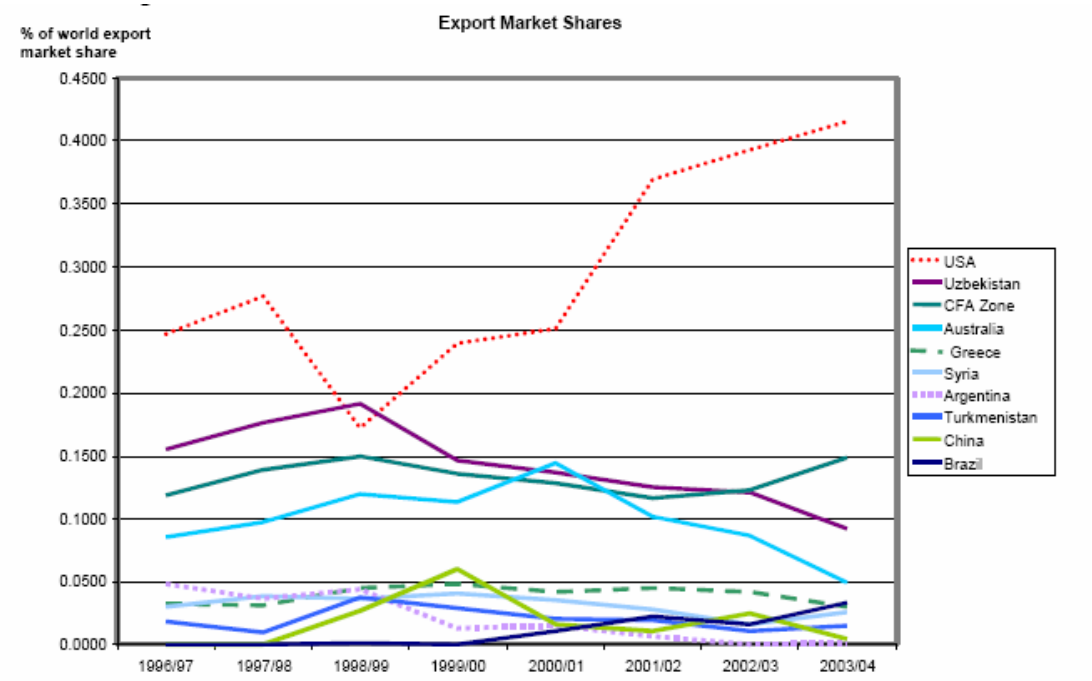


Figure 2.4: Export market shares of Cotton. The CFA countries are the 13 countries of the "Communaute Financiere Africaine", nominally: Benin, Burkina Faso, Cote d'Ivoire, Mali, Niger, Senegal, Togo, Cameroon, Central African Republic, Chad, the Congo, Equatorial Guinea, and Gabon (World Bank, 1998). **Source**: Oxfam (2004).

2.2.7 Domestic inequality

Even though total government payments to US cotton farmers are high, a great deal of inequality is involved in their disbursement. According to the findings of a UN conference held in Geneva (2003), approximately 75% of cotton subsidies are directed to a minority of 25% of farmers, with only 1% of the farmers receiving 25% of support payments. The numbers reflect an unequal distribution. On a larger scale, total US agricultural subsidies reach only 1 out of 3 farmers (Cross, 2006). In its 2004 report on cotton, Oxfam discredits the myth that US government support in agriculture has the aim of benefiting small scale producers and protect the traditional family farm. The case of the cotton sector justifies the above argument. In 2002 alone, and despite the fact that there was a $360,000 limit in the subsidies a single farmer could receive (The Economist, 2005), 25 cotton producers managed to absorb over $1 million each from the government budget, while the average payment per recipient for the same year was $331,000 (Oxfam, 2004).

2.2.8 Conclusion

Subsidies have assisted the US cotton sector in maintaining a primary position among the export nations and a leading place in the list of cotton producers. However, government support payments have been mainly absorbed by the large scale producers that due to the size of their landholdings and their production efficiency could survive in the market anyway, regardless of whether they would be subsidised or not. Small cotton farmers on the other hand have been marginalised and driven out of business. Even though they are the ones most in need of financial support, they have received only a small percentage of subsidies. Therefore, one could argue that from a distributional point of view US subsidies have not resulted in a welfare increase for the national cotton sector.

2.3 EU

2.3.1 Introduction

The history of government support in agriculture is relatively more recent in Europe compared to the US. Its roots could be traced back to the end of the Second World War, when European Nations decided that their citizens should never again face hunger and rationing (Thurow and Winestock, 2002). In 1957 they established the CAP, whose main aims where:

1) to increase agricultural production, mainly through effective use of labour and technology, in order to achieve food security and promote the livelihoods of the farmers.
2) to ensure consumers would pay a fair price for products and
3) to stabilize the agricultural market (Hill, 1984; Brouwer and Van Berkum, 1996).

When the CAP was originally introduced it addressed the needs of the time. Post-war Europe faced increased food insecurity and deficits in its foreign currency budget (Fennell, 1997). Agricultural support helped tackle both these issues. By the 1970s Europe had established self-sufficiency in the food sector and was slowly transcending into a net exporter of commodities (European Commission, 1998).

2.3.2 The two main producers: Greece and Spain

When Greece and Spain joined the European Economic Community (the predecessor of the EU during the 1980s), they became eligible recipients of the CAP. During the 1960s and 1970s cotton production in those two countries did not surpass 130,000 tonnes (Baffes, 2004a). Today they are the two main producers of cotton in the EU with volumes that exceed 500,000 tonnes (ICAC, 2002a). That increase is largely attributed to the incorporation of Greek and Spanish cotton farmers amongst the CAP recipients. Figure 2.5 provides a comprehensive approach to the cotton production levels of Greece and Spain.

Government support to the cotton producers of the two Mediterranean countries is characterised by high levels of concentration. Thessaly in Greece and Andalusia in Spain represent the bulk of cotton production, with Portugal accounting for a minor part of

production, less than 1,500 tonnes (EU, 2003a). These two regions are among the least developed in the entire EU. Hence, government support is seen as a means of economic assistance that aims to sustain rural development (ICAC, 2002b).

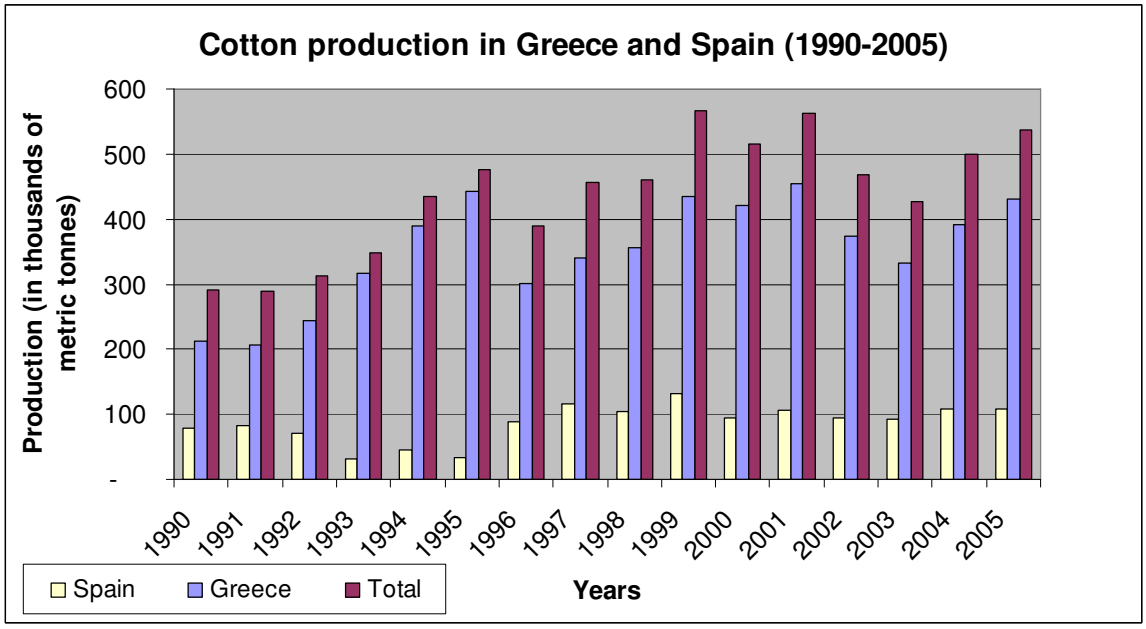


Figure 2.5: Cotton production in the EU (1990-2005). Production volumes of Portugal have not been taken into account due to minimal contribution (merely 1,500 tonnes per year). **Source**: Compiled by the author, using data from ICAC (2002a) and USDA (2005).

Cotton represents a mere 0.5% of the total agricultural output of the EU. However its importance for Greece is considerably higher, contributing 9% to the county's agricultural GDP. The relevant number for Spain is 1.5% (EU, 2003b).

2.3.3 Subsidy regime in the EU

The case of the EU is relatively different than that of the US. Primarily, Europe is a net importer of cotton unlike the US whose imports are close to zero (ICAC, 2002a). Furthermore, despite the fact that EU's subsidies are much smaller in volume compared to those provided by the US, their percentage on a global level is certainly not negligible. Oxfam (2004) argues that even though Europe contributes only a minor 2.5% in world cotton production, its share in the market of government support amounts to 17%. Farmers in Greece and Spain receive as much as $1.37 and $1.67 per kilogram of cotton

produced respectively (ODI, 2004), a figure which puts them in the group of the most favoured recipients worldwide (as will be discussed in section 2.5).

The EU does not provide export subsidies to its cotton producers. Support is mainly in terms of domestic payments. For the period between 1995/96 and 2002/03 farmers in Spain and Greece received as much as 2/3 of their income from subsidies with only 1/3 accounting for revenues derived from cotton sales (EU, 2003a). The current support system evolves around the National Guaranteed Quantity (NGQ). According to that scheme, each member country is allowed to produce a specific amount of unginned cotton. For Greece and Spain that quota is 782,000 tonnes and 249,000 respectively (ICAC, 2002b). The producers sell the unginned cotton to the ginners at a "guide price", established by the EU at a level much higher than the global price (EU, 2003b).

2.3.4 The Greek cotton sector

Karagiannis and Pantzios (2002) provide a thorough investigation on the case of Greek producers' non compliance with the NGQ scheme and it's consequences on farmer's welfare. As illustrated in table 2.1 Greek cotton growers surpassed the production quotas imposed by the EU for the period between 1995 and 1998. As result income from cotton production was reduced, leading to a series of protests on behalf of the farmers. The authors argue that had the producers complied with EU directives, both they and domestic taxpayers would have experienced an absolute Pareto improvement (the welfare of both producers and consumers would have increased).

An older study by Lianos and Rizopoulos (1988) argues that judging from the policies implemented by the Greek government in the national cotton sector and the subsidies that where allocated, the welfare of cotton producers was weighted about 10% more than that of the taxpayers.

	Marketing years		
	1995-96	**1996-97**	**1997-98**
Production (in metric tons)	1,364,798	962,480	1,085,488
NQG (in metric tons)	782,000	782,000	782,000

Table 2.1: Greek production of unginned cotton and EU NQG. Source: Karagiannis and Pantzios (2002)

2.3.5 The reform process of the EU cotton sector

Since 1992, the EU has generated a process of reform for the CAP. The aim is to move away from trade distorting policies and align agricultural support with the WTO directives. All domestic subsidies should ideally be classified within the WTO green box and to a lesser extent within the blue box (an analysis of the WTO agricultural boxes is provided in the Appendix). Payments to farmers, although essential for the sustainability of rural development, should be decoupled and directed towards the provision of environmental services rather than the enhancement of overproduction (Nowicki, 2002).

The most recent step in the CAP reform was undertaken during the Luxembourg Council, in June 2003. The main outcome of the Council was a proposal for the reduction of cotton acreage by 11% and 5% in Greece and Spain respectively. The implementation of this decision will not be an easy task, particularly since similar proposals adopted in 2001 proved unsuccessful (EU, 2003b).

2.3.6 Conclusion

Cotton production in the EU is currently undergoing a reform process, in order for the subsidy regime to be aligned with WTO directives. The European Commission recognizes however that any reforming effort of the sector should strongly consider the crop's special economic significance to the cotton producing regions in Greece and Spain.

2.4 China

2.4.1 Introduction

China is a major contributor to the international cotton market. It is the largest producer and the second largest subsidiser of cotton worldwide. Along with the US they are the only two nations that subsidise cotton exports (ICAC, 2002b).

2.4.2 Subsidies and production volumes

The government imposes a 3% tariff on imports up to 860.000 tonnes. Imports that cross that threshold are automatically rendered non-profitable since the relevant tariff reaches a level of 90%. Other means of support include transportation and marketing subsidies, as well as public stockholding (Baffes, 2004a). Figure 2.6 provides an illustration of the volume of government support that Chinese cotton farmers received between 1997 and 2002.

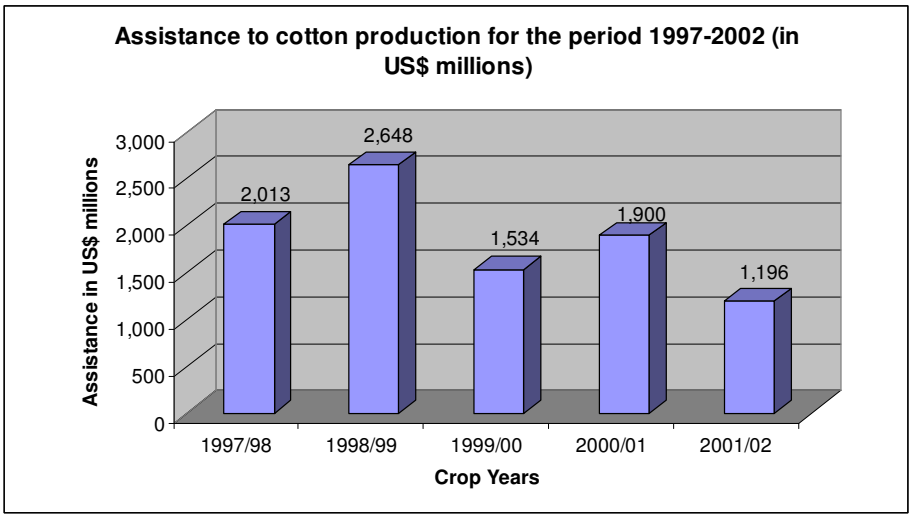


Figure 2.6: Government support to cotton producers in China (1997-2002). Source: Compiled by the author using data from ICAC (2002b).

. Chinese activities have a great influence on price fluctuations. During the past 20 years China has been shifting from a net importer to an exporter of cotton. As illustrated in figure 2.7 there is a direct correlation between the quantity that China either exports or imports and the course of the Cotlook A Index. In the years that China has a positive balance of trade prices tend to be lower (as is the case for the periods 1984-89,

1992 and 1998-2001). On the other hand when the country becomes a net importer of cotton the average Cotlook A Index is higher (EU, 2003a).

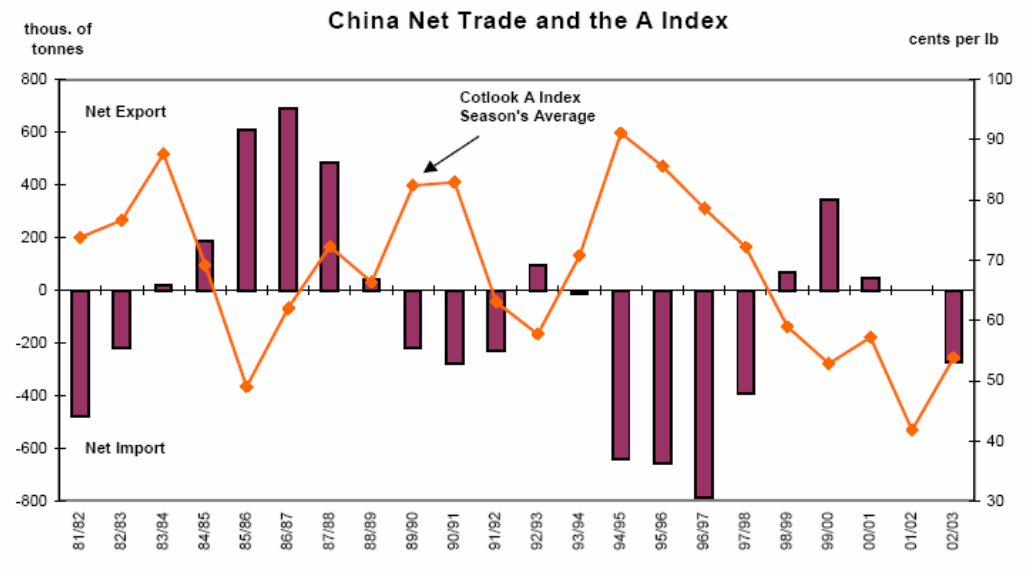


Figure 2.7: The effects of the Chinese trade balance to the Cotlook A Index. Source: EU (2003a).

2.4.3 The importance of the Chinese textile industry

The Chinese cotton market is largely affected by the country's globally competitive textile industry. With reforming initiatives in place since the early 1990s, China has ceased all measures of support to its textile companies since the beginning of 2000. In 2004, the industry contributed a monumental 11.3% in the Gross Domestic Product (GDP) (WTO, 2006c).

The future of the Chinese textile industry has entered a new phase since January 1st 2005. On that day, imports quotas that countries could impose on China, under the WTO Agreement on Textiles and Clothing (ATC), were completely eliminated. Hence Chinese textile exports increased substantially (Oxfam, 2004). Having to compete against cheaper imported products from China, European textile companies lost the comparative advantage that the former protectionist status quo provided them with. The fact put pressure on the EU officials to negotiate a Memorandum of Understanding (MOU) with China in June 2005. According to the MOU China would limit the annual growth of its exports in a number of commodities including cotton, in return for a decrease in safeguard investigations on behalf of the EU (WTO, 2006c).

2.4.4 Reform process

Since 1999 China has initiated a reform process of its cotton sector. Farmers can no longer sell their production at a guaranteed price and government monopoly is gradually being replaced by private mills and ginneries (The Economist, 2004b). In 2001 the country joined the WTO and agreed to further liberalise its practices, mainly by eradicating import quotas (EU, 2003a). Anderson *et al.* (2004) provide an insightful perspective on the consequences that China's accession to the WTO will have on the country's agricultural sector. They argue that the removal of export subsidies on cotton will cut exports by half for the 5 year period between 2002 and 2007. Although production is likely to remain constant the country's self sufficiency in cotton will decrease thus increasing the need for imports. Minot and Daniels (2005) argue that the above transformation of policy has had and will continue to have positive effects on liberalization of the world cotton market.

2.4.5 Conclusion

China's role in the fiber industry is very important. The country's soaring economy has the potential to affect the future development of the global cotton market. Furthermore, China's initiative for a liberalized cotton sector has been viewed by many researchers as a positive step in the international economy.

2.5 Comparison between the subsidies of US, EU and China

Figures 2.8 and 2.9 present a comparison of the cotton subsidies that the three nations disburse to their farmers. Although US and China provide the highest amount of subsidy payments in absolute terms, the Greek and Spanish producers receive the largest subsidies per pound of cotton produced.

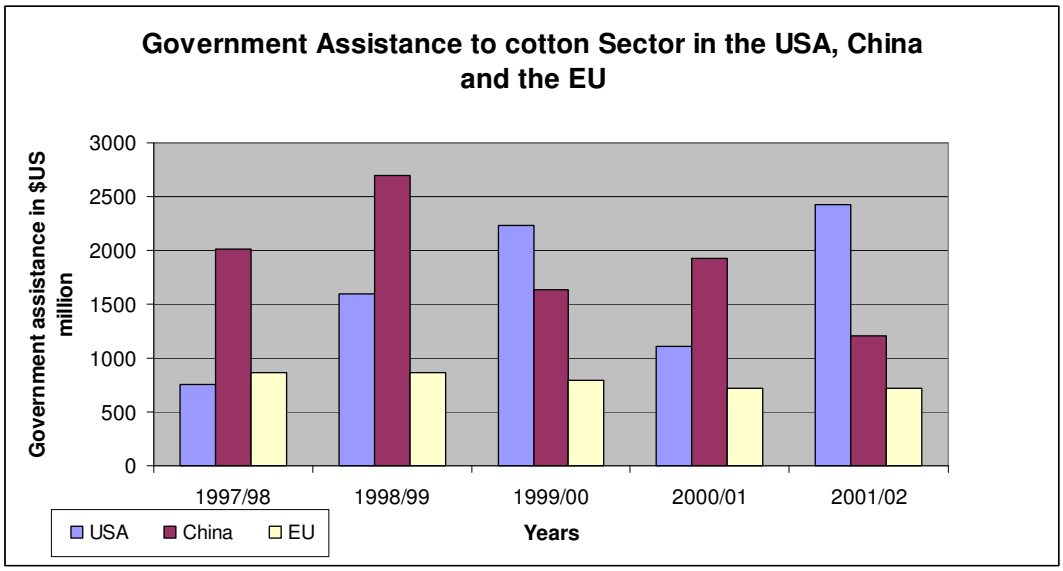


Figure 2.8: Government assistance to the cotton sector. China and the US provide the highest total amount of subsidies to their cotton producers. **Source**: Compiled by the author, using data from ICAC (2002b)

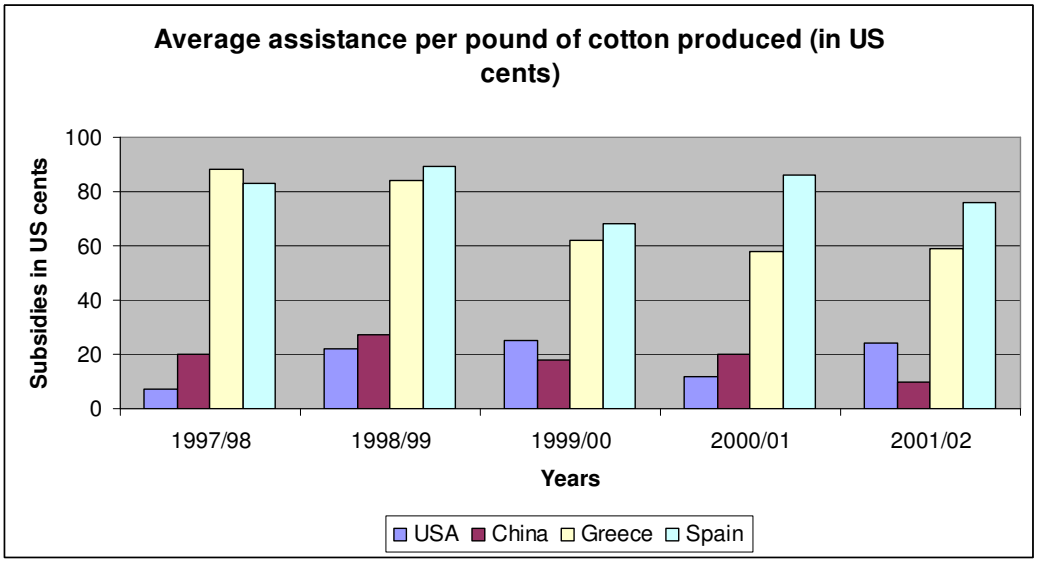


Figure 2.9: Average assistance to cotton producers. The farmers in Greece and Spain receive the highest per capita subsidies worldwide. Other nations that subsidise their cotton producers, but to a much lesser extent, are Turkey, Brazil, Egypt and Mexico. **Source:** Compiled by the author using data from ICAC (2002b).

2.6 Conclusion

Subsidy regimes in US, EU and China are characterised by a series of distributional inefficiencies that inhibit the potential for increasing welfare. In the US, large farmers receive the bulk of support payments, while in Greece taxpayers' wellbeing is reduced because greater importance is assigned to the welfare of cotton farmers. What is more, although the EU provides the lowest absolute amount of subsidies between the three nations, it ranks first in terms of average support payment per farmer.

Chapter 3: The Cotton Four countries (Benin, Burkina Faso, Chad and Mali)

"*If I produce without getting any money, and there's someone who is guaranteed to get money even if he gets nothing from production, my rival will survive, and I won't. That's the big difference. I'll stop, he'll go on. There's something unfair about it*." (Cotton farmer in Tchaourou, Benin) (in Meek, 2003)

Chapter 3: The Cotton Four countries (Benin, Burkina Faso, Chad and Mali)

3.1 Introduction

The aim of this chapter is to provide an insight into the lint fiber sectors of the Cotton Four countries (Mali, Benin, Burkina Faso and Chad) and examine the strengths and weaknesses of their production systems. At first an overview of the cotton sector in the WCA region will be presented and then each of the Cotton Four countries will be examined individually. Specific parameters that will be addressed include the dependence of each country on cotton production, as well as the examination of the main characteristics of the public cotton companies operating in each of the four nations.

3.2 The cotton sector in WCA

3.2.1 Background

The Cotton Four countries are part of the Francophone Africa or the cotton "Franc Zone" which includes in total 9 countries of WCA (illustrated in figure 3.1). The French colonial presence, predominant in the region until the middle of the 20th century, played an important role in the establishment and the success of the cotton sector.

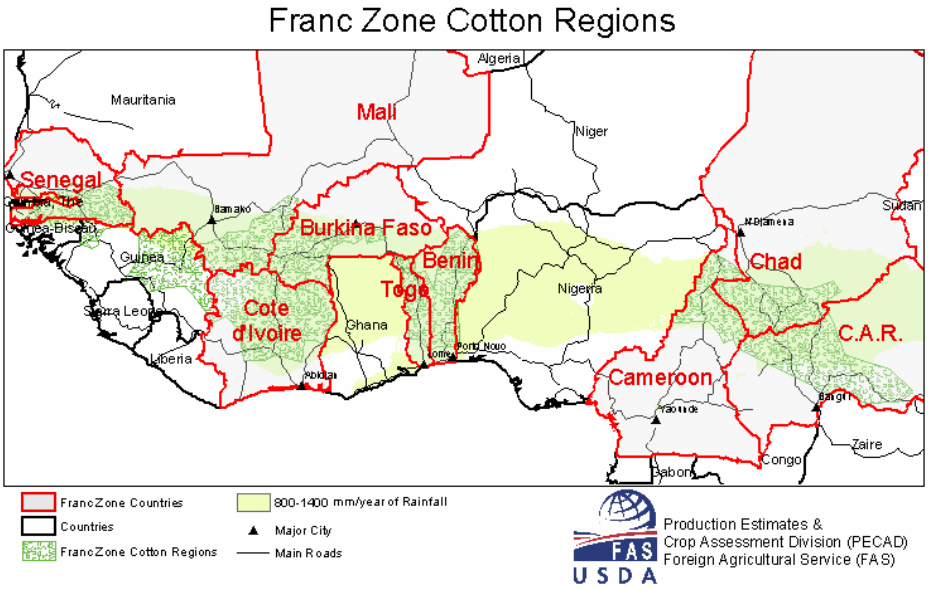


Figure 3.1: The Cotton Franc Zone. The 9 countries comprising the Cotton Franc Zone (highlighted in red): Benin, Burkina Faso, Chad, Cote d'Ivoire, Cameroon, Togo, Senegal, Central African Republic and Mali. **Source:** USDA (2002)

During the French occupation, the sector was controlled by the *Compagnie Française de Développement Textile* (CFDT). The production system was vertically integrated, with CFDT providing the farmer with all the necessary inputs (fertilisers, pesticides and technical advice) and buying his raw cotton output that was then send to the local ginneries, before being exported to France (GRAIN, 2004; Yafa, 2005).

Upon the end of the French rule, in 1960, CFDT was broken up into several national enterprises (parastatals); the *Compagnie Malienne pour le Développement des Textiles* (CMDT) in Mali, the *Société Nationale pour la Promotion Agricole* (SONAPRA) in Benin, the *Société Burkinabé des Fibres Textiles* (SOFITEX) in Burkina Faso and many others. These parastatals followed the same operating system as CFDT and became the cornerstone of the cotton sector for each country in the WCA region. Their main advantage was that they provided the farmers with an efficient input-credit system, according to which cotton producers did not have to pay for the inputs they received from the parastatals. Rather, the cost of the pesticides and the fertilisers they used was deducted from the price they were paid for their final output upon delivery to the publicly owned ginneries (Goreux and Macrae, 2003).

3.2.2 Comparative advantages and major impediments of cotton production in WCA

Cotton production in WCA is characterised by a great level of fragmentation, as there is a large number of small landholdings. The crop is cultivated on family farms of 1-2 hectares (Liebhardt, 2005). The majority of the fields are rain fed, a fact that makes production volumes particularly vulnerable to climatic conditions (Bingen, 2004). Cotton is planted between May and July, while harvesting takes place from October to December (USDA, 2002).

The extensive use of cheap family labour is the main characteristic and comparative advantage of the cotton sector in the region. It is the basic reason for the low production cost of African cotton farmers. Compared to their peers in the developed nations, they can afford to be three times more efficient in terms of raw cotton production cost, as illustrated in section 2.2.5 (Goreux and Macrae, 2003). What is more, Goreux (2004) argues that the Cotton Four have the lowest cost among the countries of the WCA region. In Burkina Faso for example, the production cost of one pound of cotton is 21 US

cents, compared to 73 US cents in the USA (UN, 2003a). However, the use of family labour in cotton fields has a series of social implications. During the 2002/03 season one out of two children in cotton producing areas did not attend school in order to work in the plantations (Oxfam, 2004).

Labour intensive production, adds yet another characteristic to the WCA lint. Because it is hand-picked, African cotton is of superior quality, compared to machine-picked cotton from the US or the EU. In global market terms, this higher quality results in a 9.3% premium above the Cotlook A Index (ODI, 2004). However, Estur (2005) argues that in the international market this premium is not always translated into increased financial earnings. It is often the case that spinners refuse to buy African cotton since they fear that its' hand-picking process will have resulted in the contamination of the fiber by foreign matter. Furthermore, Bingen (2004) suggests that the fragmentation of cotton production in WCA, described above, often causes variations in the quality of the product. Since standardised input is a main requirement of the textile industry, the variations in the quality of African cotton can be a major impediment for the region's export potential.

3.2.3 Policy coherence

Export potential is further curtailed by the different trade related policies that African nations implement. Inter-country cotton trade is often restricted and stakeholders face difficulties working in a business environment characterised by operational boundaries (Hussein *et al.*, 2005). Greater policy coherence and cooperation among the different parastatals would facilitate cotton trade and increase the exporting capabilities of WCA countries.

3.2.4 Production and yields

Until the 1980s cotton output in the region remained at a moderate level of 200,000 tons per year. Since then, the role of WCA countries in the global market has been constantly increasing. With a production volume of almost 1 million tons of cotton in 2001 (Baffes, 2004a) the region is now the 5th largest producer globally and the 2nd

largest exporter after the USA (Makori, 2005). Figures 3.2 and 3.3 illustrate the above facts.

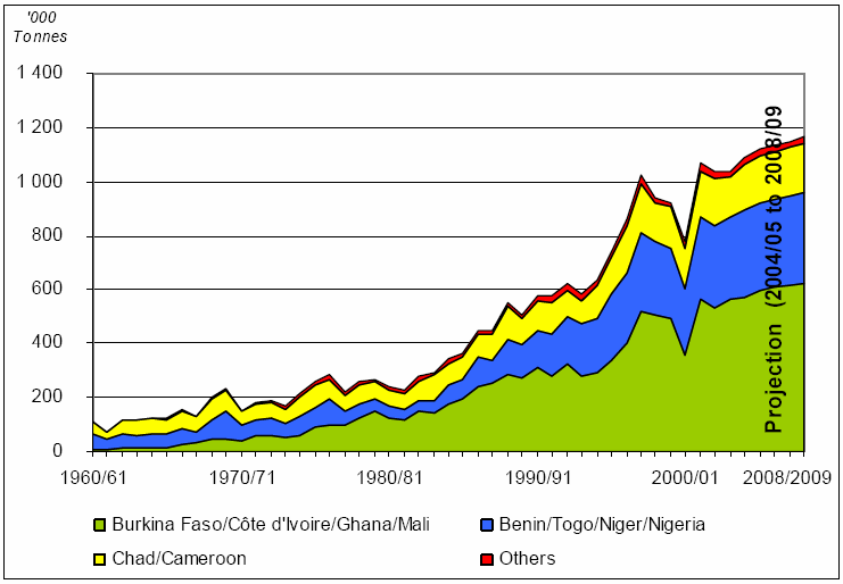
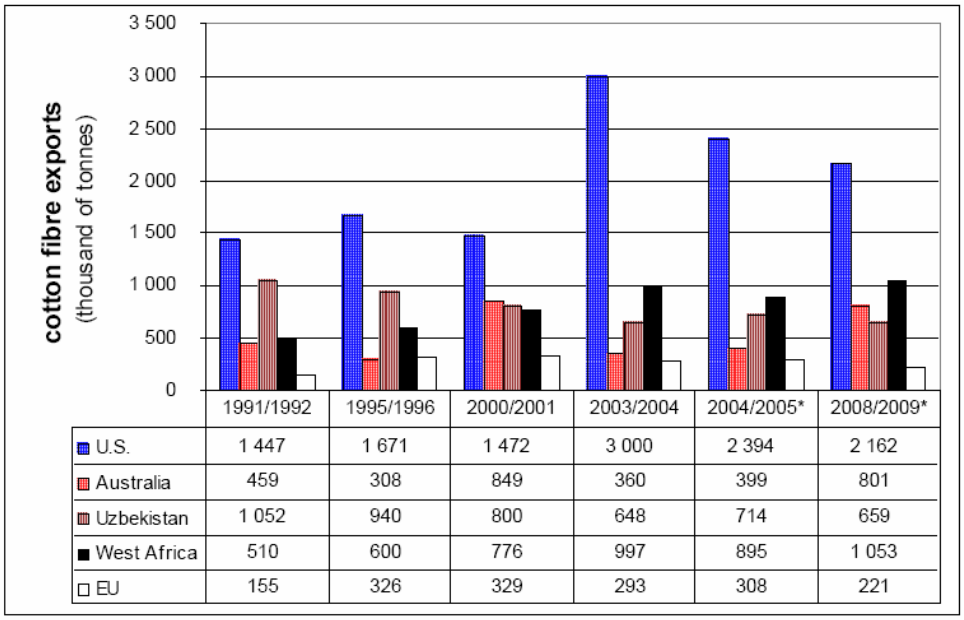


Figure 3.2: Progress of WCA cotton lint production. Source: Hussein *et al.* (2005).



	1991/1992	1995/1996	2000/2001	2003/2004	2004/2005*	2008/2009*
U.S.	1 447	1 671	1 472	3 000	2 394	2 162
Australia	459	308	849	360	399	801
Uzbekistan	1 052	940	800	648	714	659
West Africa	510	600	776	997	895	1 053
EU	155	326	329	293	308	221

Figure 3.3: WCA cotton lint exports compared with major world cotton producers. Since 2003 the WCA region has become the world's second largest cotton lint exporter. **Source:** Hussein *et al.* (2005).

The importance of cotton for both people and governments in WCA is substantial. Approximately 16 million people derive their income, either directly or indirectly, from cotton production (Hussein *et al.*, 2005). Cotton revenues account for 5%-10% of the

GDP in the Cotton Four countries and represent an even larger number in terms of export revenues, as illustrated in table 3.1.

Countries	Cotton revenues as a percentage of GDP	Cotton as percentage of total exports
Benin	8.8%	19.3%
Burkina Faso	6.9%	33.2%
Chad	5.1%	24.9%
Mali	5%	34.7%

Table 3.1: Importance of cotton in terms GDP and export revenues of the Cotton Four countries (2000). Source: Goreux (2004).

3.2.5 Conclusion

WCA has a comparative advantage in cotton production due to its low production costs. Its role in the global market is gradually becoming more important and could be further enhanced by the removal of inter-country trade constraints. This issue is linked with the ongoing debate surrounding the internal liberalisation of African cotton markets. Further discussion of this issue will take place in section 4.6, where the correlations between liberalisation on the global scale (through the removal of subsidies) and the privatisation of the cotton sectors in the WCA countries will be discussed. The following sections of Chapter 3 will simply focus on providing the main characteristics of the cotton markets of Benin, Burkina Faso, Chad and Mali.

3.3 Mali

3.3.1 Country profile

Mali is one of the three landlocked countries of the Cotton Four initiative. Approximately 65% of its land is covered by desert. Economic activity is exclusively concentrated around the Niger river area (illustrated in figure 3.4) and is heavily dependent on the primary sector, which represents 43% of GDP. The country's population exceeds 11 million with agriculture being the main income source for 73% of the Malian people (Boccanfuso and Savard, 2006; CIA, 2006).

Figure 3.4: Map of Mali. Source: CIA (2006)

3.3.2 The importance of cotton for Mali

On a global scale, Mali is the forth poorest country in the world according to the Human Development Index (HDI) classification (UNDP, 2005). In 2002 the Malian GDP was 2.5 times lower than the average African GDP. Nonetheless, Mali is the biggest cotton producer in Sub-Saharan Africa (SSA). In 2001 it ranked 13th among the world's cotton producing countries with a 3.5% share of global output (Boccanfuso and Savard, 2006). Figure 3.5 presents the data on Malian production and exports of cotton for the period between 1990 and 2005. As illustrated, lint output has gradually increased throughout the 1990s. World Health Organisation (WHO) studies have associated this trend with an improvement of national health indicators (Goreux, 2004). The sudden drop

in the production of 2000 is a result of the decision of native farmers to boycott the crop, in their effort to protest against the low prices granted by the government (Gillson *et al.*, 2004). The decreased cotton prices witnessed in the period between 1998 and 2002 had yet another important effect. They made the government aware of the need for commodity diversification. Hence, Mali tripled its gold production within that period, with the ore becoming the primary export commodity. In comparison with cotton however, gold requires much lower levels of labour, a fact that reduces its poverty alleviating properties (Oxfam, 2004).

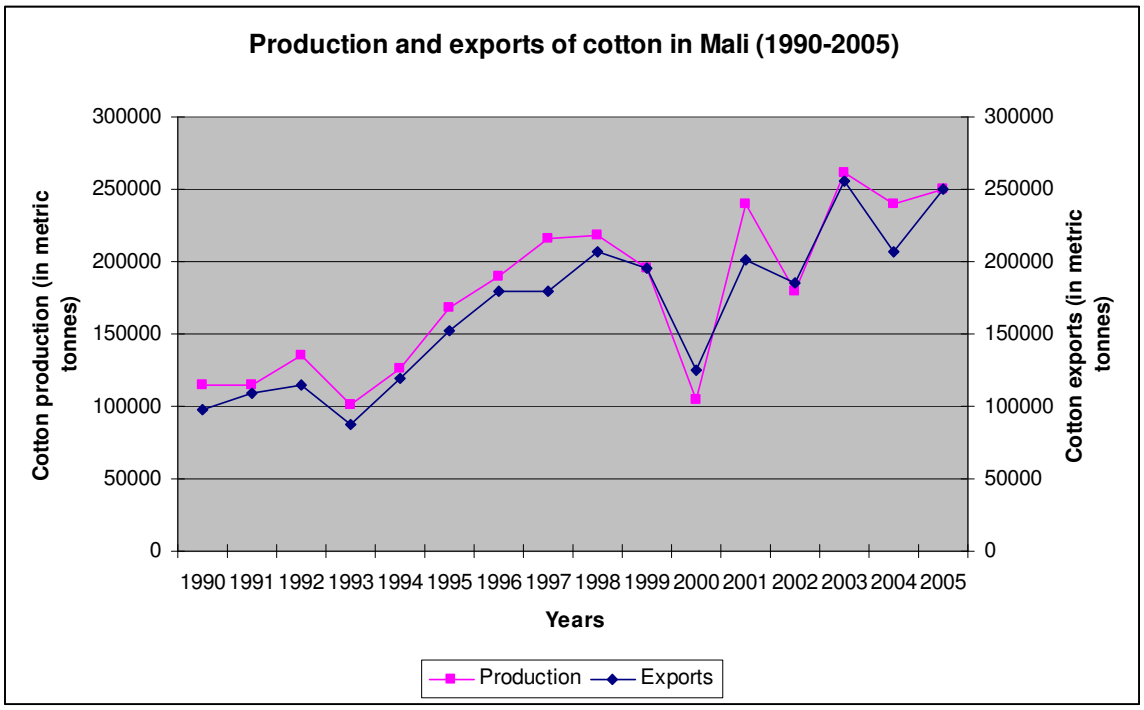


Figure 3.5: Cotton production and exports in Mali for the years 1990-2005 (in metric tonnes). Source: USDA (2005).

Cotton is a very important crop for the Malian economy. In 2000 lint fiber production represented 5% of the country's GDP, while cotton exports amounted to 59.1% and 34.7% of agricultural and total exports respectively. Furthermore, cotton plays a vital role (representing part or all of the income) in the livelihoods of 28% of the population (Boccanfuso and Savard, 2006). Figure 3.6 depicts the main cotton producing regions of Mali and the pattern according to which output volumes have changed over the years.

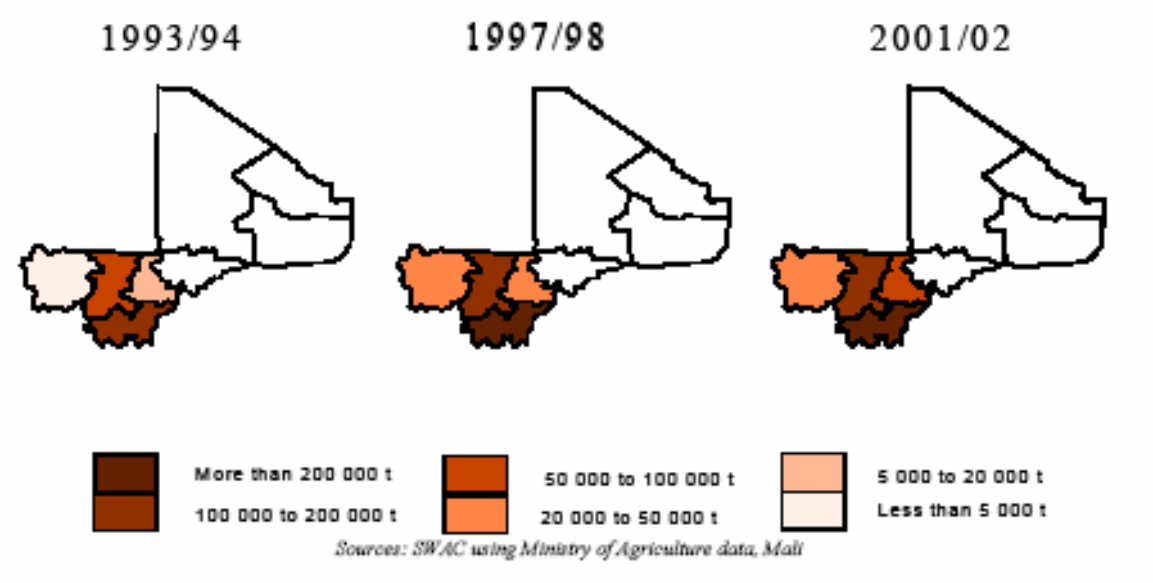


Figure 3.6: Change in cotton producing areas in Mali. Production is concentrated in the southwest regions of the country, close to the Niger river bank. Source: Hussein *et al.* (2005).

3.3.3 The nature of the cotton sector of Mali

Since the country gained it's independence from French rule, in 1960, the cotton sector has been managed by the parastatal CMDT. Its responsibilities include the provision of inputs to farmers as well as the collection and marketing of the final output. CDMT has also addressed the issue of local participation in lint production by enhancing the creation of village associations. These small scale organisations were developed with the intent to empower local people and gradually enable them to assume more control over the management of their agricultural output. However, the cotton crisis of the 1998-2002 period revealed the ineffectiveness of CMDT. The company didn't manage to create a consensus around the issue of price determination. As a result, a number of village associations boycotted cotton planting during the 2000/01 season (as mentioned in section 3.3.2). CMDT reached the edge of bankruptcy. The event generated a debate around the need for reform in the Malian cotton sector in order for similar situations to be prevented in the future. Nonetheless, the lint fiber market remains largely under state control, although several moves towards privatization are being made (Baffes, 2004a; Hussein *et al.*, 2005).

3.4 Benin

3.4.1 Country profile

Benin is a small West African country that has a population of 6.7 million. With a per capita GDP of $440 it is amongst the poorest nations of the world (World Bank, 2004). It is the only one of the Cotton Four countries that has access to the sea, a property that proves extremely beneficial for the facilitation of Benin's trade.

3.4.2 The importance of cotton for Benin

Cotton is a vital crop not just for Benin's agriculture, but for the national economy as a whole. Even though, in value terms, it ranks second behind maize, it represents 90% of agricultural exports and 60-70% of total exports (Minot and Daniels, 2005). Its importance in GDP terms reaches a level of 8% (the highest among the Cotton Four countries) and it provides the only source of income for 100,000 households (UN, 2003a).

Figure 3.7: Cotton production and exports in Benin for the years 1990-2005 (in metric tonnes). Source**:** USDA (2005)

Since the 1990s the country's cotton sector has witnessed an annual productivity growth rate of 10.7%, which by the end of the 20th century made Benin the 12th largest exporter of cotton worldwide (Minot and Daniels, 2005). Figure 3.7 presents the development of production and export levels in the cotton sector.

On a national level and taking into account all the land holdings, the average field used for cotton cultivation is approximately 0.79 hectares; a figure that rises to 2.32 hectares if cotton farmers alone are considered. Production is concentrated in the northern department of Borgou (as illustrated in figure 3.8) which accounted for 58% of total output for the 2001/02 season. The region has a lower percentage of population below the poverty line (37%) compared to other cotton growing areas of the country were poverty headcount reaches 42% (Minot and Daniels, 2005).

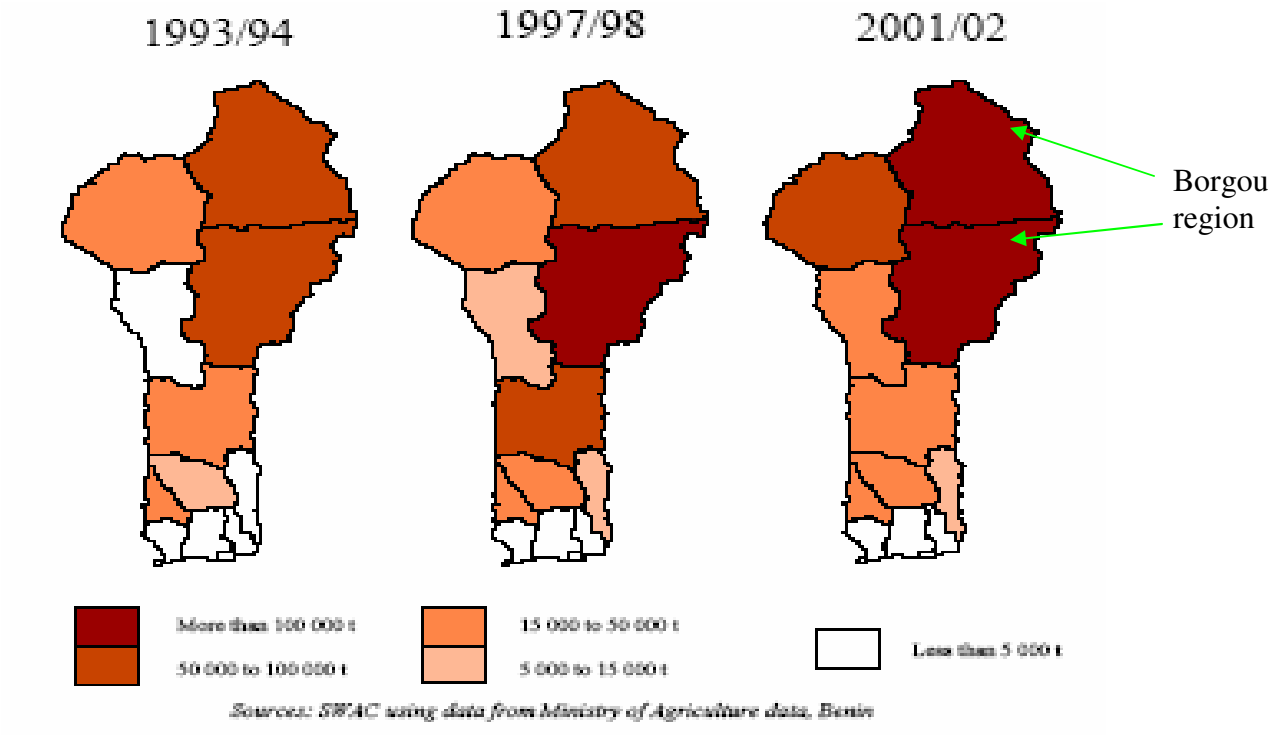


Figure 3.8: Change in cotton production areas in Benin. Source: Hussein *et al.* (2005).

In 2000 the government attempted to protect the collapse of the sector, due to low prices, by allocating $20 million to cotton farmers. However, subsidies like these can

only be granted on a temporary basis, since they go against International Monetary Fund (IMF) and World Bank regulations (Oxfam, 2004; World Bank, 2005).

The strong correlation between the prosperity of the cotton sector and the financial wellbeing of the Beninese economy is reflected in official public documents. The country achieved a 4.5% GDP growth in 2002 and was aiming for a 5.6% increase the following year. However, a series of negative developments in the lint fiber industry, such as the restrictions imposed by Nigeria in cotton trade and the unfavourable climatic conditions, made Benin miss the targets it had posed, as real GDP grew by only 3.9% (World Bank, 2005).

3.4.3 The nature of the cotton sector of Benin

SONAPRA is the country's public cotton enterprise. During the 1980s SONAPRA was responsible for processing raw cotton and dealing with the marketing of the crop, while the *Centre d'Action Régionale pour le Dévelopment Rural Bénin* (CARDER) oversaw the distribution of inputs and the development of rural infrastructure (World Bank, 1996).

Market liberalization processes were introduced in 1992 and 1995, when new entrants were allowed in input provision and the ginning sector respectively. As a result the 1990s were characterised by a substantial increase in production. However, the price reduction of 2001 brought an end to that euphoria. The government decided to involve a range of stakeholders in the sector's strategic decision making process. Despite the public participation procedures SONAPRA still retains the last word as far as price determination is concerned. Furthermore, production quotas are allocated to several ginneries, on an annual basis, in an effort to prevent cotton surpluses (Baffes, 2004a; Goreux and Macrae, 2003).

The adverse conditions in the global cotton market have generated a wide debate on the country's dependence on cotton. The need for diversification is now intensively discussed as a solution that will protect the national economy from the highly volatile and fluctuating cotton market (World Bank, 2005).

3.5 Burkina Faso

3.5.1 Country profile

Burkina Faso is the poorest amongst the Cotton Four countries (third poorest in the world) and the one with the highest dependence on cotton for its export revenues (58%) (UNDP, 2005; Elbehri and MacDonald, 2004). A landlocked nation with a population of 14 million, Burkina is one of the African countries that are severely affected by the AIDS pandemic (CIA, 2006).

3.5.2 The nature of the cotton sector of Burkina Faso

Several researchers agree that the cotton sector of Burkina has been the best managed one among the Francophone countries (Gray, 2005). Indeed, the country was one of the few WCA nations that did not have to subsidise its' producers during the 2001/02 season, when the Cotlook A Index reached record low levels (Goreux and Macrae, 2003). The main cotton production regions of Burkina are illustrated in figure 3.9.

Figure 3.9: Change in cotton production areas in Burkina Faso. Source: Hussein *et al.* (2005).

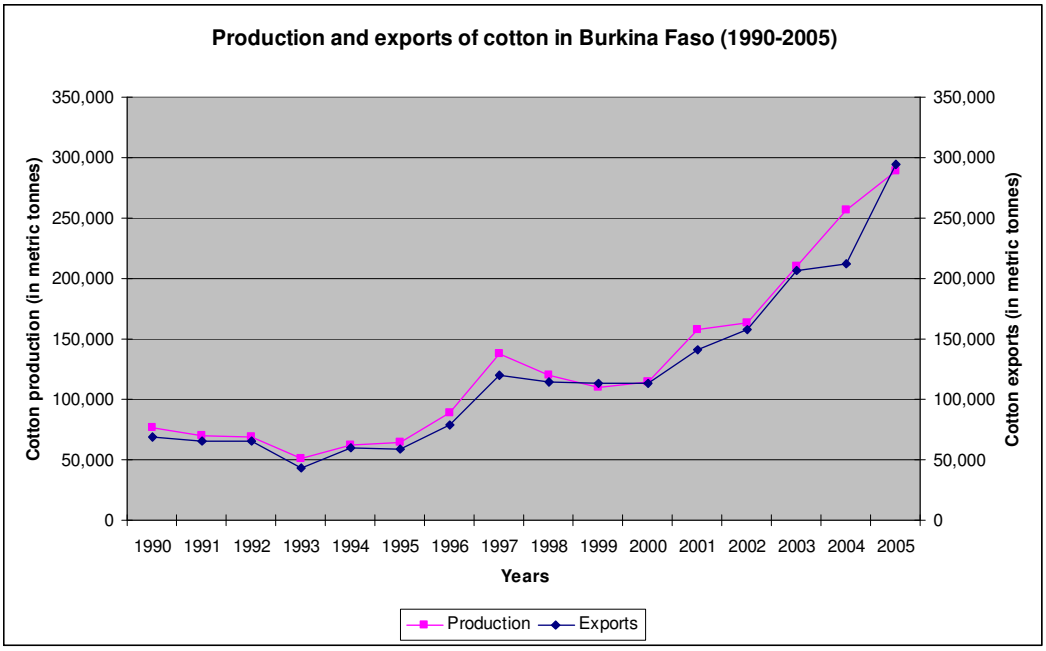


Figure 3.10: Cotton production and exports in Burkina Faso for the years 1990-2005 (in metric tonnes). Source: USDA (2005).

SOFITEX is the parastatal company in charged of the cotton sector in Burkina Faso. In 1999, the company decided to integrate a number of small scale cotton farmers into its board. As a result 30% of SOFITEX's shares were sold to producers. This participation has been one of the reasons for the company's successful performance in recent years, which is reflected in the national level data for the sector, as illustrated in figure 3.10. Since 1999, cotton production and exports have been rising substantially (Goreux and Macrae, 2003).

However, a study conducted by Gray (2005) has demonstrated a different set of results. According to the author, cotton cultivation has increased the inequality in wealth distribution. Rich farmers have better ways of coping with the risks and uncertainties associated with the fiber's production. It is often the case that poor landowners do not have access to credit or loans in order to finance inputs such as fertilizers and biocides. What is more, they are occasionally excluded from local participatory organisations that provide easier access to the resources mentioned above, while their richer peers are found to be much more active in similar networks. All of the above increase the disparities between wealthy and poor cotton growers, inevitably restraining the poverty alleviating properties of the fiber's cultivation.

3.6 Chad

3.6.1 Country profile

Chad is situated in the heart of the African continent. A landlocked country characterised by volatile political conditions, Chad has a long history of instability since its foundation in the 1960s. That is partly due to the conflicts that occasionally arise between the approximately 200 ethnic groups that inhabit the nation (CIA, 2006).

What should be noted is that little data can be found in the cotton trade literature about Chad which is why the analysis in this particular section is limited.

3.6.2 The Importance of cotton for Chad

Chad is the smallest producer of lint fiber among the Cotton Four countries (output and export data are presented in figure 3.11). Nonetheless its resilience upon the crop is substantial as it accounts for 42.1% of its agricultural exports and 24.9% of its total exports. Importance in terms of GDP rises up to 5.1% (Goreux, 2004). However, since the beginning of the 21st century cotton has lost its place as a national primary export commodity to petrol (Makori, 2005). Estimates on the value of Chad's oil reserves account to $2 billion (CIA, 2006).

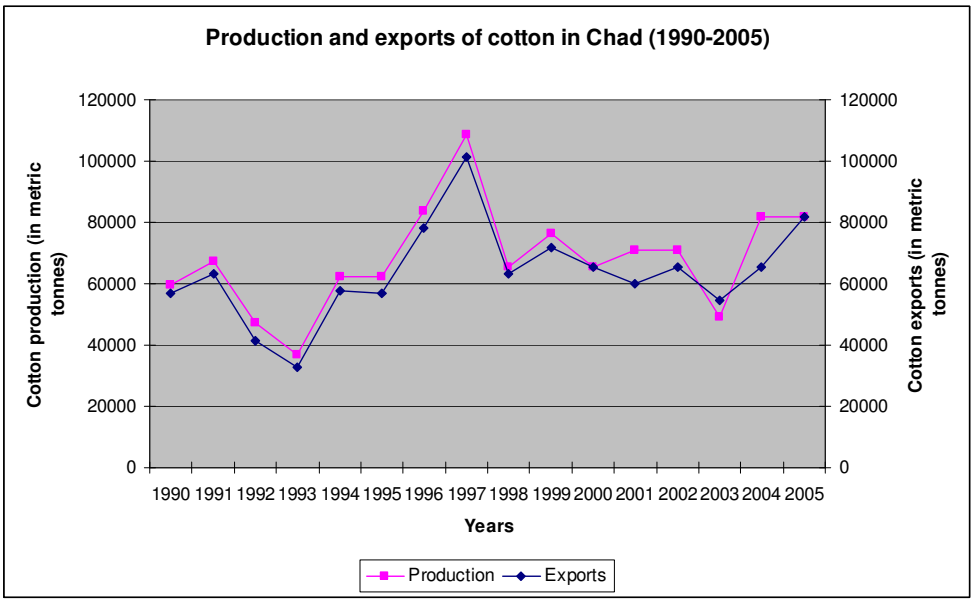


Figure 3.11: Cotton production and exports in Chad for the years 1990-2005 (in metric tonnes). Source: USDA (2005)

Lack of infrastructure, occasional droughts and geographic remoteness make Chad the least efficient producer of cotton in the WCA region. Fiber output per hectare ranges merely between 200-300 kg, while other nations such as Cote d'Ivoire, have witnessed efficiency rates of 888 kg/ha (Goreux, 2004). Even with such low production rates however, cotton still remains a vital source of income for several communities. Earnings from lint fiber trade are used for the acquisition of valuable resources on a local basis, such as water pumps, schools, stores, etc. (Hussein *et al.*, 2005).

3.7 Conclusions

Cotton production is a highly volatile market that depends largely on external factors, such as fluctuations of the Cotlook A Index that WCA nations do not control. The governments of the Cotton Four countries have seemed to realized that and put forward efforts to diversify their production in order to decrease their dependence from the crop. Furthermore, the creation of synergies is likely to reduce the inter-country trade barriers and assist the coordination of the African cotton sector as a whole. Additionally, special attention should be paid to a number of social implications related to cotton production (low school attendance rates and wealth disparities among cotton farmers in Burkina Faso). Finally, greater public participation in the decisions regarding marketing and production appears to deliver substantial benefits both on a national and a local scale.

Chapter 4: The impacts of subsidies

"*The money that those countries put into agricultural subsidies is five times what they give as development assistance. And we've always said to those rich countries, "you're hypocrites". You tell us to play the rules of the open market at the same time as you subsidise your farmers*." (Mali's Finance Minister Bassary Toure) (in Baxter, 2003)

Chapter 4: The impacts of subsidies

4.1 Introduction

The three previous chapters have provided a broad perspective of the global cotton market and the characteristics of the lint fiber sectors in developed and developing countries. The aim of this chapter is to examine whether cotton subsidies have trade distorting effects on a global and a regional scale, with particular reference to WCA.

At first, the theoretical evidence of the effects of cotton subsidies will be presented. Then, a summary of a series of econometric models will be provided, in an attempt to illustrate the main impacts that subsidies have. The most important models will be analysed in more detail and discussion will focus upon their main findings.

4.2 Theoretical evidence

Figure 4.1 presents a simplified illustration of the theoretical impact that developed country cotton support has on developing nations, using a two country one good model with the US and Benin presented purely as example countries. Within the figure, chart 2 represents the world cotton market under the assumption that developed countries subsidise their domestic markets. With a world supply curve Sw and a world demand curve Dw, the equilibrium point is M'. Global production accounts for Qw and is sold at a price Pw. Chart 1 illustrates the supply curve of the US cotton exporters. US producers would have to sell their output at a price Pw if the government didn't provide support payments. However, with subsidies, they are able to increase their production (from Q'iw to Qiw) and receive a subsidised price Pw+σi (with σi accounting for the total volume of subsidies). Chart 3 presents the supply curve of Benin, a developing nation that can not afford to subsidise its producers. Therefore, the latter have no alternative but to sell quantity Qkw at the world price Pw.

At this point, the assumption that subsidies are removed on a global level is introduced. In that case the world supply curve will shift to the left (S'w). Under the new equilibrium point (M'') production will be reduced to Q'w and price will reach P'w. This will be the price at which producers throughout the world will have to sell their output.

For US farmers (Chart 1) the new equilibrium will mean decreasing revenues,

since they will produce less cotton (Q''iw) and sell it at a lower price (P'w). With subsidies their total income would equal (Pw+σi) * (Qiw), whereas after the elimination of government payments they receive only (P'w) * (Q''iw). Hence, they experience a welfare reduction, illustrated in Chart 1 by the red shaded area.

On the other hand, Beninese farmers (Chart 3) will witness a substantial income increase. The new world price P'w will allow them to expand their output to quantity Q''kw. Prior to subsidy removal they earned (Pw) * (Qkw), whereas with the new equilibrium point they receive (P'w) * (Q'kw). Contrary to US producers, they experience a welfare increase, represented in Chart 3 by the blue shaded area.

Therefore, subsidies are trade distorting since they keep world prices higher than normal. Their removal, on a global scale, will benefit producers in non-subsidising countries, while it will lead to a decrease in production and revenues for developed nations such as the US. Another important point is that the impact of subsidy elimination on the overall level of welfare will depend upon a number of factors including whether countries are net exporters or importers of cotton. Net-importers will have to pay more for the lint fiber they buy as the world price will have risen. However, since cotton producing nations in the developing world export the majority of the cotton they produce (in the case of the Cotton Four countries exports amount to 90% of annual production) (Goreux, 2004) subsidy elimination is likely to have a positive welfare impact for them.

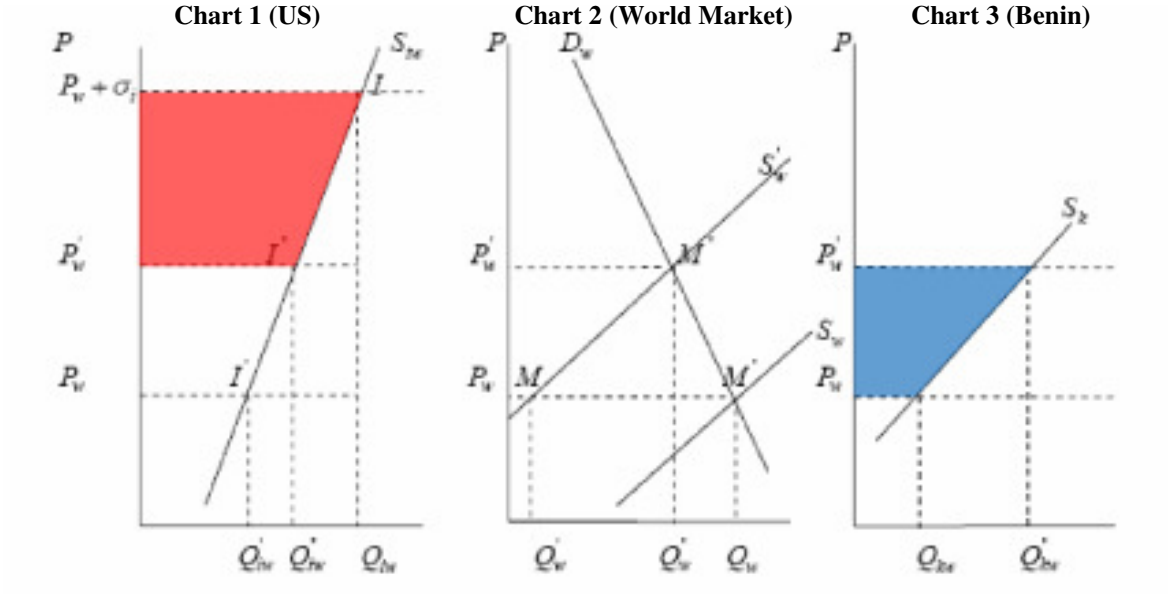


Figure 4.1: The world cotton market equilibrium. Source: Gillson *et al.* (2004)

4.3 Estimating the effects of subsidy removal

4.3.1. Introduction

This section will first provide a summary of the main econometric models that estimate the changes in the world market potentially brought about by the elimination of cotton subsidies. The most important models will then be analysed in more detail. Finally, the discussion will focus on the differences and conclusions that can be drawn from the surveys.

4.3.2 Summary of econometric models

Table 4.1 presents a summary of the main econometric models that were constructed in an attempt to calculate the impacts of subsidy elimination to the global cotton market. Each model examines different parameters based on a variety of assumptions and methodologies. The main goal, common in most of the econometric studies, is to estimate the effects from the removal of subsidies on three parameters:

1) Production volumes in the three main cotton subsidising nations (US, EU and China),
2) World price (Cotlook A Index)
3) Production volumes and forgone net export earnings for the African nations (some models refer to the Cotton Four countries specifically).

Despite the variety in the quantitative results, most models arrive at the same overall conclusions, according to which subsidy elimination in the global cotton market will mean:

1) Reduced production volumes for the main cotton subsidising nations
2) Increase in the world price
3) Increased export earnings and poverty alleviation for WCA nations.

However, substantial differences exist between their findings. There are a number of reasons that cause these variations:

1) *Differences in levels and structure of support*: While data on the Cotlook A Index and production volumes are accurate and reliable, this is not the case for the amount of subsidies that authors use in their simulations. It is often difficult to make the distinction

		Results (all figures represent percentages of change)					Net export earnings forgone due to subsidies	Increase in earnings as % of world total	Effects on poverty
Models	**Methodology-Assumptions**	**world price**	**African exports**	**US production**	**Chinese production**	**EU production**			
FAPRI (2002)	Data for 2001-2011	12.7%	12.6%	-6.7%		-70.5%			
Pan *et al.* (2005)	Data for 2006-2011	10.79%	3.57% (WCA)	-3.71%					
Tokarick (2003)	Partial equilibrium model. Se=1.5, De= -0.75	2.8%							
Poonyth *et al.* (2004)	Data for 1996-2000. Se=0.1, De= -0.1	3.1%	4.1% (cotton 4)	-14.2%		-31.7%			
ICAC (2003)	Short run/partial equilibrium analysis. Se= 0.47, De= -0.05	30% and 70% for 2000/01 and 2001/02 respectively							
Sumner (2003a)	Partial equilibrium model focused specifically on the US (1999-2003). Se=0.361, De= -0.2	12.6%		-28.7%					
Goreux (2004)	Data for 1997-2002. Se= 0.15 to 0.9, De= -0.05 to -0.6	12%		-9.3%	-8.5%	-30%	$US 110.4 million annually (cotton 4)		
Gillson *et al.* (2004)	De= -0.1, Se=0-0.6	18%-28%		From -1.5% to -15.2%	From -2.6% to -7.1%	From -8.5% to -28.2%		From 8.3% to 11.2% (for WCA)	
Boccanfuso and Savard (2006)	Mali country specific model. 50% price increase of cotton assumed								2.27% decrease in poverty

Continues in following page

		Results (all figures represent percentages of change)							
Models	**Methodology-Assumptions**	**world price**	**African exports**	**US production**	**Chinese production**	**EU production**	**Net export earnings forgone due to subsidies**	**Increase in earnings as % of world total**	**Effects on poverty**
Minot and Daniels (2005)	Benin country specific model. 40% price reduction of cotton assumed for the period 2001/02								8% increase in rural poverty
Oxfam (2004)	Estimated loss of income for Sub-Saharan Africa (SSA) countries due to US subsidies.						$US 305 million (SSA 2001/02)		

Table 4.1: A summary of the results of different econometric models that estimate the impact of subsidy removal. Se=Supply elasticity, De=Demand elasticity **Source:** Pan *et al.* (2005), Baffes (2004a), Poonyth *et al.* (2004), Tokarick (2003), Gillson *et al.* (2004), Goreux (2004), Sumner (2003a), Boccanfuso and Savard (2006), Minot and Daniels (2005),Oxfam (2004)

between a government payment that affects world prices and one that has no distorting impacts in cotton trade. The final judgment can be made only by the WTO. However, there is a substantial time-lag in the decisions of the organisation, since panel rulings can take 2 or 3 years to become finalized. Furthermore, there is an ongoing debate on the issue of "decoupled" payments (see section 2 of Appendix). Even though they are not included within the WTO Amber box, several observers argue on their trade distorting properties (Goreux, 2004). What is more, (Baffes, 2004a) addresses the ambiguity concerning Chinese policies. Some authors assume that the country supports its cotton sector, while others do not include China amongst the main subsidisers. For all of the above reasons, different models calculate different levels of subsidies and hence produce a variety of results.

2) *Differences in supply and demand elasticities*: Those two parameters are important because they determine the flexibility that producers have in order to respond to price fluctuations. A supply elasticity of 10% means that if the Cotlook A Index increases by US $ 1 then farmers will produce 10% more cotton. On the other hand, if the demand elasticity is -10%, the same change in price will make buyers willing to purchase 10% less cotton.

Demand for cotton is relatively inelastic. In other words, buyers are not so sensitive to price changes and would continue to buy cotton, even if the Cotlook A Index rose substantially. This fact is attributed to the following reasons:

- Most cotton uses have few good substitutes.
- For most textile manufacturers and spinners, fiber combinations in their final product can not be changed easily.
- The cost of raw cotton compared to the total cost of the final product is very low.
- For the above reason, an increased raw cotton price will result only in a subtle price change of the final product. Consumers are usually indifferent to such minor changes (Sumner, 2003a).

Cotton's demand elasticity can be calculated through data provided by the ICAC. However, the estimation of the supply elasticity in each country poses certain difficulties. Goreux (2004) argues that only the elasticities for the US cotton sector are reliable. Data

for the rest of the world and especially for African countries are either unreliable or unavailable, hence supply elasticities can only be estimated through the use of different scenarios.

3) *Differences in methodologies and assumptions*: Several surveys assume different levels of market liberalization. They often include other agricultural commodities apart from cotton among their parameters and use various baseline years in order to estimate the effects of subsidy removal (Baffes, 2004a). These variations are therefore the cause of differentiations among survey results.

In an attempt to produce a simple average of all the econometric models mentioned in this chapter, Baffes (2004a) estimates that the elimination of all kinds of support would increase world cotton prices by 10% and result in a $150 million annual increase in export earnings for the Francophone African countries.

4.4 Detailed analysis of specific models

The models analysed in this section were chosen based on the importance they have had in the cotton trade negotiations. The first is the model constructed by D.A. Sumner. It focuses exclusively on the US market and was used by the Brazilian delegation in its appeal to the WTO. The second model by L. Goreux was utilized by the Cotton Four countries in their proposal for a liberalised cotton market. Its importance lies in the fact that it measures the financial losses that the African nations suffered, as a result of government support in the lint fiber sector. The survey conducted by the Overseas Development Institute (ODI), the third model analysed in the section, is one that incorporates the assumptions and findings of Goreux but goes a step further by calculating how the welfare effects from a removal of support payments is distributed amongst the non-subsidising nations. The last model by Boccanfuso and Savard, is the first of its kind to examine the impact of market liberalization on a country level. The analysis is focused exclusively on Mali, with the intention of assessing the effects of subsidy elimination to the country's poverty levels.

4.4.1 The model of D.A. Sumner

The first econometric model to be analytical described is that by Daniel A. Sumner (2003a). Its importance lies on the fact that it was the model used by Brazil to provide evidence for its case against the US in the WTO dispute panel body (Sumner, 2003b).

4.4.1.1 Aims of the model

In his study, Sumner investigates the impact of subsidy removal in the US cotton market. He examines six different types of government payments and calculates the impact each program's removal will have on a number of parameters including US cotton production, exports and the Cotlook A Index.

4.4.1.2 Methodology-Assumptions

Based on a partial equilibrium analysis, the author uses data from the marketing years 1999-2001 and tries to estimate the changes in the different parameters for the years 2002-2007. Specific attention is paid to the calculation of demand and supply elasticities.

Sumner argues that every cotton producing region of the US has a different supply elasticity. However, he provides a national weighted average of 0.361 (for the year 2000). This means that for a 10% decline in cotton price, US production would decline by 3.61%. As far as demand elasticity is concerned, he states that the figure for the US is -0.2. This implies that with a 10% price increase, the demand of the processing mills for raw cotton would decline by 2%.

4.4.1.3 Results

Tables 4.2-4.4 present the main findings of the model. There are 7 simulation scenarios; one for the removal of each subsidy program (six in total) and one for the elimination of all government payments.

Changes in Production (%)	**Marketing Year**				
Categories of subsidies	99-00	00-01	01-02	02-03	**Average**
All programs	-26.6%	-29.15%	-11.61%	-47.29%	**-28.7%**
PFCPs/DP	-1.18%	-0.55%	-1.07%	-0.7%	**-0.875%**
MLA/CCP	-0.99%	-1.26%	-2.08%	-1.05%	**-1.3%**
Crop insurance	-3.37%	-1.76%	-3.34%	-3.01%	**-2.9%**
LDP	-15.6%	-15.49%	-1.02%	-36.21%	**-17.1%**
STEP-2	-5.64%	-10.08%	-3.09%	-3.67%	**-5.6%**
Export Credit	-2.53%	-1.72%	-1.85%	-1.32%	**-1.8%**

Table 4.2: Simulated responses of US cotton production to the removal of US subsidies. The six subsidy programs examined are the following: 1) production flexibility contract payments (PFCPs) and direct payments (DP), 2) market loss assistance payments (MLA) and counter-cyclical payments (CCP), 3) crop insurance subsidies, 4) Step-2 payments, 5) loan deficiency payments (LDP) which are part of the marketing loan benefits and 6) export credit guarantee subsidies (ECG) (further explanation of the above subsidies, is provided in section 1 of the Appendix).. **Source:** Sumner (2003a).

Changes in Exports (%)	**Marketing Year**				
Categories of subsidies	99-00	00-01	01-02	02-03	**Average**
All programs	-41.66%	-46.93%	-27.94%	-48.16%	**-41.2%**
PFCPs/DP	-1.23%	-1.14%	-1.34%	-1.08%	**-1.2%**
MLA/CCP	-1.03%	-1.77%	-2.42%	-1.78%	**-1.7%**
Crop insurance	-3.48%	-3.41%	-4.13%	-3.93%	**-3.7%**
LDP	-15.95%	-22.98%	-10.08%	-29.67%	**-19.7%**
STEP-2	-15.87%	-13.62%	-7.78%	-5.62%	**-10.7%**
Export Credit	-4.71%	-4.63%	-3.16%	-2.82%	**-3.8%**

Table 4.3: Simulated responses of US cotton exports to the removal of US subsidies. **Source:** Sumner (2003a).

Changes in Price (%)	**Marketing Year**				
Categories of subsidies	99-00	00-01	01-02	02-03	**Average**
All programs	10.78%	13.99%	7.74%	17.7%	**12.6%**
PFCPs/DP	0.31%	0.31%	0.5%	0.38%	**0.4%**
MLA/CCP	0.26%	0.5%	0.92%	0.63%	**0.6%**
Crop insurance	0.9%	0.95%	1.57%	1.40%	**1.2%**
LDP	4.16%	6.64%	1.93%	10.27%	**5.8%**
STEP-2	3.9%	3.95%	2.29%	2%	**3%**
Export Credit	1.07%	1.35%	1.03%	1.02%	**1.1%**

Table 4.4: Simulated response of world price (Cotlook A Index) to the removal of US subsidies.
Source: Sumner (2003a).

As seen in the above tables a complete elimination of all the US cotton subsidies will result in a 12.6% rise in the world price of the fiber, a 28.7% and 41.2% decline in US production and cotton exports respectively. As far as the individual subsidy programs are concerned, one could argue that LDP and Step-2 payments are the most influential amongst the six. In all three categories (production, exports and world prices) they rank first and second respectively, in terms of their effect on the parameters under examination. Furthermore, PFCPs/DP and MLA/CCP are the least distorting subsidy programs as they appear to have only minor influences on the US cotton market.

4.4.2 The model of Goreux

The econometric model of Goreux is the one most frequently referenced. It was used by the Cotton Four countries as supporting material for their proposal to the WTO in 2003 (further details provided in section 5.3). Furthermore, it was the first to prove, based on scientific data, that African nations experience a welfare reduction by the subsidies that developed countries provide to their farmers.

4.4.2.1 Aims of the model

The aim of the model was twofold:

1) Measure the financial losses in the cotton sectors of African countries, brought about by government payments that the US, EU and China provided to their domestic markets,

2) investigate the possibility and plausibility of a compensation system (Goreux, 2004).

4.4.2.2 Methodology-Assumptions

Goreux states that precise calculations for demand and supply elasticities can be made only for the US market. Limited knowledge for relevant figures in other countries would not allow for accurate simulation scenarios. To overcome this obstacle the author conducted a series of calculations which led to the creation of 18 different combinations of supply and demand elasticities. Each of the two variables was given five different prices within the following range: a) demand elasticity: -0.05 to -0.6, b) supply elasticity: 0.15 to 0.9. The main scenario that Goreux uses is the one according to which demand and supply elasticities are -0.1 and 0.5 respectively.

Furthermore, he measures the effects of subsidy removal in the cotton production of US, China, Greece, Spain and a number of WCA countries, as well as the effects that this elimination will have to the global cotton price. He then goes on to estimate the export earnings forgone by a number of WCA states during the period of 1997/98 to 2001/02.

4.4.2.3 Results

The main results of Goreux's study are depicted in tables 4.5 to 4.7. All calculations were made with the assumption of a demand and supply elasticity of -0.1 and 0.5 respectively.

Production	**Marketing Years**					
Countries	97/98	98/99	99/00	00/01	01/02	**Average**
Global level	-0.7%	-1.2%	-1.4%	-1.1%	-1.2%	**-1.1**%
USA	-0.9%	-9.5%	-16.2%	-6.7%	-12.9%	**-9.3**%
China	-8.2%	-12.1%	-8.2%	-9.1%	-4.6%	**-8.5**%
Greece	-30.4%	-31.8%	-27.2%	-25.8%	-31.4%	**-29.3**%
Spain	-29.3%	-33%	-29.1%	-33.4%	-36.6%	**-32.3**%
WCA	3.7%	6.2%	7.3%	5.5%	6.5%	**5.8**%

Table 4.5: Effects of eliminating subsidies on production. WCA countries include: Benin, Cote d'Ivoire, Burkina Faso, Cameroon, Chad, Togo, Central African Republic, Senegal, Niger, Nigeria, Guinea, and Ghana. **Source:** Goreux (2004).

	Marketing Years					
Price increase	97/98	98/99	99/00	00/01	01/02	**Average**
In US cents/pound	5.47	7.54	8.01	6.39	5.72	**6.6**
In % of Cotlook A Index	7.6%	12.8%	15.2%	11.2%	13.3%	**12**%

Table 4.6: Effects of eliminating subsidies on World Price (Cotlook A Index). Source: Goreux (2004).

Net Export earnings foregone by Cotton four countries (in $US millions)						
	Marketing Years					
Countries	97/98	98/99	99/00	00/01	01/02	**Average**
Mali	36.7	50.9	49.3	20.3	41.6	**39.7**
Benin	25.2	28.8	38	28	29.8	**30**
Burkina Faso	23.6	27.9	27.3	23.1	27.4	**25.8**
Chad	17.3	15	18.5	11.5	11.8	**14.8**
Total	102.8	122.6	133.1	82.9	110.6	**110.4**

Table 4.7: Net export earnings forgone by Cotton Four Countries (Mali, Benin, Burkina Faso, Chad) in millions of US$, due to subsidies. **Source:** Goreux (2004).

According to the results provided by Goreux, Greece and Spain are the two countries affected the most in terms of production decline (-29.3% and -32.3% on average respectively for the period 1997-2002) by a potential subsidy removal. USA and China would also be affected but to a less severe level (-9.3% and -8.5% respectively). African countries would experience a rise in production of 5.8% while total world cotton output would decline be 1.1%. As far as prices are concerned, the author estimates that the Cotlook A Index would rise by 12% (6.6 cents/pound) if subsidies were to be eliminated.

As depicted in table 4.7 Mali is the country affected the most (in terms of foregone export earnings) by government support in cotton production (average annual losses of $US 39.7 million), with Benin ($US 30 million), Burkina Faso ($US 25.8 million) and Chad ($US 14.8 million) following. All Cotton Four countries lost an average of $US 110.4 million annually for the period between 1997 and 2002.

4.4.2.4 The issue of compensation

In the final part of his survey, Goreux discusses the issue of compensation; whether or not African nations should accept monetary funds by the cotton subsidising nations in return for the losses they experience in terms of foregone export earnings. He

argues against such an option, as he believes that if developed countries were to compensate African nations for the subsidies they provide, then government payments would be rendered acceptable. WCA nations would be in danger of becoming "addicted" to compensation funds. What is more, such payments would not result in decreased production for the developed world, but would just add a budgetary burden that countries like the US can afford. Finally he suggests that only a temporary compensation program with a strict and short-term deadline could be considered sustainable.

4.4.3 The ODI model

In this study conducted by the ODI and funded by the UK Department for International Development (DFID), Gillson *et al.* (2004) attempt to take cotton related econometric models a step further. They introduce a range of new assumptions that deliver unique findings, the most important of them being a new approach to the effects of EU subsidies on WCA nations.

4.4.3.1 Aim of the model

What distinguishes the ODI model from other similar surveys is that it goes beyond simply trying to measure the effects of subsidy removal to parameters such as world price and production. The authors have attempted to calculate the way that these effects will be distributed amongst producer countries in terms of increased export earnings and assess which cotton producing nations have the most to gain from a liberalised market.

4.4.3.2 Methodology-Assumptions

Drawing from the assumptions made by Goreux (2004), the authors of the ODI model estimate a demand elasticity of -0.1. However, in terms of supply their assumptions are quite distinctive. First of all, they argue that WCA countries have supply elasticities that can reach 0.6, while most other models assume elasticities of 0.5. Furthermore, they introduce a unique assumption according to which several cotton producing countries in Central Asia (such as Turkmenistan, Uzbekistan and Tajikistan) as well as Australia have a zero (0) supply elasticity. This is due to the major water

constraints these countries face, which prevent them from increasing their production (further discussion of the issue in section 6.2.4).

The ODI model also touches on the issue of **market fragmentation**. Most econometric models assume a single and unitary market for cotton. This means that spinners change suppliers regularly based only on who provides the cheaper price (ID21, 2005). A key element that this assumption takes for granted is that different categories/qualities of cotton have homogenous characteristics. However, Gillson *et al.* argue that differences in lint properties can be observed even between two cotton suppliers that produce the same quality of lint (for example an African and a Chinese supplier). Therefore, and due to several technological constraints, spinners can not afford to change the blend of cotton they use as an input to their factories. Once they have found a supplier that suits them, they stick with him. For that reason the global cotton market, according to the ODI model, is characterised by a level of fragmentation or "stickiness".

The authors created 4 different simulation scenarios that combine all the elements discussed above. These are:

1) Single market with uniform elasticity (S/U): This scenario is the one closest to most econometric models. It assumes a unitary cotton market with a supply and demand elasticity of 0.5 and -0.1 respectively for all producer countries.
2) Fragmented market with uniform elasticity (F/U): According to this scenario, spinners are unlikely to move between different suppliers. Elasticities are the same as in the S/U scenario.
3) Single market with differentiated elasticities (S/D): Here the assumptions for the differences in supply elasticities, discussed above, are introduced. Table 4.8 presents the elasticities assigned to the various countries used in the model.
4) Fragmented market with differentiated elasticities (F/D): This simulation incorporates the same market fragmentation assumptions as the F/U scenario and the elasticities presented in table 4.8.

4.4.3.3 Results

The main findings of the model are presented in tables 4.9 through to 4.12. Table 4.9 attempts a comparison with the results of Goreux (2004). As one can observe the S/U

model of Gillson *et al.* is the one closest to the results of Goreux, since the same supply and demand elasticities are used. In terms of changes in the Cotlook A Index, the ODI model provides a set of results that range between an increase of 18% and 28% with the highest result given by the F/D scenario.

Differentiated supply elasticities		
Australia: 0	Burkina Faso: 0.6	Egypt: 0.35
Tajikistan: 0	Cote d'Ivoire: 0.6	Sudan: 0.35
Turkmenistan: 0	Mali: 0.6	Rest of the World: 0.5
Uzbekistan: 0	Togo: 0.6	
	Uganda: 0.6	
	Zimbabwe: 0.6	
	Brazil: 0.6	
	Cameroon: 0.6	
	Tanzania: 0.6	

Table 4.8: Supply elasticities under the differentiated set of scenarios. Source: Gillson *et al.* (2004).

However, the same scenario estimates that world production will remain static. The reason for this result could be that the reductions in cotton output by the four main subsidisers (US, China, Greece and Spain) are offset by the increased production of the African nations that due to their higher supply elasticity (0.6) can respond more effectively to the escalating need for lint fiber.

Changes in world price and production after the removal of subsidies					
	Goreux (2004)	**Sim S/U**	**Sim F/U**	**Sim S/D**	**Sim F/D**
Cotton Price	*15.2%*	18%	20%	22%	28%
World production	*-1.4%*	-1.6%	-1.7%	-0.6%	-0%
US production	*-16.2%*	-15.2%	-8.3%	-13.6%	-1.5%
Chinese production	*-8%*	-7.1%	-2.6%	-5.3%	-2.6%
Greek production	*-27%*	-26.3%	-20%	-24.9%	-9%
Spanish production	*-29%*	-28.2%	-19.2%	-26.8%	-8.5%

Table 4.9: Comparison of results between Goreux (2004) and Gillson *et al.* (2004). Source: Gillson *et al.* (2004).

Table 4.10 presents the calculations concerning the change in production for the Cotton Four countries as well as a number of other cotton producers (Australia, Brazil, India, Turkey and Pakistan). Since these results are not directly comparable, Gillson *et al.* provide another set of calculations (illustrated in table 4.11) that rank those countries,

based on the increased earnings that they achieve by the elimination of subsidies. In other words, table 4.11 demonstrates how the welfare effects from the removal of government support are distributed amongst the various non-subsidising cotton producers. Based on the findings of table 4.10 one could argue that production increases are similar for all Cotton Four countries under all four simulations, with Burkina Faso having a slight advantage. In the results of table 4.11 Australia, Turkey and India appear to gain the most out of the removal of subsidies, while the WCA nations also increase their earnings to a lesser extent (a maximum of 11.2% under the F/D scenario).

Percentage of change in cotton production after the elimination of subsidies				
	Simulation scenarios			
Countries	**S/U**	**F/D**	**S/U**	**F/D**
Benin	9%	4%	11%	6%
Burkina Faso	9%	5%	**13%**	**8%**
Chad	9%	4%	11%	6%
Mali	9%	2%	13%	2%
Australia	9%	**7%**	0%	0%
Brazil	9%	1%	**13%**	1%
India	9%	2%	11%	2%
Turkey	9%	6%	11%	7%
Pakistan	9%	1%	11%	1%

Table 4.10: Production changes after the elimination of subsidies. The percentages highlighted in bold, identify the country that has the highest production increase in each simulation. **Source:** Gillson *et al.* (2004).

Increase in cotton earning as a percentage of world total				
	Simulation scenarios			
Countries	**S/U**	**F/D**	**S/U**	**F/D**
Australia	8.4%	**20.8%**	7.7%	14.3%
Brazil	8.7%	3%	9%	4.2%
India	**19.9%**	12.4%	**20.2%**	12.5%
Turkey	9%	18.1%	9.1%	**19.1%**
Pakistan	18.3%	5.4%	18.5%	5.7%
WCA	8.3%	9.2%	8.5%	11.2%

Table 4.11: Share of world increase in cotton production earnings after the elimination of subsidies. The percentages highlighted in bold, identify the country that has the highest income increase in each simulation. **Source:** Gillson *et al.* (2004).

Table 4.12 contains the most interesting results of the ODI model. It focuses specifically on WCA countries and examines the individual as well as the cumulative effects of the elimination of subsidies by the US, EU and China. Although the US are once again identified as the main market distorter, since they are the cause for more than 50% of foregone earnings by the African nations, the key point is the role of the EU. In most econometric models, the two European nations, Greece and Spain, appear to have a minimal distorting role in the world market and developing nations in particular. Gillson *et al.* argue that this is because most models assume a unitary market. However, once this assumption is relaxed and a hypothesis of a fragmented market is introduced, the effects of EU subsidies on WCA rise substantially (40% under the F/D simulation, compared to 8% on both unitary market scenarios). The exact opposite happens for China. Under the single market scenarios China's effect on WCA cotton producers ranges between 33% and 36%. However, the fragmentation simulations reduce that effect to 1%.

Gillson *et al.* attempt to explain those differences with the following argument. The majority of China's imports (almost 90%) come form the USA and Australia. Therefore, the removal of Chinese subsidies will only benefit those two countries in a fragmented market, since spinners will continue doing business with the same suppliers, rather than look for cheaper fiber. Hence African cotton farmers will not be able to enter the Chinese market. The EU countries, on the other hand, compete with the WCA nations for the same markets. That is why if cotton trade is fragmented and European subsidies are removed, spinners will have to increase their purchases from Africa, since EU production will have decreased.

Percentage of total loss in earnings of WCA producers that cotton subsidies in each of				
Simulations	**All subsidies**	**US subsidies**	**EU subsidies**	**Chinese subsidies**
S/U	100%	46%	8%	36%
F/U	100%	59%	38%	1%
S/D	100%	43%	8%	33%
F/D	100%	56%	40%	1%

Table 4.12: Percent for which the three developed countries are responsible for income foregone by WCA countries. Source: Gillson *et al.* (2004).

The key points drawn from the above table are the following:

1) EU subsidies might be low in absolute terms compared to those provided by the US and China. However, their effects on WCA farmers are disproportionately higher than most econometric models might assume.
2) The ability of African nations to benefit from the elimination of subsidies, lays not only on their ability to increase production (which depends largely on their supply elasticity), but also on whether or not they have access to third markets.

4.4.4 A country specific model: Case study of Mali

Boccanfuso and Savard (2006) constructed the first country specific computational general equilibrium model (CGE). They studied the effects of a liberalized global cotton market on poverty alleviation in Mali. Their aim was to examine the distribution of the effects of subsidy removal within different segments of the population. The most important simulations of the model are the following:

1) Sim 1: all agricultural subsidies are removed followed by a 50% increase in prices.
2) Sim 2: a 50% rise in the price of cotton is assumed.

Both simulations account for an increase in household income and GDP, with the later being minimal. However, wages and total investment are among the variables that experience a considerable reduction as presented in table 4.13.

Variables	**Reference**	**Sim 1 (Δ%)**	**Sim 2 (Δ%)**
Household Income	149.55	1.15	1.08
Wage	1.00	-5.41	-4.89
Total investment	46.17	-16.33	-14.59
GDP	181.94	0.06	0.05

Table 4.13: Macro results of simulations from the Boccanfuso and Savard model. **Source:** Boccanfuso and Savard (2006)

The authors also carried out a poverty analysis using two variations of the Foster, Greer and Thorbecke (FGT) poverty index.

1) *Poverty incidence variation* (FGT-0): It is a simple poverty headcount index, presenting the percentage of the population whose daily consumption is below the poverty line.

2) *Poverty depth variation* (FGT-1): Otherwise referred to as the poverty gap index, it is calculated using the following formula:

P-I/P, where P=poverty line and I= individual daily consumption.

The poverty gap can reveal how poor the people within a survey group are. The greater the value of the index, the deeper the poverty in a specific area. If the daily consumption of an individual is equal to the poverty line then his poverty gap index is zero. On the other hand the poverty gap of an absolutely poor (one that makes no daily expenditures what so ever) is equal to one (Benson *et al.* 2002).

As shown in table 4.14, market liberalization in the agricultural and cotton sector contributes to poverty reduction in both FGT variations.

Index	Reference	Sim 1 (% of change)	Sim 2 (% of change)
FGT-0	0.64	-2.27	-2.13
FGT-1	0.29	-6.06	-5.44

Table 4.14: FGT variations at the national level. The reference column illustrates that 64% of the population of Mali are below the poverty line. Market liberalization can pull 2.27% of the poor above the poverty line, while it reduces the poverty gap by 6.06%. **Source:** Boccanfuso and Savard (2006).

A more detailed breakdown of the poverty analysis was also conducted using two different group sets. The first set categorized the population according to levels of education and the second set used a rural versus urban criterion. Tables 4.15 and 4.16 present the relevant findings.

Group	Definition	Reference	Sim 1 (Δ%)	Sim 2 (Δ%)
1	**No education**	0.7	-2.2	-2.06
2	**Primary**	0.38	-5.49	-5.49
3	**Secondary**	0.2	0	0
4	**University**	0.04	3.57	3.57
5	**Profes/technical**	0.12	1.79	1.79
6	**Urban**	0.31	3.3	3.3
7	**Rural**	0.77	-3.2	-3.04

Table 4.15: FGT-0 poverty incidence variations. The reference column provides the current poverty headcount for the two group sets. According to the first group set (groups 1-5) the less educated an individual in Mali, the more chances it has to be amongst the poorest segment of the population. Furthermore, the rural areas have a higher percentage of poor population (77%) compared to urban centers, where 3 out of 10 people living in cities are below the poverty line. **Source:** Boccanfuso and Savard (2006).

The main trend revealed in table 4.15 is that market liberalization and subsidy removal benefits the non educated poor rather than the wealthier and better educated

segment of the population. Furthermore, the people living in rural areas (which have higher poverty indices compared to urban population), experience income increases and a subsequent poverty reduction.

Both simulation scenarios provide almost identical results. Market liberalization and subsidy removal reduces the poverty headcount of groups 1 and 2 (primary education and non-education), while it has the opposite results for groups 4 and 5 (higher education). The same pattern can be identified in the second group set. Elimination of subsidies puts more of the richer urban population segment below the poverty line, while it reduces the number of poor within the rural segment by 3.2%

Group number	Definition	Reference	Sim 1 (Δ%)	Sim 2 (Δ%)
1	**No education**	0.32	-6.23	-5.59
2	**Primary**	0.12	-2.4	-2.28
3	**Secondary**	0.08	1.76	1.67
4	**University**	0.01	6.78	6.22
5	**Profes/technical**	0.03	4.38	4.02
6	**Urban**	0.09	2.74	2.43
7	**Rural**	0.37	-6.96	-6.25

Table 4.16: FGT-1 poverty depth variations. The reference column illustrates that the better educated segment of the population (groups 3,4 and 5), that is below the poverty line, is less poor, when compared to the people that have received only primary or no education at all (groups 1 and 2). Similarly, poverty is deeper and more severe for the rural than the urban population.. **Source:** Boccanfuso and Savard (2006).

Table 4.16 also reveals that market liberalization benefits the less educated-rural Malians as it reduces their poverty gap. On the contrary, better educated people and urban population, experience a deterioration of their poverty gap.

In the final part of their study, Boccanfuso and Savard address the topic of welfare implications from subsidy removal, with reference to the model of MacDonald *et al.* (2003). The later is a multi-country CGE analysis regarding the region of SSA. Its results demonstrate only a slight welfare increase derived from market liberalization, for the whole region. However, Boccanfuso and Savard argue that such aggregate models can often provide misleading results. That is because countries within the same region have different trade policies. Mauritania, for example, is a net importer of agricultural commodities. Therefore, the removal of subsidies and the consequent price increase will mean greater import expenditures and welfare reduction for that particular country. On the other hand, a net exporter of goods, as is the case of Mali, will greatly benefit from

the elimination of government support in developed countries. Hence, the authors suggest that a country-by-country analysis is an essential approach when one attempts to estimate agricultural policy implications to welfare changes.

4.4.5 The Oxfam report

The Non-Governmental Organisation (NGO) conducted a very influential study of the effects of US subsidies to African cotton producers. The report was widely publicised and made people aware of the problems that the global cotton market faced. One of the most important findings of the survey was the one that highlighted the inefficiency of US development aid due to cotton subsidies.

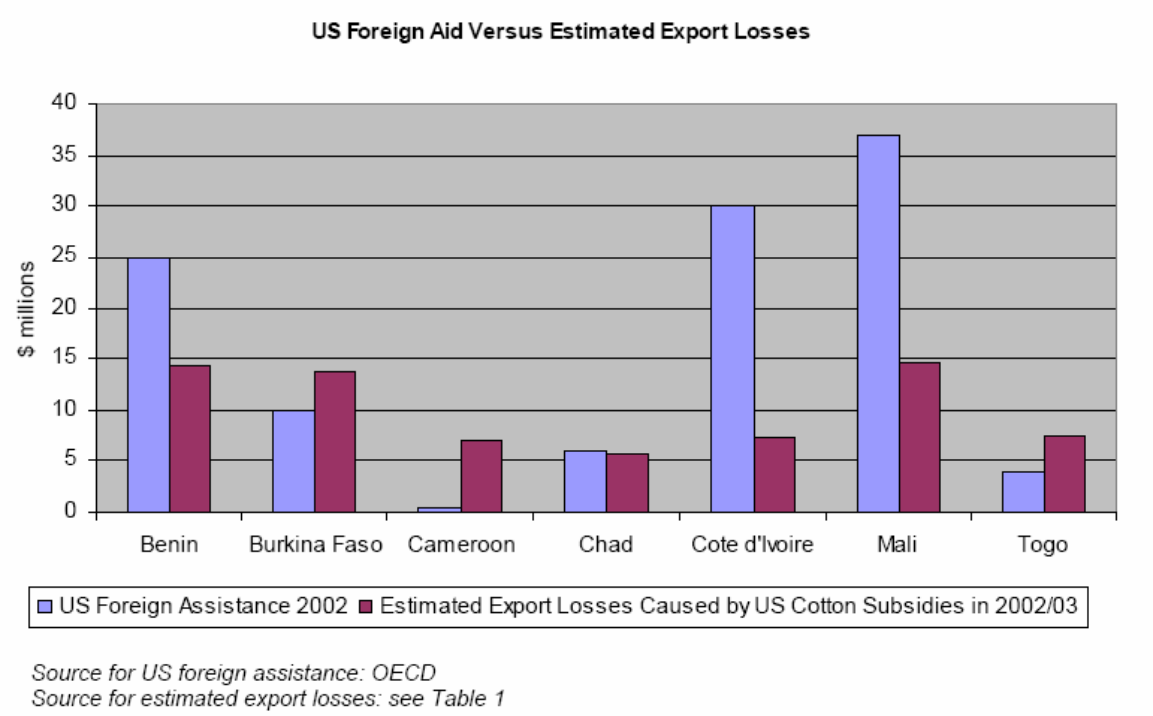


Figure 4.2: Correlation between US development aid and estimated export losses due to US government support to cotton producers. Source: Oxfam (2004).

Figure 4.2 presents a series of comparisons between the funds directed to developing African nations in the form of US foreign assistance and the income that those nations lose as a result of US support payments to cotton producers. As illustrated there are certain cases where export loses are surpassing the recipient's development aid (as is the case for Burkina Faso, Cameroon and Togo), rendering the latter completely

useless (Oxfam, 2004). UN (2003a) provides relevant data concerning 2001, when the deficit between US foreign aid and estimated export losses caused by US cotton subsidies was $5.3 million for Mali and approximately $16 million for Benin.

4.5 Discussion

After reviewing all of the evidence provided in this chapter so far, one could argue that cotton subsidies are truly trade distorting. African nations have a lot to gain from their elimination. Market liberalization on a global scale appears to be the most sustainable solution. It is one that has the potential to reduce poverty among the poorest segments of a country's population, judging from the evidence presented in the model of Boccanfuso and Savard (2006). None the less, even if market liberalization in the cotton sector is finally achieved, developing countries will not be able to benefit unless they have the ability to increase their production and enter markets from which they have so far been excluded. Evidence regarding that argument was presented in the model of Gillson *et al.* (2004). The authors argued that spinners are likely to stick with the supplier that provides the more stable cotton quality and guarantees on-time deliveries.

A number of constraints in African infrastructure (such as inadequate roads and means of transportation) and lack of access to marine trade by many landlocked countries of the continent, inhibit the on-time exports of ginned cotton (also discussed in chapter 3). Furthermore, evidence provided in section 3.2.2 demonstrated that spinners have in some cases questioned the quality of African cotton, which, due to its hand-picked process, can be contaminated by foreign matter. WCA countries should therefore be assisted and funded by developmental and multilateral organisations in order to improve their infrastructure and guarantee standardised quality in their product.

What is more, not all subsidies carry the same trade distorting effects. In his analysis, Sumner (2003a) provides evidence for the above argument by calculating that Step-2 payments and LDPs are the ones that mainly suppress world cotton prices. African countries as well as trade negotiating organisations such as the WTO should pay specific attention to that finding. They should focus their efforts on the elimination of those categories of subsidies that have the most distorting impacts on cotton trade.

Additionally, African nations should seek compensation for losses they have already sustained. The study of Goreux (2004), that provides a detailed account of the export earnings foregone by the Cotton Four countries, has been already presented to the WTO. Nonetheless, a long-term monetary compensation scheme should not be a negotiating priority for WCA countries, since it does not lead to production decrease in subsidising nations and it could become an argument for the preservation of government payments.

Another main priority should be the minimization or even the elimination of cotton production in the EU. According to the majority of the econometric surveys European countries receive the highest per capita subsidies in the world. Additionally, evidence provided in section 2.3.4 suggested that cotton subsidies in Greece (the largest EU cotton producer) do not result in a Pareto optimum solution as they reduce the welfare of Greek taxpayers. Hence, from an economic point of view EU production is completely unsustainable. Furthermore, Greek and Spanish cotton farmers compete for the same markets with African producers. Minimisation of EU production would therefore benefit both European consumers, but also African cotton producers. Negative effects to European cotton farmers from the implementation of the above proposal could be mitigated by appropriate government policy measures, such as cultivation of alternative crop varieties.

Finally, as mentioned in sections 4.2 and 4.4.4 market liberalisation and elimination of subsidies will only benefit countries that are net exporters of cotton. Therefore, further research should address the issue of potential welfare reduction in developing nations that are net importers of cotton and identify appropriate mitigating measures.

4.6 Internal liberalisation

The previous sections have provided evidence to support the liberalisation of the global cotton market and the removal of subsidies. However, the issue of the internal liberalisation of African cotton markets is not as clear. The literature, in terms of studies that estimate potential gains from the privatisation of the WCA parastatals, is limited.

The most relevant survey is the one conducted by Makdissi and Wodon (2004). The aim of the authors was to access the effects of implementing a free market system in the lint fiber industry of Benin. Liberalisation would be mainly achieved through the privatisation of the currently monopolised production system, as described in chapter 3. The new system would mean that farmers would have to negotiate private contracts with ginneries, individually and on an annual basis, rather than selling their output for guaranteed prices to SONAPRA, the Beninese public cotton company. Assuming that the government would have no intervention and could not compensate farmers in the event of a crop failure during a particular season, cotton producers would be fully exposed to potential price shocks in the world market. Taking into account the high level of risk aversion among most African farmers and the increased volatility of the Cotlook A Index, Makdissi and Wodon (2004) suggested that such a system would lead to negative impacts for producers.

Important lessons could also be drawn from the experience in East and Southern African countries. The cotton sectors of the above regions are privatised and open to competition with several companies each trying to secure its own raw cotton input from the local farmers. Bingen (2004) argues that this system has lead to lower production volumes and yields, compared to the vertically integrated system of WCA. According to the author this is because the companies have little incentive to invest in research and development (R&D), since in such a competitive market the extra R&D cost would be unbearable.

This is not to suggest however, that public monopolies are a panacea. They too have many disadvantages, which were presented in chapter 3. However, for a market with the characteristics of the WCA cotton sector (fragmented production, producers with limited financial power, lack of basic infrastructure and limited access to information and technology) the parastatal-centred system is perhaps the most appropriate since it

provides the support that impoverished farmers need. Reforms that incorporate elements of a liberalised market could be beneficial but only to a certain extent. Additionally, as long as government support in other cotton producing countries (such as US, EU and China) is in place, it would be unfair for the international community to expect the WCA nations to unilaterally liberalise their cotton sectors.

4.7 Conclusions

The theoretical as well as econometric evidence provided in this chapter has lead to the conclusion that subsidies provided by the US, EU and China are trade distorting, since they reduce the export income that WCA countries could receive from cotton trade. Hence, those policies inhibit welfare increase in the African countries that could greatly benefit from higher prices in a liberalised cotton market. EU production was judged as particularly harmful for WCA producers. At the same time the implementation of a totally privatised market system would not prove beneficial for the African region. However, there is a lot of room for changes especially in the fields of better transportation infrastructure and establishing standardisation of WCA cotton quality. Under these circumstances one can expect an improvement in the region's cotton trading potential; an improvement with serious poverty alleviating effects.

Chapter 5: The role of the WTO

"The world keeps making it sound like we are growing filthy rich out of these programmes. In that case why do I see farmers going broke? All we are doing is trying to equalise ourselves with the world. Their cost of production (that of African producers) is lower than mine." (cotton farmer in Bula, USA) (in Meek, 2003)

Chapter 5: The role of the WTO

5.1 Introduction

The WTO is an international organisation whose aim is to establish and sustain a "*smooth, predictable and free global trade"* (WTO, 2005g). It was created in 1995 following the completion of the nine year long trade negotiations of the Uruguay Round (1986-1994). The commitments made during that period on the issue of subsidy removal in the textile industry (as incorporated in the ATC) where not successfully implemented. However, the currently ongoing Doha Development Round (DDR) has delivered new momentum to the textile trade negotiations. On the issue of cotton, the old Uruguay Round rivals, US and EU, have joined forces in order to confront a group of developing countries, led by Brazil, who are demanding a freer and more equitable global cotton market (Sumner, 2006; Goreux, 2004).

The purpose of this chapter is to analyse the role of the WTO within the framework of the negotiations regarding cotton trade. The case of Brazil versus the USA and the Cotton Initiative are examined, since they represent the most important steps in the reform process of the lint fiber market.

The fact that the WTO has the right to enforce sanctions on its members grants the organisation the power to effectively pursue and implement policy changes. The following pages will address the issue of whether this power has been used efficiently and explore future challenges to be tackled.

5.2 USA vs. Brazil

5.2.1 Introduction

Brazil was the first country to challenge the policies implemented by the US government on the cotton sector. On September 27, 2002 the Brazilian delegation in the WTO presented the country's case against US cotton subsidies. The South American country argued that the US was violating the Peace Clause through the payments with which it supported its farmers (Oxfam, 2004).

The Peace Clause was an agreement formed during the Uruguay Round. It was a painful compromise for many countries of the developing world in their effort to find common ground with US and EU delegates and achieve a minimum of consensus in a number of agricultural issues (IATP, 2003). According to the Peace Clause, countries could continue providing subsidies as long as they remained at or below 1992 levels (ODI, 2004). These subsidies could not be challenged until the end of 2003, when the Peace Clause expired (WTO, 2002a).

5.2.2 The arguments of Brazil

Brazil argued that the US had violated the Peace Clause by disbursing a far larger amount of domestic support to its cotton farmers in the period between 1999 and 2002 (Baffes, 2004a). In 1992 the US cotton growers received $1.62 billion in the form of government payments, while in 1999 and 2001 the relevant figure was $2.3 billion and $2.06 billion respectively (The Economist, 2004a). Brazil based its case largely on the findings of the econometric model of A. Sumner (analysed in section 4.4.1), according to which US cotton exports were 41% higher because of domestic support, which resulted in a 12.6% decline in world prices. As a result, Brazilian cotton farmers experienced a loss of approximately $600 million in export earnings (Baffes, 2004a).

5.2.3 The case of the USA

The US tried to prove that direct payments, which along with step 2 payments and export credit guarantee (ECG) were included in Brazil's case, were decoupled payments and consequently did not have trade distorting effects. Their disbursement was based on historical volumes of production and thus did not provide an incentive for farmers to plant more cotton. Therefore, and since those kinds of subsidies do not result in overproduction, they should not be associated with price decline (The Economist, 2004a).

5.2.4 The decision

The final ruling of the WTO dispute settlement panel, on April 26 2004, was in favour of Brazil. The panel found that even though direct payments were based on historical levels of production they could not be considered decoupled, as they limited the

list of crops that farmers could choose from and they had as a prerequisite that land was still used for production. Step 2 payments and ECG were also found to be violating WTO rules and were considered export subsidies (Oxfam, 2004).

5.2.5 The appeal

The US government filled an appeal against the panel's ruling on March 3rd 2005. The new decision, released a few weeks later, called the US to comply with the original verdict and remove its trade distorting support until July 1st 2005, or negotiate an agreement that would satisfy Brazil. On July 5th 2005, the US Secretary of Agriculture submitted a proposal to the Congress with the aim of aligning US policy with the WTO directives. One of the key elements of the proposal was the elimination of Step 2 payments (Schnepf, 2005). Earlier this year, in February 6 2006, the US House of Representatives voted for the elimination of Step 2 payments, as of August 1st 2006 (Oxfam, 2006).

5.2.6 Conclusion

One could argue that because of the above outcome, the USA-Brazil dispute could be considered a very important point in the wider agricultural negotiations agenda. It was the first time that such a legally binding decision was imposed on the world's most powerful economy. The US exercised its right to appeal the WTO panel ruling in an attempt to fully exploit the cumbersome bureaucratic procedures until implementing any policy changes. However, it did ultimately comply, if only partially, to the organisation's directives by eliminating the Step 2 payments. Therefore the WTO decision had a real effect on the US agricultural policy. Furthermore, the fact that Brazil used one of the econometric models that measure the distorting effects of government support to justify its case galvanizes the importance of such studies, making scientists more accountable for their findings (Baffes, 2004a).

5.3 The Cotton Initiative

5.3.1 Introduction

On May 16th 2003 four African countries, Benin, Burkina Faso, Chad and Mali submitted to the Director General of the WTO a set of suggestions on the issue of cotton. Their proposal, entitled: "Poverty reduction, Sectoral Initiative in Favour of Cotton" (WTO, 2003b), urged the international community to take specific steps towards the liberalization of the cotton market in the upcoming Ministerial Conference of Cancun, in September 2003. The proposal called for two main issues to be addressed:

1) **Subsidies**: All trade distorting government payments (as identified by the WTO agricultural boxes) should be gradually phased out and eventually eliminated.
2) **Transitional measures**: Until the above goal was reached, developing country producers should be compensated financially for the damage they sustained by the policies of the subsidy providing nations (ODI, 2004).

The proposal, also referred to as the Cotton Initiative (OECD, 2004), was officially presented to the Trade Negotiations Committee on the 10th of June 2003 by the president of Burkina Faso, Blaise Compaore (WTO, 2004). The four African countries based their case on the fact that cotton is a crop of vital economic importance to the WCA nations, accounting for up to 80% of their export earnings (ICTSD, 2003). Furthermore, they argued that they suffered a total economic loss of $1 billion in 2002, due to developed country cotton subsidy programmes (Baffes, 2004a).

5.3.2 The aftermath of the proposal

The proposal gathered the support of a number of nations including Canada, Australia and the EU. The US, on the other hand, argued that there were a number of reasons other than subsidies that distort international cotton trade and refused to cooperate (WTO, 2003a). As consensus on the issue could not be reached, the meeting in Cancun ended without the goals of the Cotton Initiative having been accomplished (Baffes, 2004a).

5.3.3 The formulation of the Cotton Sub-Committee

Although the immediate effects of the proposal were not successful, a few months later the Cotton Initiative generated a rather important outcome. On November 19th 2004 the member governments of the WTO formed the Cotton Sub-Committee as a response to the 2003 proposal of the four African nations and also within the framework of the August 1st 2004 decision (often referred to as the "July Package"). The aim of the Sub-Committee was to tackle the issues surrounding cotton "ambitiously, expeditiously and specifically", within the framework of the "**three pillars of market access, domestic support and export competition**" identified in the 2001 Doha Declaration (WTO, 2004). Several African nations welcomed the formulation of the Sub-Committee urging all members to allow farmers of the world's poorest continent to "live from the products of their own hands" (WTO, 2005a).

In April 2005 a group of 41 African countries came forth with a new proposal that took the Cotton Initiative a step further. The African Group asked for improved market access and elimination of domestic and export subsidies by the 21st of September 2005 and the 1st of July 2005 respectively (WTO, 2005b). However, WTO members were rather reluctant to support such rigid deadlines. By the time of the next Sub-Committee's session (that of June 2005) no member had submitted a written response to the above proposal (WTO, 2005c). Hence, African nations realized that a change of strategy was needed. During he 8th Sub-Committee session (in November 2005) the four countries of the Cotton Initiative, submitted a new proposal, with the hope that it would be incorporated in the final declaration of the upcoming Hong-Kong Ministerial Conference. The proposal remained strict on the issue of export subsidies, calling for a complete elimination by the end of 2005, but was less rigid on how WTO members should tackle domestic subsidies. The Cotton Four countries called for a gradual process of elimination that would continue until the end of 2008 (80% of government support dismantled by the end of 2006, 20% divided between 2007 and 2008) (WTO, 2005e). Furthermore, the ultimate goal of the African nations was to detach progress in the cotton sector from the rest of the agricultural negotiations. In contrast, countries such as the US that hold great interests in the preservation of the current status quo, want to see cotton sector reforms as

a part of a wider decision concerning agriculture as a whole (WTO, 2005d). That was one of the greatest difficulties that stalled negotiations.

5.3.4 The 6th Ministerial Conference

The final outcome of the Hong-Kong Ministerial in December 2005 was a rather ambiguous one as far as the issue of cotton is concerned. Although WTO members agreed to eliminate all forms of export subsidies within 2006, there was no consensus on a relevant deadline for domestic government support. Members simply reaffirmed their commitment to ambitiously reduce domestic subsidies "over a shorter period of time than generally applicable" (WTO, 2005f). The Declaration also had general statements about enhancing South-South cooperation and technology transfer as well as continuation of development aid by donors on the cotton sector.

With an official agreement in place for the elimination of all export subsidies within 2006, the main challenge for WTO members will be to establish an appropriate monitoring mechanism that will ensure progress towards that goal (WTO, 2006a). What is more the Cotton Four countries decided to tackle domestic subsidies more ambitiously, since the 6th WTO ministerial meeting did not set a time-bounding deadline on the issue. On March 2006 they submitted a new proposal that aims at reducing domestic cotton subsidies on a much larger and faster scale compared to other agricultural commodities. They proposed a formula to ensure that eradication of domestic subsidies for cotton will proceed faster and deeper compared to subsidy cuts of other agricultural products. The equation of the formula is given in table 5.1 (WTO, 2006b).

The formula
If
Rg = the Aggregate Measure of Support (AMS) cut for agriculture in general, and
Rc = the AMS cut for cotton
Then
$\mathbf{Rc} = \mathbf{Rg} + [(100 - \mathbf{Rg}) \times 100] / 3 \times \mathbf{Rg}$

Table 5.1: Formula for the elimination of domestic cotton subsidies. According to the equation the smaller the amount of Rg the greater the amount of Rc. The formula is therefore a means of ensuring that domestic cotton subsidies will be eliminated regardless of the progress in the eradication of AMS cuts for agriculture in general. **Source**: WTO (2006b).

5.3.5 Conclusion

This latest proposal by the Cotton Four countries has been gradually gaining support among the Sub-Committee members. With the exception of the US, that wants to see any decision concerning cotton to be taken as part of an overall ruling that will incorporate all agricultural sectors, most members (EU, Brazil, China and others) have expressed favourable views on the issue (WTO, 2006d; WTO 2006e). Cotton Four countries, in an effort to address the reluctant position of the US towards their proposal, have argued that the Hong-Kong Declaration called for cotton to be treated with priority compared to the progress of negotiations in general agricultural issues. On the basis of that argument, their proposed formula should be accepted and implemented (IDEAS, 2006).

5.4 Conclusion

The two case studies analysed above illustrate the fact that the WTO has largely contributed to the liberalization of the cotton sector. Of course a lot remains to be done. As mentioned above the elimination of domestic subsidies is the most difficult issue that remains unsolved. However, as argued by Cross (2006) the WTO is perhaps one of the most democratic multilateral organisations. To that extent, its role is extremely important in the agricultural negotiations and can deliver successful steps towards further reform.

Chapter 6: Implications for sustainable development

"*American and European taxpayers are financing the destruction of livelihoods of millions of cotton farmers in Africa*"
Celine Charveriat, head of Oxfam's advocacy office in Geneva. (in BBC Africa, 2003)

Chapter 6: Implications for sustainable development

6.1 Introduction

This chapter will focus on the environmental and sustainability implications of cotton production. The main effort will be to examine whether the poverty alleviating properties of the fiber's cultivation, analysed in previous chapters, come with or without environmental sideffects. The impacts on water ecosystems, soil health and the effects of pesticide use will be examined with specific references to the situation in WCA nations. Consecutively, the analysis will evolve around the use of GM cotton and the potential benefits from the adoption of the crop by African countries. The final part of the chapter discusses the issues dealing with organic cotton as an environmental friendly alternative to conventional varieties.

6.2 Water use

6.2.1 Introduction

Agriculture is by far the largest consumer of water worldwide. Approximately 69% of total freshwater withdrawal is used for irrigation of cultivated land. Cotton is one of the three crops (along with rice and wheat) that take up 58% of the total irrigated areas on a global level. Data for cotton alone reveal that 73% of world lint output comes from irrigated rather than rain-fed fields (Soth *et al.*, 1999). Taking into account that one kilogram of cotton lint requires 29,000 litters of water in order to be produced, one can understand that the water footprint of the fiber's production is extremely intense (Campbell, 2003).

6.2.2 The world market for water

What is more, the market for water is characterised by a great amount of distortion. Because farmers in many countries do not pay the full price of the water they consume, irrigation represents one the hidden subsidies in agriculture. In the US alone the cost of that subsidy amounts to about $3.5 billion, while on a global scale it reaches $20-25 billion (Lomborg, 2001). Since farmers do not pay the full cost of water they often

tend to be irresponsible in the amounts they use. Taking into consideration that cotton is one of the most water demanding crops, this behaviour is likely to lead to increased pressure on freshwater ecosystems from continuous lint cultivation.

6.2.3 Water use for cotton production

There is an important distinction in the way cotton is grown. Cultivations can be either rain-fed or irrigated. According to Soth *et al.* (1999) there is a substantial yield difference between those two growing methods (854 kg/ha for irrigated and 391 kg/ha for rain-fed cotton). However, the main problem of irrigation methods is inefficiency. Almost 60% of the ground water that is diverted to cotton plantations through canals is lost either through evaporation or poor water management. A solution to that problem would be the application of drip irrigation which can increase water efficiency. However, in 1999, less than 1% of all irrigated fields globally were watered by this method (Soth *et al.*, 1999).

6.2.4 Water footprint of cotton production in different countries

Ideally, cotton should only be grown in regions with rich water resources and high levels of annual rainfall. In an attempt to determine which countries have a more sustainable production in terms of water use, Chapagain *et al.* (2006) conducted a survey to assess the water footprint of cotton cultivation on a global scale. Their results are summarised in table 6.1.

As illustrated cotton production in dry regions such as the Mediterranean (Greece, Turkey and Egypt) and Central Asia (Turkmenistan and Uzbekistan) is highly unsustainable in terms of water resources, since 100% of the cotton fields in these countries are irrigated. Groundwater, a rather non-renewable resource, is a major input in the cultivating process of the above states. The problem is intensified by the fact that most of these nations already face water scarcity issues.

On the other hand, cotton cultivation appears to be more sustainable in countries such as Mali, India, US and China, as their farmers rely more on rainwater than on irrigation. Brazil is the country that exercises the least pressure on its freshwater resources, as cotton cultivation is almost entirely rain-fed.

		Virtual water content (m3/ton of cotton)		
Country	**Irrigated share of cotton fields**	**Groundwater**	**Rainwater**	**Total**
Australia	90%	1408	870	2278
Brazil	15%	46	2575	2621
China	75%	760	1258	2018
Egypt	100%	4231	0	4231
Greece	100%	1808	530	2338
India	33%	2150	6512	8662
Mali	25%	1468	3750	5218
Turkey	100%	2812	288	3100
Turkmenistan	100%	5602	407	6010
USA	52%	576	1673	2249
Uzbekistan	100%	4377	83	4460
Average	-	1818	1827	3644

Table 6.1: Water consumption for cotton cultivation in the largest producing countries. **Source**: Compiled by the author, using data from Chapagain *et al.* (2006).

6.2.5 Conclusion

Therefore, one could argue that the situation in the cotton sector is far from being ideal. From a water use perspective, countries such as Greece and Egypt should reduce their cotton production, whereas others (like Brazil and Mali) have the potential of being the most sustainable suppliers of lint fiber.

6.3 Soil health

6.3.1 Introduction

Soil health is, along with rainfall, one of the most important resources of agriculture (Moseley, 2004). Several studies have been conducted in the cotton regions of WCA countries, in order to investigate the impacts of lint fiber production on the quality of land.

6.3.2 Negative impacts of new cotton cultivation methods to soil health

Throughout the last decades of the 20th century, the agricultural methods used in cotton cultivation of WCA have moved away from traditional practices. In an effort to increase export earnings from cotton trade, the parastatal companies of WCA countries have promoted a series of practices that have had questionable environmental impacts. The use of animal plowing and inorganic fertilisers has allowed for more land, in some cases marginal, to be put under cotton cultivation. Fallowing periods have been reduced as a means of increasing cotton growing seasons. All these methods have raised production volumes. However, the increase has been the result of cultivated land expansion and not of higher yields. That kind of intensification has resulted in increased soil acidity and depletion of soil organic matter. Nevertheless, many WCA governments disregard those results, arguing that economic development is a higher priority than environmental sustainability (Bingen, 2004; Gray, 2005, Moseley, 2005).

6.3.3 Cotton production and deforestation

Unlike coffee and tobacco, the other two important African crops, cotton only grows where sunlight is abundant and has extremely low tolerance to shade. As a result, farmers have to cut down trees in order both to sustain and expand their production. Benin losses approximately 100,000 hectares of forests annually, particularly, close to cotton growing regions (Brottem, 2005). What is more Gray (2005) argues that trees act as an obstacle to the use of machinery and animals, hence felling is a very popular activity among cotton farmers.

6.3.4 Studies showing positive effects of cotton production to soil health

On the other hand, several studies have shown different results. Adger *et al.* (2001) challenge the populist discourse by arguing that cotton production in Mali has not had soil depleting impacts. The authors provide evidence that animal use gives farmers the chance to apply manure on the fields instead of inorganic fertilisers. Furthermore, they argue that cotton production isn't necessarily adopted as a monoculture. It is often the case that maize, millet or sorghum is planted within a crop rotating scheme that replenishes soil nutrients. Hussein *et al.* (2005), argue that this method has been beneficial in terms of soil fertility in Burkina Faso, while Makori (2005) suggests that it has enhanced food security in cotton growing regions.

The most recent study of the Malian cotton zone brings forth further evidence to support the conclusions of Adger *et al.* (2001). Benjaminsen *et al.* (2006) examined 441 soil samples from 25 different villages of south Mali. Their findings are summarised in table 6.2.

Land use type	pH	Phosphorous (ppm)	Potassium (ppm)	Magnesium (ppm)	Nitrogen (%)	Carbon (%)
Continuous cultivation	6.4	31.4	28	23.2	36.8	39.4
5 year old fallows	6.1	14.6	10.1	4.5	13.3	43.2
8-10 year old fallows	5.9	11.8	7.1	6.2	13.2	47
15-20 year old fallows	6	10.9	7.1	7.3	11.1	45.9
Woodland	6	10.2	7.6	8	10.9	71.1
Sacred groves	6.5	4.8	3.8	11.9	11.1	78.2

Table 6.2: Means and percentages of soils variables at the most intensively cultivated cotton zone of Mali. Source: Benjaminsen *et al.* (2006)

The analysis shows that most soil nutrients (nitrogen, potassium, magnesium and phosphorous) are higher in land that is being continuously cultivated with cotton. Also, fallow soil appears to be more acid compared to cultivated areas. However, the findings of Benjaminsen *et al.* (2006) are in accordance with Moseley (2005) and Bingen (2004) who argue that cotton production depletes the soil from organic matter. The authors

conclude that fallowing should not be associated with nutrient replenishment, though farmers might make use of this technique for other reasons such as weed control.

6.3.5 Conclusion

As a result of the differences among the studies presented above, no firm conclusions could be drawn on the issue of detrimental impacts of cotton cultivation to soil health. The only argument which appears to be solid is the one that draws a direct correlation between lint fiber production and deforestation as well as organic matter depletion.

6.4 Pesticides

6.4.1 Introduction

Cotton is the crop that accounts for the highest amounts of insecticides than any other agricultural product (Makori, 2005). Even though the global acreage of cotton is relatively small (just 2.4% of the world's arable land is used for cotton cultivation), the fiber's production takes up 24% of the insecticides and 11% of the pesticides which are sold worldwide (Soth *et al.*, 1999).

Data for Africa reveal that over 80% of the pesticides used in the continent are applied in cotton fields (Elbehri and MacDonald, 2004). The heavy dependence of African cotton in pesticides is illustrated in figure 6.1.

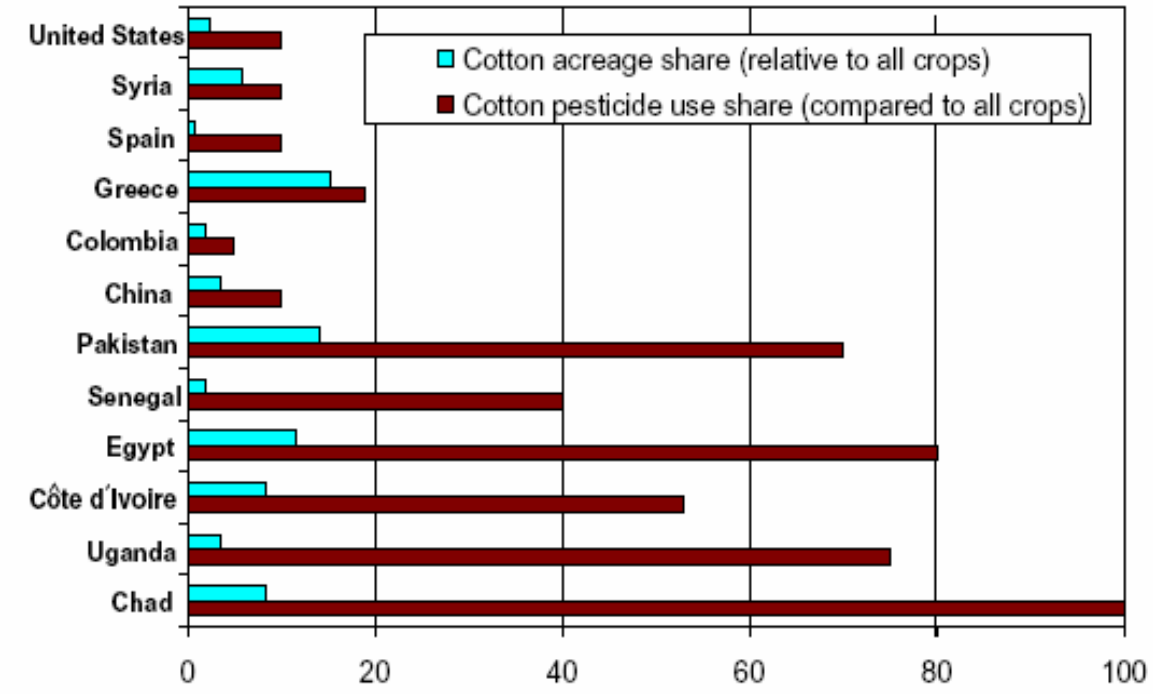


Figure 6.1: Share of pesticides used in cotton production, with reference to total pesticide use per country. As illustrated, African nations apply the majority of the pesticides they use, in cotton fields. In the case of Chad, pesticide application in the country is directed exclusively to cotton. **Source:** Elbehri and MacDonald (2004).

Additionally, Ajayi *et al.* (2002) state that the cotton pesticide use share for Mali is 80%, while Tovignan and Nuppenau (2004) suggest that the relevant figure for Benin reaches 90%.

6.4.2 Pesticides in Sub-Saharan Africa (SSA)

Ton (2003) provides a list of all insecticides used in conventional cotton production of SSA countries (table 6.3). According to the WHO classification all the chemicals listed below, with the exception of triazophos which is considered highly hazardous (Class Ib), are characterised moderately hazardous (Class II). FAO experts have suggested that the use of Class II chemicals should be avoided in developing countries, since farmers do not always take the necessary precautions or follow safety instructions when applying them on their fields (Elbehri and MacDonald, 2004).

Active ingredient	Group	WHO Class
Betacyfluthrine	synthetic pyrethroids	II
Carbaryl	Carbamate	II
Carbosulfan	Carbamate	II
Chlorpyrifos	Organophosphate	II
Cyfluthrin	synthetic pyrethroids	II
Cypermethrin	synthetic pyrethroids	II
Deltamethrin	synthetic pyrethroids	II
Dimethoate	Organophosphate	II
Endosulfan	Organochlorine	II
Fenvalerate	synthetic pyrethroids	II
Lambdacyhalothrin	synthetic pyrethroids	II
Profenofos	Organophosphate	II
Triazophos	Organophosphate	Ib

Table 6.3: Characteristics of the main active ingredients in use in conventional cotton production in sub-Saharan Africa (2000/01). Source: Ton (2003).

6.4.3 Pest resistance to chemicals

The majority of pesticides are produced in order to target the bollworm, which is the main problem pest in cotton cultivation (Ferrigno *et al.*, 2005). Traditionally, African producers have used pyrethroids in order to control bollworm populations. However, experiments carried out in the mid 90s in Cote d'Ivoire demonstrated an increasing resistance of pests to that particular group of chemicals (Vassal and Vaissayre, 1997). Parastatal cotton companies in WCA decided to respond by applying endosulfan, a pesticide of higher toxicity compared to pyrethroids. This has generated the "pesticide treadmill" phenomenon, where more powerful chemicals are gradually used, as pests develop resistance to less toxic pesticides (Bingen, 2004). Similar cases of bollworm

resistance to pyrethroids were recorded in China. Farmers resorted to the use of highly toxic and dangerous "cocktails" of organophosphates, pyrethroids and in some cases DDT (although the chemical had been banned since the early 80s), which did not prove successful (Pray *et al.*, 2002).

6.4.4 Economic aspects

The chemical input provision system in WCA is organized in such a way that promotes oversupply and overuse of pesticides (Williamson *et al.*, 2005). Parastatals have to order pesticides one year in advance. As a result, chemical input needs are not correctly estimated and the national cotton companies usually order more pesticides than farmers actually need, in order to avoid shortages (Bingen, 2004).

However, despite the heavy reliance of African countries to cotton pesticides the economic benefits from the use of chemicals are marginal. With no application of pesticides, WCA cotton farmers are likely to sustain yield losses of approximately 34%. If they do decide to protect their fields from pests by spraying, then yield reduction will only drop to 23%, given them a net benefit of merely 11% (Cabanilla *et al.*, 2004). Taking into account that pesticide costs represent 25-30% of total cotton inputs and that since the 1994 devaluation of the CFA franc imported chemicals have been seriously overpriced, it is difficult to justify the use of pest targeting chemicals from an economic point of view (Benjaminsen *et al.* 2006).

6.4.5 Health problems caused by pesticides

Apart from the economic cost, pesticides also have another more serious impact; that on human health. In many developing nations of Central America, Asia and Africa one out of two cotton farmers have experienced sickness or suffered injuries due to pesticide application (Repetto and Baliga 1996). In some countries of WCA the situation is even worse as pesticide poisonings are experienced by almost all of the local cotton farmers, as is the case in Benin (Tovignan and Noppenau, 2004). What is more research has demonstrated that pesticide application in Africa is not always conducted in accordance with safety regulations, due to luck of information on behalf of the farmers (ODI, 2004). A study in Zimbabwe (Maumbe and Swinton, 2003) concluded that a large

number of cotton producers did not comprehend the dangers associated with pesticides, resulting in considerable amounts of "pesticide induced acute syndromes".

Tovignan *et al.* (2001) conducted a study in Benin in order to record the causes of pesticide poising by cotton farmers. Their results showed that in the 2000/01 season there were 241 cases of health problems related to pesticide use, out of which 24 were fatal. The majority of the incidents were related to consumption of contaminated food. This could be the result of a number of reasons:

- Due to lack of training and pesticide surpluses, cotton farmers believe that it is safe to apply highly toxic cotton pesticides to food crops.
- Food crops often grow adjacent to cotton (as a result of the small, varied land-holding pattern in Africa) and can absorb a certain amount of pesticides that can render them poisonous.
- When women are involved in pesticide application prior to preparing the family meal, food contamination can take place as they are not always aware of the proper sanitary measures that need to be followed and washing facilities are often unavailable.

Storage is yet another issue. A village survey demonstrated that 88% of cotton farmers keep pesticides in their bedroom in order to protect this valuable and expensive input from theft. Under those circumstances, and specifically when small children can have access to those chemicals, accidents are bound to happen. Furthermore, complete isolation of used insecticide-spraying equipment is difficult and poisoning can occur due to consumption of water that is occasionally stored in empty pesticide containers. (Tovignan *et al.*, 2001).

6.4.6 Environmental hazards

One of the main environmental impacts of pesticide use is the contamination of groundwater. Pazou *et al.* (2006a) sampled the river Queme, which runs through the main cotton belt of Benin. Out of the 35 specimens taken in different parts of the river, all were found to be contaminated by organochlorine and organophosphorous pesticides. The presence of those chemicals was a result of run-off from the cotton fields. Similar chemicals were also found in fish populations (Pazou, 2006b). What is more, Tovignan *et*

al. (2001) suggest that farmers often use cotton pesticides in fishing. Bingen (2004) highlights that African governments and parastatals companies are very reluctant in granting permission for studies on the environmental impacts of pesticide use. Finally, Elbehri and MacDonald (2004) argue that apart from cases of pest resistance to chemicals (which weres mentioned previously), pesticides can harm birds and other natural predators of pests.

6.4.7 Conclusion

Pesticides are a dangerous but at the same time inevitable input in conventional cotton production. High illiteracy rates and lack of proper application training in developing countries makes pesticides hazardous not only for the environment but for people. It is essential that parastatals in WCA rationalise chemical provision, educate rural farmers on the proper use of chemicals and apply strict regulations in order to monitor pesticide use.

6.5 GM cotton

6.5.1 Introduction

GM cotton was originally developed in the US in 1996 by the multinational biotechnology corporation Monsanto. The aim of the company was to create a crop that would be resistant to the bollworm pest, the most harmful for cotton plantations world wide (Edge *et al.*, 2001).

There are two main varieties of GM cotton: herbicide tolerant or Ht cotton and Bt cotton which is the most widely used variety (Baffes, 2004b). Bt cotton is inserted with the bollworm resistant gene Cry1A originally taken from the soil bacterium *Bacillus thuringiensis* (Bt) (Elbehri and MacDonald, 2004). Once the target pest digests part of the plant the Bt protein kills it (Edge *et al.*, 2001).

Country	GM cotton acreage (as a % of total cotton plantations)
China	58%
US	37%
Mexico	30%
Australia	25%
South Africa	25%

Table 6.4: GM cotton acreage as a percentage of total cotton plantation areas in various countries. Source: James (2003).

This technological breakthrough was rapidly adopted by cotton farmers all over the world, since its appearance coincided with the first recorded cases of bollworm resistance to pesticides (as analysed in section 6.4.3). By the year 2003, 21% of the total acreage of cotton planted on a global level was genetically modified (James, 2003). Table 6.4 presents the countries with the largest GM cotton acreage. However, several regions including the EU, WCA and Central Asia have yet to authorize the use of GM cotton within their borders (Baffes, 2004b).

6.5.2 Bt cotton's main characteristics

Bt cotton provides a series of benefits for the producer. The main ones, as presented in Edge at al. (2001), are listed below:

- Reduction in use of pesticides, and subsequent economic savings.
- Increased yields, since level of production loss, due to invading pests, decreases.
- Reduced spraying related costs, such as fuel for machinery and labour.
- Reduced health risks for farmers since less pesticide application is required.

On the other hand, there are several issues surrounding the use of Bt cotton that have inhibited its wider adoption, especially in developing countries. The most important ones are the following:

- *High seed price*: Monsanto, the company which is the main provider of Bt cotton, charges farmers a "technology fee" for the seeds that they purchase. That extra cost, which in a way is a royalty farmers have to pay in order to have the right to use the company's product, is the main reason for which the price of Bt cotton seeds is significantly higher than that of conventional varieties (GRAIN, 2004). Table 6.5 provides the technology fee costs for various counties.

Country	Technology fee for Bollgard
United States	79 $US/ha
Australia	98 $US/ha
Argentina	78 $ US/ha
China	60 $US/ha (approx.)
India	60 $US/ha (approx)
South Africa	50 $US/ha (approx.)

Table 6.5: Price of the "technology fee" with which Monsanto charges its Bt cotton costumers in various countries. Bollgard is the commercial name of the first Bt cotton variety produced by Monsanto. **Source:** GRAIN (2004)

- *Technical Use Agreement (TUA)*: The TUA does not allow farmers to save and reuse GM seeds from one year to another, a practice that has been commonplace throughout the entire history of agriculture. Instead the farmers are obliged to sign a contract with Monsanto that compels them to buy Bt cotton seeds from the company every year (De La Perriere and Seuret, 2000; Winston, 2002).
- *Contamination*: A rather controversial issue surrounding the GM debate is whether genetically modified seeds have the potential to transfer their properties to adjacently grow conventional varieties, thus "contaminating" them. Many GM adopting countries have specific restrictions in place as a means of preventing such contamination. Farmers are obliged to plant conventional cotton varieties on

each side of their field in order to create a buffer zone that will contain pollen within the boundaries of their own land. The size of this buffer zone can range from 20% in the India and the US, to 70% in Australia (Soil Association, 2002; Winston, 2002; GRAIN, 2004). However, in many developing countries the small size of cotton fields growing next to each other would reduce the effectiveness of such restrictions.

6.5.3 Bt cotton in developing countries

Results of Bt cotton adoption have been so far studied in three developing countries: South Africa, China and India. The following sections will present the results of several studies conducted in those areas.

6.5.3.1 South Africa

South Africa was the first African nation to adopt Bt cotton on a commercial scale in 1998. Ismael *et al.* (2002) conducted a survey in order to assess the results of the first two years of Bt cotton cultivation in the country. In their study they included a sample of 100 cotton smallholders from the Makhathini Flats region (illustrated in figure 6.2), consisting of both adopters and non-adopters of Bt cotton. Their findings are presented in figure 6.3.

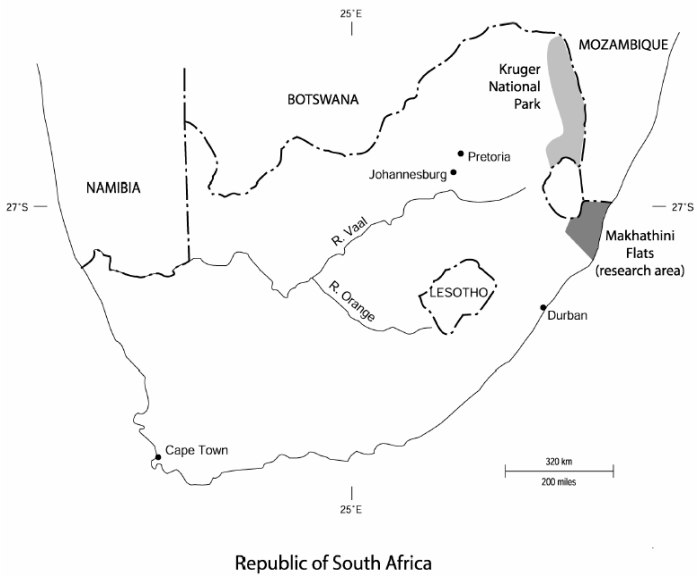


Figure 6.2: Map of South Africa highlighting the study area of Makhathini Flats. Source: Ismael *et al.* (2002).

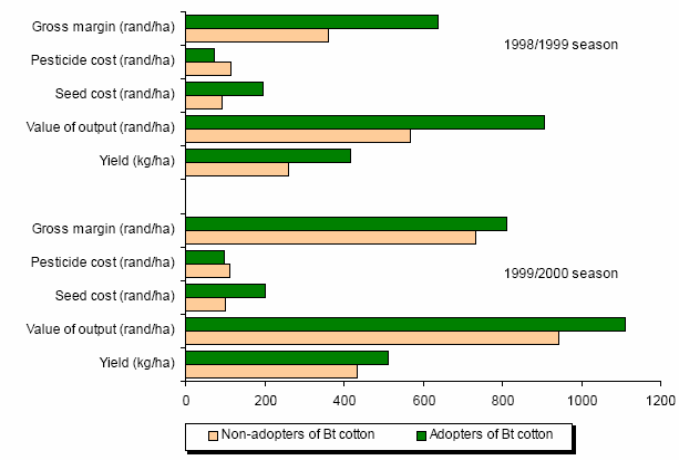


Figure 6.3: The findings of the survey of Ismael *et al.* (2002). Source: Ismael *et al.* (2002)

The results demonstrate a clear advantage for Bt cotton adopters. Even though seed cost of the GM variety is higher, the extra expenditures are offset by the reduction in pesticide cost and the increased yields. The increased value output of Bt cotton adopters indicated that the crop can contribute significantly to poverty alleviation of smallholder farmers.

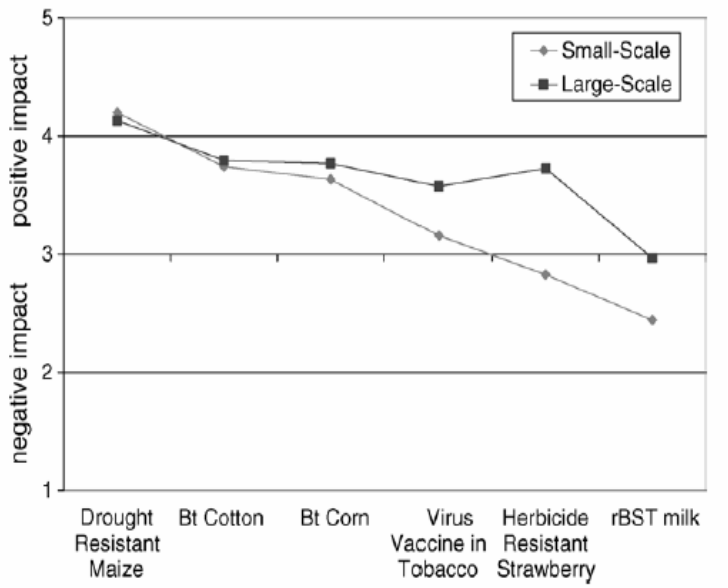


Figure 6.4: The impact of GM crops on small and large scale producers. The author carried out a series of interviews with farmers and stakeholders in the agricultural sector of South Africa in order to determine the impacts of 6 different GM crops cultivated in the country. **Source**: Aerni (2005)

Benefits of Bt cotton cultivation to small scale South African farmers are also recorded in Aerni (2005). His findings, presented in figure 6.4, suggest that Bt cotton is

the second most beneficial crop for both small and large scale farmers behind drought resistant maize.

6.5.3.2 China

China is the only country where biotechnology research and consecutive agricultural applications have been driven by governmental agencies, such as the Chinese Academy of Agricultural Sciences, rather than by multinational corporations like Monsanto (Hillocks, 2005). Bt cotton acreage has increased by over 1000% within the last seven years, currently amounting to 2.5 million ha (Yang *et al.*, 2005).

A survey conducted by Pray *et al.* (2002) in the Republic of China, provides interesting findings. The researchers examined cotton fields in 5 different Chinese regions. Their results demonstrate clear yield advantages for Bt cotton adopters as well as considerable reductions in pesticide applications. Table 6.6 provides a breakdown of the cost savings.

	2001		2000		1999	
Cost	Bt	Non-Bt	Bt	Non-Bt	Bt	Non-Bt
Output revenue	1277	1154	1578	1013	1362	1265
Non-labour costs						
Seed	78	18	59	21	62	63[a]
Pesticides	78	186	52	118	31	177
Chemical fertilizer.	162	211	132	128	154	154
Organic fertilizer	44	53	41	18	28	34
Other costs	82	65	86	70	120	88
Labour	557	846	840	841	616	756
Total costs	1000	1379	1211	1196	1011	1271
Net revenue	277	–225	367	–183	351	–6

Table 6.6: Cost savings achieved by the use of Bt cotton in China. **Source:** Pray *et al.* (2002).

Net benefits are significantly higher for Bt cotton adopters in all three survey periods. The findings are similar with those of Ismael *et al.* (2002) presented above, in terms of seed and pesticide costs. Additionally, Pray *et al.* (2002) report reduced expenditures in labour and fertiliser use (with the exception of the 2000 period).

Another set of interesting findings is the one that addresses impacts on health. According to the survey pesticide poisoning levels were lower for farmers that used Bt cotton, compared to their peers that planted conventional varieties. Table 6.7 presents the relevant results.

	Number of poisonings as a percentage of farmers		
Year	**Non-Bt cotton only**	**Both Bt and non-Bt cotton**	**Bt cotton only**
1999	22%	11%	5%
2000	29%	19%	7%
2001	12%	10%	8%

Table 6.7: Impact of Bt cotton on farmer poisoning in China. Source: Pray *et al.* (2002).

An important conclusion that the authors draw is that economic benefits from pesticide use reduction are recorded only in regions where bollworm is the main pest. The same argument is expressed by Elbehri and MacDonald (2004) in order to support that not all regions are equally suitable for cultivation of Bt cotton.

6.5.3 3 India

Following a four year trial period, Bt cotton was final introduced to commercial use in India in 2002. Since then, several studies (Qaim, 2003; Qaim and Zilberman, 2003; Barwale *et al.*, 2004) have demonstrated positive impacts for Bt cotton adopters, relating to increased yields and insecticide spraying reductions.

6.5.4 Scenarios of GM cotton adoption in WCA

Several researchers have attempted to estimate the economic impacts of a potential GM cotton adoption in WCA. The econometric models that will be presented in this section are largely based on the lessons and assumptions drawn from the South African experience.

6.5.4.1 Elbehri and MacDonald (2004)

The first model to be presented is the one constructed by Elbehri and MacDonald (2004). Their findings (presented in table 6.8) suggest that Bt cotton adoption in WCA would result in an increase in cotton production and exports that would provide an additional $US 81 million to the region's economic welfare. That happens regardless of the added seed cost, as insecticide expenditures is reduced by 25% and a small amount of labour is released, in order to participate in other working areas.

Increase in percentage of:		Input cost changes with Bt cotton compared to conventional cotton			Welfare increase ($US
Cotton output	Cotton exports	Insecticides	Seed	Labor	81.81
5.15%	9.61%	-25%	110%	-8%	

Table 6.8: Effects of Bt cotton adoption in WCA. Source: Elbehri and MacDonald (2004).

6.5.4.2 Cabanilla et al. (2004)

Cabanilla *et al.* (2004) carried out a more country specific analysis of the impacts of Bt cotton adoption in WCA. Assuming three different adoption rates (30, 50 and 100%) and three yield advantage scenarios (10, 30 and 45%) they calculated the net benefits of GM cotton introduction in Mali, Benin and Burkina Faso. As illustrated in table 6.9 all three WCA nations could experience considerable welfare increases that range from $US 4 to 67 million.

	Total benefits in $US million		
Country	**100% adoption**	**50% adoption**	**30% adoption**
• **45% Yield advantage**			
Mali	67	34	20
Burkina Faso	41	20	12
Benin	52	26	16
• **30% Yield advantage**			
Mali	45	23	14
Burkina Faso	28	14	8
Benin	35	18	10
• **10% Yield advantage**			
Mali	23	11	7
Burkina Faso	14	7	4
Benin	18	9	5

Table 6.9: Aggregate benefits from Bt cotton at varying rates of adoption. Source: Cabanilla *et al.* (2004).

6.5.4.3 Anderson et al. (2006)

The final and most recent model is that of Anderson *et al.* (2006). Using the Global Trade Analysis Project the researchers calculate the impact of Bt cotton adoption for SSA as a whole. Their findings suggest that GM cotton introduction to the region will increase total welfare by $US 187 million and contribute an additional 0.091% to the GDP of SSA. Furthermore, they argue that the region has more to gain from Bt cotton adoption than from elimination of subsidies and tariffs, under the current round of WTO negotiations, as the estimated gains from subsidy removal, according to their calculations, reach only a level of $US 147 million. However, if removal of government payments for cotton and Bt cotton adoption are simultaneous, then welfare gains double to $US 370 million. Their findings are summarised in table 6.10.

Welfare increase in $US million for Sub-Saharan Africa		
Adoption of Bt cotton	Removal of cotton subsidies	Simultaneous subsidy removal and Bt cotton adoption
187	147	370

Table 6.10: Welfare implications of subsidy removal and adoption of Bt cotton for SSA. Source: Anderson *et al.* (2006).

Finally, in terms of which world regions would benefit the most from GM cotton adoption, they estimate that SSA ranks third behind India and Pakistan, as illustrated in figure 6.5.

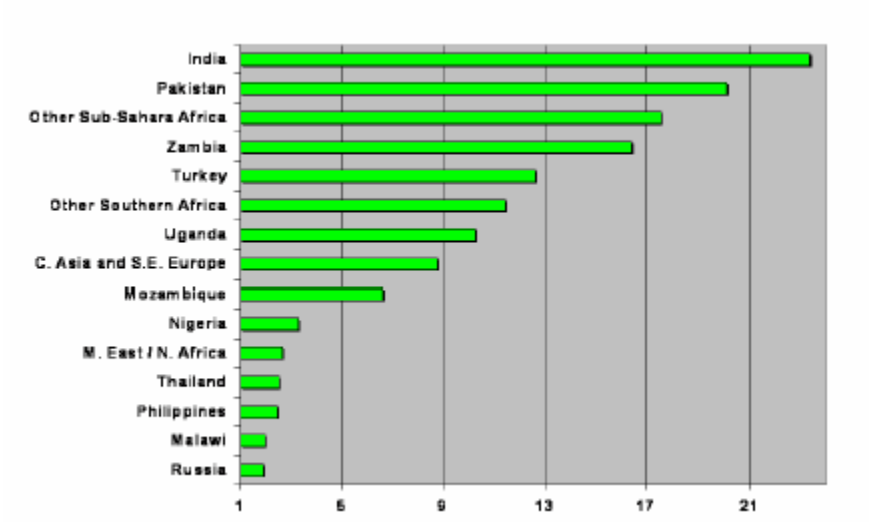


Figure 6.5: Welfare gain from GM cotton adoption as a percent of GDP, as a multiple of the percentage gain to the world as a whole. Source: Anderson *et al.* (2006).

6.5.5 Opposing views

Even though the majority of the peer reviewed articles report positive results from GM adoption, either existing (as were the cases for South Africa, China and India) or projected (as with the three econometric models mentioned above), several sources present opposing views.

A five year study carried out by Pschorn-Strauss (2005) in the Makhatini region of South Africa has demonstrated that adoption rates of Bt cotton have fallen dramatically after the first two year study periods of Ismael *et al.* (2002). Farmers' debts have since been increasing and secondary pests, not targeted by the Cry1A protein, are gradually becoming more problematic. Qayum and Sakkhari (2005) also report similar negative findings about Bt cotton in India.

Nevertheless the above surveys, and several others that hold a rather reluctant stance towards the adoption of biotechnology in developing countries, are reports of NGOs or other environmental organisations and therefore may not hold the same credibility as publishised peer reviewed articles. However, some of the arguments that they present could be considered valuable contributions to the wider GM cotton debate. For this reason they are selectively presented in the following section with specific reference to WCA.

6.5.6 Will GM cotton be successful in WCA?

There are several reasons that could inhibit the welfare increase of GM cotton adoption in WCA. As mentioned in section 6.5.3.2, Bt cotton is an effective solution only in regions where the bollworm is the main problem pest. In the WCA region however, cotton farmers face a wide diversity of pests other than the bollworm.

Table 6.11 presents a list of the main cotton pests in several WCA countries as well as their susceptibility to Bt cotton. As illustrated Bt cotton can not control many of these pests, rendering potential benefits from pesticide use reductions questionable.

Country - region	Early season pests (in order of importance)	Control by B cotton*	Late season pests (in order of importance)	Control by B cotton*
Benin-North	*Helicoverpa armigera* *Sylepta derogata* *Aphis gossypi*	O ? X	*Helicoverpa armigera* *Earias spp.* Other bollworms	O O O
Benin – South	*Polyphagotarsonemus latus* *Sylepta derogata* *Helicoverpa armigera*	X O O	*Polyphagotarsonemus latus* *Cryptophlebia leucotreta* *Pectinophora gossypiella* Exocarpic pests	X ? ● O
Ivory Coast	*Aphis gossypii* *Empoasca facialis* *Polyphagotarsonemus latus* *Sylepta derogata* *Lygus vosselari*	X X X O X	*Pectinophora gossypiella* *Polyphagotarsonemus latus* *Cryptophlebia leucotreta* *Earias spp.* *Helicoverpa armigera*	● X ? O O
Mali	*Aphis gossypii*	X	*Helicoverpa armigera* *Sylepta derogata* *Spodoptera littoralis* *Diparopsis watersi* *Earias spp.*	O O O O O
Senegal	*Diplopodes* *Aphis gossypii* *Amsacta moloneyi* *Sylepta derogata* *Cosmophila flava*	? X O O O	*Helicoverpa armigera* *Earias spp* *Diparopsis watersi* *Aphis gossypii* *Bemisia tabaci*	O O O X X
Togo – Kara	*Sylepta derogata* *Aphis gossypii* *Amrasca spp.* *Diparopsis watersi*	O X X O	*Sylepta derogata* *Aphis gossypiella* *Amrasca spp.* *Diparopsis watersi* *Dysdercus spp.*	O X X O X
Togo - Central	*Polyphagotarsonemus* *Aphis gossypii* *Amrasca spp.* *Sylepta derogata*	X X X O	*Polyphago. Latus* *Pectinophora gossypiella* *Helicoverpa armigera* *Earias spp.* *Dysdercus spp.*	X ● O O X

* Based on the experiences of countries where Bt cotton has been introduced

● = complete, O = partial, X= none, ? = unknown

(Modified from Secretariat for the 61st Plenary Meeting of the International Cotton Advisory Committee, Report on Production Practices, Cairo, Egypt, October 2002).

Table 6.11: Principal pests of cotton in certain countries of Western Africa and their susceptibility to cotton. **Source:** GRAIN (2004).

Most WCA cotton farmers have been receiving free seeds on an annual basis by the parastatal companies for years. GM cotton introduction will result in additional input cost which, if similar to the cost of Bt seeds in South Africa, will be close to $US 50/ha (Hillocks, 2005). Provided that pesticide costs in the region average about $US 68/ha, Bt cotton will have to completely eliminate the use of pest control chemicals in order to deliver economic benefits to native farmers (GRAIN, 2004).

Another potential obstacle to the successful adoption of GM cotton could arise from the issue of contamination. Contrary to the norm in South Africa where cotton holding acreage ranges between 4 and 8 ha (Hillocks, 2005) in most of SSA, cotton plantations do not exceed 2 ha (Bingen, 2004). Hence the production pattern is

characterised by small, adjacent land holdings where apart from cotton other food crops are also cultivated. Therefore, contamination of conventional cotton from Bt and Ht varieties is possible, with negative effects especially to the emerging organic farming market (GRAIN, 2004).

6.5.7 Conclusion

Despite all the realized and potential benefits of GM cotton, some questions and concerns are still posed by several researchers. How long will Bt cotton remain efficient? Will bollworm pests eventually develop resistance to the Cry1A protein? (Edge *et al.*, 2001) Will the future adoption of Bt cotton provide biotechnology corporations with potential monopolistic powers in the market? (Ismael *et al.*, 2002) Are there any possible environmental sideffects that we are not yet aware of and might prove irreversible? (Anderson *et al.*, 2006).

Scientific research and future developments have yet to provide answers to these questions. What is certain is that GM technology is not a one-size-fits all solution. What works for one country might prove inefficient for another. Bt cotton adoption should therefore be addressed on a country by country and case by case basis, in order for its beneficial effects to be fully exploited by those in need.

6.6 Organic cotton

6.6.1 Introduction

The previous sections of chapter 6 revealed the adverse environmental effects of conventional cotton production. The solution of GM cotton, which provides economic benefits in terms of reduced pesticide use, still has higher expenses for seed purchases. An alternative that farmers have recently started to adopt is that of organic cotton.

6.6.2 Origin of organic cotton

Even though organic cotton production has been taking place in developing countries for years, officially certified organic cotton was produced for the first time in 1990 in Turkey and the US (Baffes, 2004b). Originally it was adopted in an effort to move towards a more environmental friendly production method that would decrease dependence from expensive and hazardous chemical inputs (ICAC, 2003).

6.6.3 Benefits of organic cotton

Certified organic production in SSA, initiated in the mid 1990s, has been supported primarily by European NGOs and bilateral organisations, rather than African governments and parastatals. The main reason for cotton smallholder conversion to organic farming has been the increased cost of synthetic inputs and the health hazards associated with pesticides, all encountered in conventional cotton production (Patter *et al.*, 1999). Instead, organic cotton farming uses a variety of organic fertilisers that range from animal manure to neem seed, papaya leaves and cow urine (Tovignan and Nuppenau, 2004). According to Moseley (2005) organic fertilisers are the ideal way to maintain and improve levels of soil organic matter which is associated with a number of environmental benefits, such as improved infiltration and protection from acidification. Furthermore, organic farming relies on the augmentation of predator populations rather than utilizing hazardous synthetic pesticides in order to achieve protection against the bollworm (Ferrigno *et al.*, 2005).

6.6.4 Constraints

Organic cotton enjoys a premium of approximately 20% over the price of the conventional fiber varieties (Ferrigno *et al.*, 2005). However, this price difference, which is not always guaranteed for producers, has to be able to offset the reduced yield of organic production, compared to conventional cotton (ICAC, 2003). Nevertheless, lower yields are not the only issue that African farmers have to struggle with. A number of impediments inhibit their welfare:

- *Certification issues*: Organic cotton certification is an expensive process that lasts for a period of three years. During this transitional time framework, farmers are not allowed to sell their output as organic and therefore cannot claim price premiums (Van Elzakker, 1999). Furthermore, different countries often have different national regulations as far as organic products are concerned, an issue that further complicates organic cotton imports (Ferrigno *et al.*, 2005).
- *Demand constraints*: As far as the final consumer of cotton products is concerned, organic cotton does not represent a significant added value. Contrary to organic food, the fiber is seen as too distant from the final product, making it difficult to the consumer to link organic cotton to specific health advantages. Finally, there are already so many things that one has to consider when buying clothes (such as brand, colour, size, texture) that the organic derivation of the fiber is of little importance (Baffes, 2004b).
- *Supply constraints*: The main characteristic of organic cotton on the field is that it must be a part of a wide crop rotating scheme. Several other organic crops have to be planted through the different seasons, in order to secure the replenishment of soil nutrients. Therefore, the farmer has to secure a market not just for his cotton output, but for all the crops that he cultivates throughout the year (Van Elzakker, 1999; ICAC, 2003).

6.6.5 Benefits for African farmers

Despite all of the above problems, organic cotton has demonstrated significant benefits for WCA nations. NGO generated organic cotton farming initiatives in Mali and

Benin, have specifically contributed to the enhancement of gender equality and the reduction of financial risk for producers.

6.6.5.1 Gender equality and female empowerment

Usually female family members were excluded from conventional cotton production, due to the fact that when women were involved in pesticide application they could face pregnancy implications, often leading to abortion. Furthermore, cases of poisoning as a result of contamination of family meals by chemicals that were passed on to food which was prepared by women that had just returned from a day of spraying at the fields, have also been recorded (Tovignan and Nuppenau, 2004). However, since organic cotton farming requires no pesticide application, women have become increasingly involved in it, by obtaining their own land and improving their status in the local communities while contributing significantly to the family income (Dietler and Guntern, 2005).

6.6.5.2 Financial security

Furthermore, since organic cotton initiatives generated by NGOs are carried out in collaboration with European companies that guarantee the purchase of outputs, farmers have secure buyers for their products. This reduces the financial risk associated with the price fluctuations of the conventional cotton market (Vermeulen and Ras, 2004). Even though this kind of relationship between producers and companies might not be sustainable in the long run due to issues of competition, it is nevertheless a necessary first step in order to assist the creation and establishment of the organic cotton market in WCA countries.

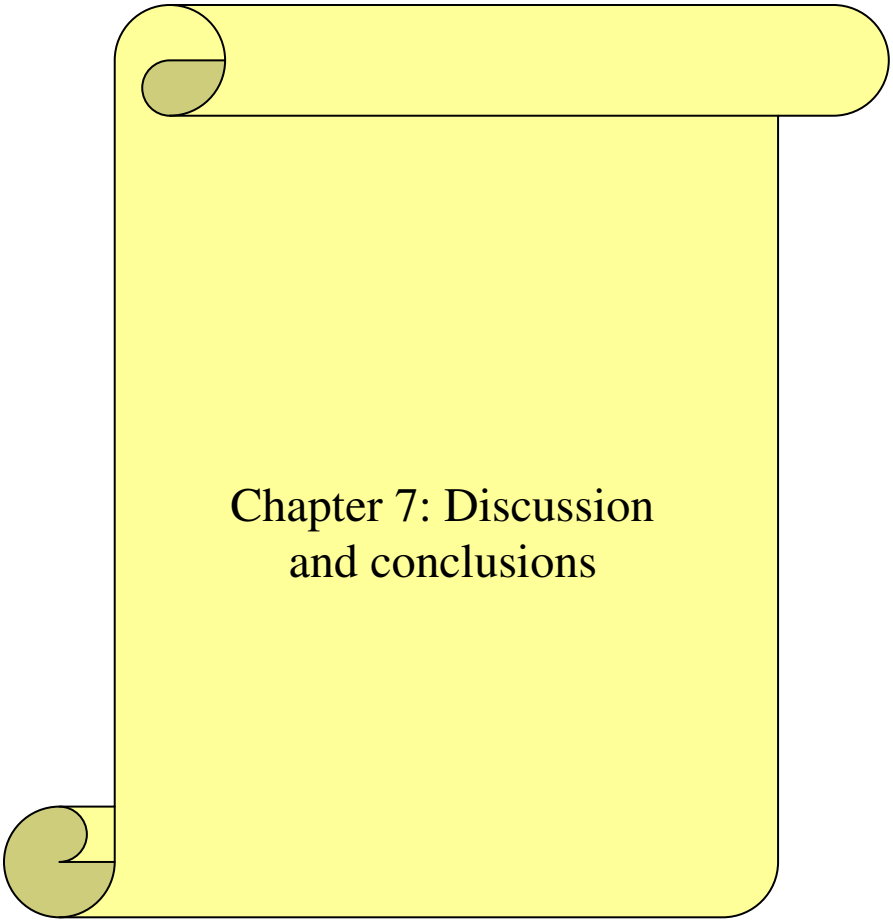
6.6.6 Conclusion

Ton (2003) argues that organic cotton production in SSA should be supported by the national governments in order that output volumes rise substantially and export trade is rendered more profitable. Furthermore, Makori (2005) suggests that WTO members should distinguish cotton products based on their productions methods and not just on

their physical characteristics. That would differentiate organic from GM cotton in the eyes of the consumer and provide separate markets for these two commodities.

6.7 Conclusion

Cotton production is seen by many as Africa's response to poverty. However, it carries with it several environmental hazards that are concentrated around the issue of pesticide use. The way in which the chemical provision system functions today is not sustainable, since it endangers primarily the farmers but also the environment. Adequate training and more rational use is required. GM varieties appear as a lucrative solution for African farmers. Nevertheless, before the continent decides to open its gates to biotechnology, it should carefully consider a number of issues. It still remains questionable whether the conditions and characteristics of the cotton system in WCA are appropriate for the introduction of Bt cotton. Organic cotton is certainly a more environmental friendly solution. However, as organic production still functions under a protectionist regime (with the aid of European NGOs and environmentally aware corporations) it is not known whether it will be economically sustainable it a free market.


Chapter 7: Discussion
and conclusions

Chapter 7: Discussion and conclusions

7.1 Introduction

Cotton trade sustainability has three dimensions: economic, environmental and social (Hussein *et al.*, 2005). All are equally important. In order for global cotton market sustainability to be achieved those three dimensions should be addressed effectively. The aim of this chapter is to reflect upon the most important issues presented in the previous sections, bearing in mind that all potential solutions and suggestions for the future of the cotton market, should incorporate economic, environmental and social benefits in the best possible way.

7.2 The moral argument against subsidies

World leaders have made specific poverty alleviating commitments. Every year large sums of money are spend in the form of foreign developmental aid. However, their effectiveness is reduced by protectionist policies exercised by countries such as the US, EU and China.

The developed nations of the world have a right to protect vulnerable segments of their population and support sectors of their economy that are considered valuable, as is the case of agriculture. Within that framework, agricultural subsidies could be justified. However, poverty and vulnerability are relative terms. A poor farmer in the US might be considered wealthy when compared to a smallholder from Benin. An equity issue therefore rises when one considers that protectionism in developed nations can have severe welfare reduction impacts for the even more impoverished farmers of WCA.

7.3 The economic argument

Therefore, cotton subsidies should be eliminated even if one considers just the moral argument. But perhaps the economics of cotton production are more convincing. Costs in the US and the EU are much higher than in WCA. A global scale optimum resource allocation would require more cotton to be produced in African nations that have the comparative advantage of cheap labour. However, a line needs to be drawn in the level of dependence that WCA will have from cotton.

7.4 Strategies for WCA cotton sector

Theoretically, the more cotton WCA countries produce, the better. Nonetheless, cotton monocultures pose serious environmental hazards. In a way it's like putting "all the eggs in one basket". A strategy like that could easily fail if for example bollworm populations increase dramatically during one season and destroy cotton plantations. Furthermore, lack of crop rotation (associated with overproduction) deprives the soil from vital nutrient replenishment, while it endangers food security. The best practice for WCA nations would be to focus on cotton production, but at the same time cultivate other food crops as well.

Furthermore, cotton sector reform initiatives should continue with careful and well studied steps. A good example is the use of pesticides. WCA parastatals should consider reforming the whole chemical input provision system, as the one in place today leads to overuse of chemicals with immediate threats to the health of cotton farmers.

What is more, cotton sector liberalization might not be the best solution for all countries. Each WCA nation should judge where its problems lie and develop its own strategy. However, a wide inter-African coordination is needed. Trade barriers among countries should be eliminated, as analysed in section 3.2.3. For several landlocked nations (like Mali, Burkina Faso and Chad) access to marine transportation is vital and should be negotiated with neighbors on a fair and mutually beneficial basis.

Standardised quality and guaranteed availability to the buyer will also be key issues for the future of WCA cotton sector. In the event that subsidies are removed, the subsequent production decrease of the US, EU and China (predicted by all the econometric models), will have to be substituted by developing nations. Therefore, WCA countries should be in a position to increase their cotton output, deliver standardised quality to the buyer and guarantee safe and on-time transportation. Alternatively, spinners will turn to other cotton producing nations for lint fiber supply.

7.5 The case of the EU

A number of findings suggest that cotton production in the EU is particularly unsustainable. From an environmental perspective Greece, EU's largest cotton producer, has the highest level of irrigated cotton fields, thus exercising great stress over its

freshwater resources. Furthermore, the fact that EU producers receive the highest per capita subsidies in the world supports the economic unsustainability of European cotton production, since, as argued by all econometric models presented in chapter 4, if those subsidy payments were withdrawn, output volumes in the region would decrease dramatically. Taking into account the fact that EU cotton competes for the same markets as WCA production, one could argue that reduction or even total elimination of EU cotton cultivation would be beneficial both for European taxpayers and for WCA farmers.

7.6 GM vs organic cotton

Two alternatives to conventional cotton cultivation were presented; GM and organic cotton. So far Bt cotton adoption has been substantial in the US and China, but very low in WCA. Several models (presented in section 6.5.4) revealed the beneficial impacts of a potential Bt cotton adoption in SSA, which could be even greater than the benefits arising from subsidy removal. However, the solution of biotechnology, being relatively recent, should be adopted after careful consideration and analysis of the conditions that characterise the cotton sector of each country. On the other hand, organic cotton production has been in place for decades in Africa, although without official certification. As it could be a rather sustainable solution in terms of its environmental benefits (use of organic rather than synthetic fertilisers, no use of pesticides), organic production should gain more support from the parastatal companies in WCA.

7.7 The role of the WTO

The importance of the WTO in the world cotton sector is paramount. So far the organisation has demonstrated its willingness to work towards a more equitable market by incorporating the views of the developing nations and providing them the chance to articulate their proposals to the international community. However, two issues should be addressed in the future:

1) Environmental aspects should also be incorporated in the organisation's decisions as far as cotton is concerned.

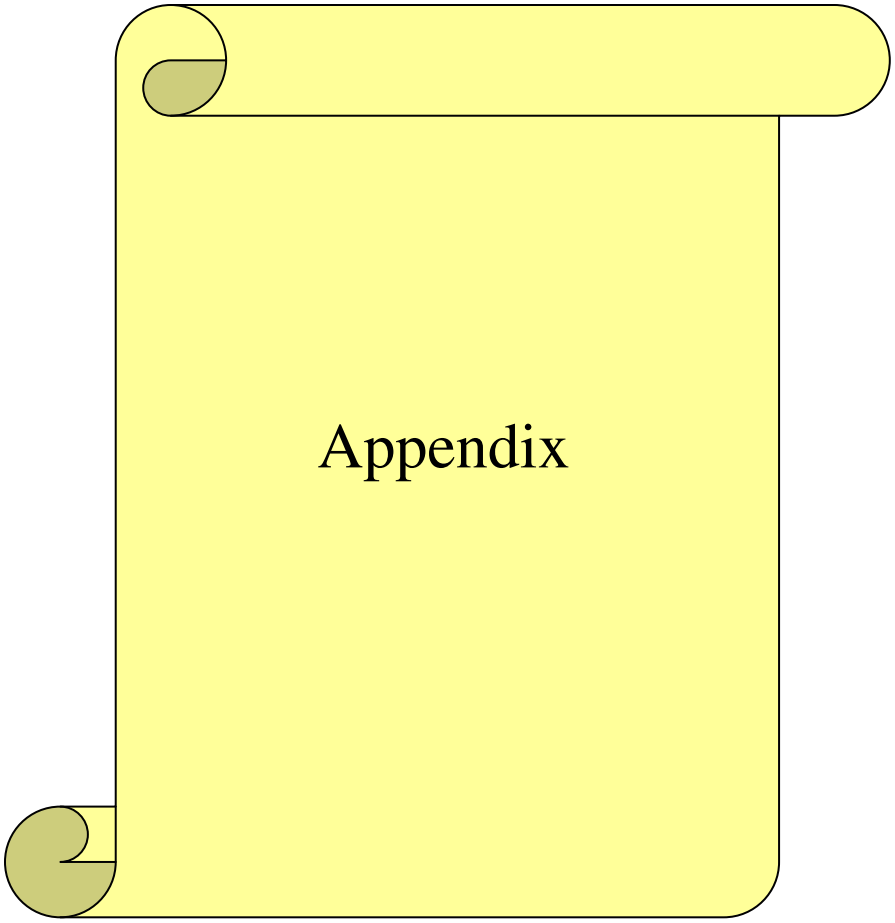
2) A wider cooperation between the WTO and other bilateral organisations (such as the World Bank and the IMF) is needed.

Finally, until full elimination of subsidies is accomplished, developing countries should have the right to support their national cotton sectors, without fear of violating regulations posed by structural adjustment programs.

7.8 Conclusion

Trade liberalisation of the global cotton market should be pursued by the international community. Cotton subsidies should be eliminated, not just for the sake of cotton farmers of the WCA region, but also for that of taxpayers and consumers in the developed world.

At the same time, a number of other parameters should also be considered. Policy makers should realize that the poverty alleviating properties of cotton lie in a free and fair global market; one that will consider the threats that cotton cultivation posses to the environment; one that will contemplate on the use of GM varieties primarily on the basis of what is best for developing countries; one that will be determined to allocate cotton production in the regions that are best suited for the crop; one that will be prepared to pay the correct price of the lint fiber; a price that will incorporate all the aspects of production, whether they will be water use, pollution from pesticides and subsequent health impacts, organic methods of cultivation, presence of subsidies and social parameters (access of women to production, use of child labour). Only under these circumstances can we hope to give the impoverished nations of the world a fair chance to dispose themselves from the anathema of poverty.


Appendix

Appendix

1. Government support payments of the US cotton sector

Cross (2006) provides a comprehensive list of the complex system of US cotton support programs. The most important ones are given below:

1) **Marketing loan payments**: They give cotton farmers the opportunity to use their crops as collateral in negotiating a loan from the US Department of Agriculture. If world prices fall below a certain threshold, then the payments that farmers have to make to the government are reduced accordingly.
2) **Direct payments**: They are the "decoupled" payments that are supposed to be part of the WTOs green box (for an analysis of the WTO agricultural boxes see section 2 of the Appendix). Their disbursement is based on "historical" rather than current levels of production or price fluctuations. In that way they do not encourage excess cotton supply. However, they limit the choices of the farmer as far as his final product is concerned. Although the farmer has no responsibility to plant cotton, he is not allowed to cultivate a number of crops including fruit, vegetables or wild rice.
3) **Counter-cyclical payments and other emergency assistance**: They are considered a supplement to the previous method of support as they shield cotton producers that receive direct payments from price fluctuations. They are also based on "historical" production levels
4) **Crop insurance** aims to secure cotton growers from natural disasters.
5) **"Step 2" payments**: this program provides incentives for buyers to purchase domestic cotton, when US prices are not competitive compared to boarder prices.
6) **Export credit guarantees**: It is a means of indirectly supporting cotton exporters. The US government takes the role of the guarantor in order for private lenders to finance the exporting activities of farmers.

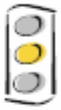
2. The WTO Agricultural boxes

Domestic support in agriculture

THE BOXES

In WTO terminology, subsidies in general are identified by "boxes" which are given the colours of traffic lights: green (permitted), amber (slow down — i.e. be reduced), red (forbidden). In agriculture, things are, as usual, more complicated. The Agriculture Agreement has no red box, although domestic support exceeding the reduction commitment levels in the amber box is prohibited; and there is a blue box for subsidies that are tied to programmes that limit production. There are also exemptions for developing countries (sometimes called an "S&D box", including provisions in Article 6.2 of the agreement).

AMBER BOX

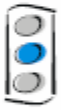


All domestic support measures considered to distort production and trade (with some exceptions) fall into the amber box, which is defined in Article 6 of the Agriculture Agreement as all domestic supports except those in the blue and green boxes. These include measures to support prices, or subsidies directly related to production quantities.

These supports are subject to limits: "de minimis" minimal supports are allowed (5% of agricultural production for developed countries, 10% for developing countries); the 30 WTO members that had larger subsidies than the de minimis levels at the beginning of the post-Uruguay Round reform period are committed to reduce these subsidies.

The reduction commitments are expressed in terms of a "Total Aggregate Measurement of Support" (Total AMS) which includes all supports for specified products together with supports that are not for specific products, in one single figure. In the current negotiations, various proposals deal with how much further these subsidies should be reduced, and whether limits should be set for specific products rather than continuing with the single overall "aggregate" limits. In the Agriculture Agreement, AMS is defined in Article 1 and Annexes 3 and 4.

BLUE BOX



This is the "amber box with conditions" — conditions designed to reduce distortion. Any support that would normally be in the amber box, is placed in the blue box if the support also requires farmers to limit production (details set out in Paragraph 5 of Article 6 of the Agriculture Agreement).

At present there are no limits on spending on blue box subsidies. In the current negotiations, some countries want to keep the blue box as it is because they see it as a crucial means of moving away from distorting amber box subsidies without causing too much hardship. Others wanted to set limits or reduction commitments, some advocating moving these supports into the amber box.

GREEN BOX

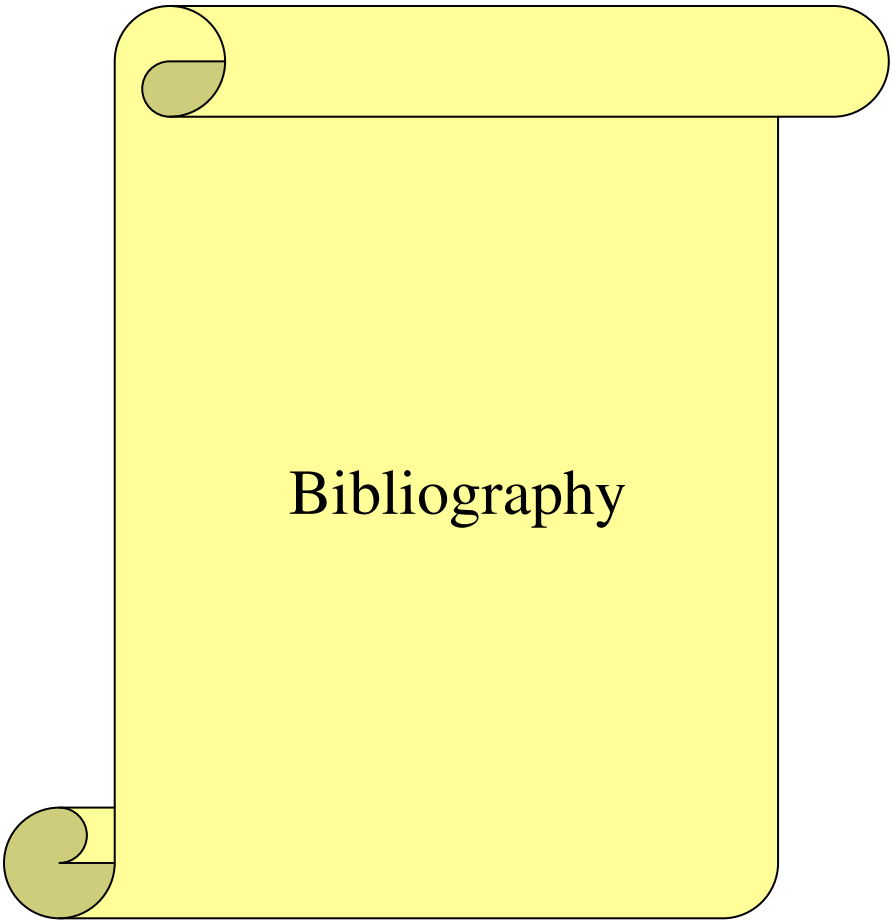
The green box is defined in Annex 2 of the Agriculture Agreement.

In order to qualify, green box subsidies must not distort trade, or at most cause minimal distortion (paragraph 1). They have to be government-funded (not by charging consumers higher prices) and must not involve price support.

They tend to be programmes that are not targeted at particular products, and include direct income supports for farmers that are not related to (are "decoupled" from) current production levels or prices. They also include environmental protection and regional development programmes. "Green box" subsidies are therefore allowed without limits, provided they comply with the policy-specific criteria set out in Annex 2.

In the current negotiations, some countries argue that some of the subsidies listed in Annex 2 might not meet the criteria of the annex's first paragraph — because of the large amounts paid, or because of the nature of these subsidies, the trade distortion they cause might be more than minimal. Among the subsidies under discussion here are: direct payments to producers (paragraph 5), including decoupled income support (paragraph 6), and government financial support for income insurance and income safety-net programmes (paragraph 7), and other paragraphs. Some other countries take the opposite view — that the current criteria are adequate, and might even need to be made more flexible to take better account of non-trade concerns such as environmental protection and animal welfare.

The WTO Agricultural Boxes. **Source:** WTO (2002b)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