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The sub-Saharan Africa Cotton Sector. Selected features

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Abstract

Though cotton only represents a very small share in world merchandise trade, it is an indispensable commodity in sub-Saharan Africa (SSA). Productivity and profitability of cotton production and processing are key determinants of growth in cotton producing countries. This study analyses the SSA cotton sector. The first section will use value chain analysis to trace the value creation process from the raw material stage to final retail products. The second section analyses the sector from an industrial organizational perspective, highlighting how the sector's specific features have influenced reforms outcomes and comparing experiences to other reformed SSA crop sectors. The purpose of section three is to shed light on Research and Development in cotton in SSA, framed in a broader picture of agricultural research in SSA. The final section analyses the issue of quality in cotton and tests the assertion that fully implemented reforms have undermined quality performance of the cotton sector in SSA.

Keywords sub-Saharan Africa Cotton Sector, Cotton Liberalization, Cotton R&D, Cotton Quality

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Legend

Admarc - Agriculture Development and Marketing Corporation

AFZ – African Franc Zone

ASIC - Senegalese Interprofessional Cotton Association

ASTI –Agriculture Science and Technology Indicators

BOI - Bank of Industry

CFDT - Compagnie Francaise de Developpement des Fibres Textiles

CGC - Guinean Cotton Company

CNUCI - The Niger United Cotton Industries

CotonChad - Chad Cotton Company

CotonTchad SN - Société Cotonnière du Tchad Société Nouvelle

CPC - Cotton Public Corp

CPDA - Christian Partners Development Agency

CTG - cotton/textile/garment

Dagris - Developpement des Agro-Industries du Sud

ESA – East South Africa

FAOSTAT- Food and Agriculture Organisation

FNPC - National Federation of Cotton Producers

Fonpa - National Forum of Cotton Farmers

GPC - Cotton Producer Groups

ICAC – International Cotton Advisory Committee

ICO - International Coffee Organization

IFI – International Financial Institutions

IRCT - Cotton and the Exotic Textiles Research Institute

KTDA - Kenya Tea Development Agency

Lintco - Lint Company of Zambia

NSCT - La Nouvelle société cotonnière du Togo

SCCL - Sudan Cotton Company Ltd.

SCDA - Special Crops Development Authority

SCN - Société Cotonnière du Niger

Sicot-sa - Société industrielle de coton

Socadetex - Société Centrafricaine de Developpement des textiles

Sococa - Société Cotonnière Centrafricaine

Socoma- Société Cotonnière du Gourma

Socosa - Société Cotonnière des Savanes

Sodefitex - Society for the Development of Textile Fibres

Sofitex - La Société Burkinabè des Fibres et Textiles

Sopic - Société de production industrielle de coton

Sotoco - Société Togolaise de Coton

SSA – sub-Saharan Africa

Tan - Tanzania

TCB - Tanzania Cotton Board

Unpcb - Union nationale des producteurs de coton du Burkina Faso

UNCTAD – United Nations Conference for Trade and Development

UNECA – United Nations Economic Commission for Africa

UNIDO – United Nations Industrial Development Organisation

USDA – United States Department of Agriculture

WCA - West Central Africa

Introduction

The world's major cotton producers are China, the U.S., and India. Although Africa is not among the first four world cotton producers, taken together, the countries of francophone Africa are the world's third major exporter, together with the U.S., Uzbekistan, and Australia they account for more than two-thirds of global cotton exports (Baffes, 2007). Most importantly, francophone Africa is the world's lowest-cost cotton producer (the International Cotton Advisory Committee rates Benin, Mali, and Burkina Faso as the three lowest cost cotton producers).

Cotton only represents 0.12 percent of world merchandise trade (Baffes, 2007); nonetheless, it is an indispensable commodity in a large part of sub-Saharan Africa (SSA). In Africa, cotton is typically produced by smallholders. More than two million rural households rely on cotton production to earn their living (Baffes, 2007). In some regions, it is the only cash crop and as such it represents the most important economic activity. The cotton sector's share in the total merchandise exports of West and Central Africa (WCA) ranges from 25 to 45 percent, while its share in GDP ranges from 3 to 6 percent (World Bank, 2004). Although Africa's overall share in world agricultural trade declined from 1980 to 2005, the share of cotton trade more than doubled over the same period (Tschirley, Poulton, and Labaste, 2009). This is due to a three-fold increase in cotton production from 1960 to 2001. These facts explain why the productivity and profitability of cotton production and processing are one of the key determinants of growth and of poverty across much of the continent. Minot and Daniels (2002), for example have estimated a 7 percent decrease in rural per capita income as a consequence of a 40 percent decrease in the cotton price received by growers in Benin.

Although cotton is the most common natural fibre and has been known and used for at least 5000 years, it was only introduced into most of SSA in the twentieth century during

colonization (anglophone Africa) or right after independence (francophone Africa). The main reason for its introduction was the need to supply the coloniser's (or ex-coloniser's) textile industry. The sector was initially a state monopoly throughout the region. Nowadays, the cotton sector varies considerably from West to East Africa, due to the reforms that occurred during the 1980s and 1990s.

Such differences in the organization of the sector reflect the pattern of colonisation in Africa: while anglophone countries have adopted reforms resulting in a more competitive system and a marginalisation of state intervention, most francophone countries still retain the traditional statist system. Nevertheless, reforms have been attempted even in parts of francophone Africa, though the outcomes have generally been more limited as far as competition is concerned. Reforms in the sector have been supported by the World Bank and the International Monetary Fund which devised what has been seen as a standard reform package with the stated objectives of scaling down the role of the state, developing the private sector, and enhancing competition in both input and output markets[1] inspired by Industrial Organisation theories.

Industrial organization (IO) studies the functioning of markets. This can be either from an empirical or a theoretical perspective. The "Harvard tradition" developed the "structure-conduct-performance" paradigm, which emphasises that market structure shapes firm conduct, and in turn market performance. The "new theoretical IO", uses theoretical tools to help analyse markets, but also makes practical contributions as a consequence to positive analysis (describing the industry). IO tends to see different structures emerging in different industries reflecting specific features of the production technology and the character of retail markets (Tirole, 1988). IO theory relates the concentration in an industry to the degree of attainable scale economies (Viner, 1932). Few economies of scale will result in many small size entities in the sector and consequently a more competitive system, while large returns to

[1] The EU and national development agencies such as DFID UK (Department for International Development) have embraced the same goals.

scale result in few large entities and oligopolistic or monopolistic systems. Monopolies/monopsonies usually have a negative connotation of being related to price distortion, loss of social welfare (dead-weight welfare loss), loss of efficiency, and so forth. On the other hand more competitive systems are considered in theory as efficiency-increasing, cost minimising and as such, social welfare enhancing.

The cotton sector in SSA seems to challenge some aspects of IO. In general, more competitive cotton sectors have shown to be more efficient as far as prices received by farmers and cost efficiency are concerned, but have also shown that incentives for horizontal coordination among firms can be compromised undermining input provision. Such coordination is necessary to avoid free-riding risks and consequently allow for input credit and extension provision.

Actually, Tschirley, Poulton and Labaste (2009) argue that results of the sector liberalization to date appear mixed. They state that in East Africa, where reforms were adopted first and to a greater extent, liberalisation has shown a positive impact on prices received by farmers, but a negative impact on the quality of seed cotton; prices and quality being the two key issues in the sector. In those francophone Africa countries where reforms have been adopted, the result according to these authors has most often been that of switching from a state monopoly to a private or semi-private monopoly with no major changes for the claimed ultimate beneficiaries of the reforms: smallholder farmers.

Initially it may seem that price levels result solely from the sector structure and governance, but at a closer look other key determinants, such as quality and research, also play an influential role. Indeed, African cotton can differ in price considering quality premiums, which are partly due to the co-ordination inside the supply chains that can result in the monopolisation of the sector. It seems apparent that competition has consequences not only on seed cotton price, but also on the services provided to producers (such as the provision of credit for input, extension and research) and ultimately on cotton lint quality. Therefore,

even if these structures are theoretically more efficient, it is not clear whether smallholder cotton farmers are better off under this system than in a system in which they receive lower prices but have access to input credit and extension.

This study seeks to contribute to the ongoing debate on reforms of the SSA cotton sector. Although there are recent buildups, as for example Swinnen et al. (2011) and Delpeuch et al. (2011) who discuss contract enforcement as a new pivotal variable, literature on this subject generally individuates the collapse of the input credit system as the main cause of the failure of reforms in the sector. The latter is arguably one important cause in the disappointing outcomes of the liberalized SSA cotton sectors, but it is not to be considered the one and only such cause. Along with input provision I consider maintenance of quality as an equally important feature to the survival of the sector. Although a fall in quality following liberalization is actually often mantioned in literature, it is rarely treated in depth. Considering its importance over the long run, the purpose of this research is to contribute to the existing literature in that it sheds light on this critical feature. More specifically, the purpose is to understand if a liberalization of the SSA cotton sector has the positive effects claimed by the IFIs (International Financial Institutions) from a quality perspective considering the link with prices obtained on the world market. The objective is tackled from multiple perspectives, starting from an analysis of the SSA cotton sector, its dynamics and individuation of its critical peculiarities; ending with an empirical analysis of the effects of liberalization on what here is recognised as the critical feature of the SSA cotton sector other than input credit provision.

Section one lays out the bare bones of the cotton value chain, singling out each stage in the value chain: from the production of the raw material to the retail product. The purpose is to give a comprehensive overview of the present cotton-to-textile sector in SSA. The analysis also answers the question why grand part of the value added is not retained in the producing region.

Section two comprises two parts. Part one shapes the dynamics of the SSA cotton sectors from an Industrial Organization perspective, eventually reflecting industry-specific features. Furthermore, an Industrial Organisation analysis of the evolution of the sector from the nineteen sixties to nowadays is given, including an up-dated bird's eye view of reform experience per country. Part one ends with identifying which critical features in the SSA cotton value chain are sensitive to the changes in sector design.

Part two of the section analyzes three other SSA success cash crops (coffee, cocoa and tea) which have according to literature more succesfully become competitive. The purpose is to eventually draw a comparison with the cotton experience.

Section three and four focus on two sensitive features of the cotton sector: research and quality.

Section three gives a bird's eye view of the status quo of research and development (R&D) units devoted to cotton in selected SSA cotton producing countries, framed in a broader picture of general agricultural research and development system. Further, data on R&D expenditure are considered in the attempt of understanding if reforms and design changes have had any influence on the public expences directed to R&D in cotton in SSA.

The final section is devoted to a distinguishing feature of cotton production that is the presence of externalities in relation to the quality of cotton lint. Demand for quality in cotton lint has increased over time, due to the evolution in the spinning technology and to a saturation of the world cotton market. Lint quality is determined by the quality of the cotton fibre itself and by contamination (twigs, leaves etc.) thus involving a number of stages in the cotton value chain. The fibre characteristics of African cotton are in general superior to those of the cottons considered in calculating the Cotlook A Index and handpicking, which is general throughout Africa, can in principle ensure low contamination resulting in cleaner lint with fewer neps and can thereby obtain a premium on the world market. However, the achievement of such premiums is not inevitable. An analysis of the quality issues of cotton

and related externalities is drawn, eventually considering if reform experiences have affected this feature through an econometric analysis of data on prices and premiums (or discounts). The combination of the theoretical approach set out in sections 1 and 2 with the empirical analysis set out in section 4 have the purpose to provide systematic and comprehensive analysis. The empirical part of the dissertation includes data – average export premia for cotton before and after reforms - from the ASTI, the ICAC and Cotlook Ltd. This study should help analyze the success and failure of the African cotton reforms experience and the discussion of future policies both on the part of the producers and donors.

Chapter I

Mapping the SSA Cotton Sector

Introduction

The purpose of this chapter is to introduce the subject of cotton and its value chain in sub-Saharan Africa. I start with some "background information" on cotton in general and then pass to cotton in sub-Saharan Africa. In paragraph 1.3 I describe the cotton value chain more or less in general -keeping an eye on the cotton value chain in sub-Saharan Africa (SSA)- and finally, in paragraph 1.4, I focus on the peculiarities/criticalities of the chain in SSA.

1 Some general background information

The cotton plant belongs to the variety genus *Gossypium.* Although in the wild the plant grows up to ten metres high and is a perennial crop, for commercial cultivation it has been domesticated through breeding to range between one to two metres -in order to facilitate picking- and to be an annual crop. Regardless of its form –herbaceous or ligneous-, it thrives in dry tropical and subtropical areas. Among about fifty species of cotton plants within the world only four are cultivated for their fibres. The most commonly cultivated species of cotton in the world are *Gossypium hirsutum* and *Gossypium barbadense*. *Gossypium hirsutum,* oroiginally from Mexico, accounts for more than 90% of world fibre production. *Gossypium barbadense*, of Peruvian origin, accounts for about 5% of world fibre and includes some of the most precious species. The cotton plant is almost exclusively cultivated for its oleaginous seeds and for the fibres growing from them (i.e. cotton, strictly speaking). Cotton fibre is broadly classified into three categories based on the staple length; the short staple cotton has a staple length from one to two centimetres (cm). This kind of coarse cotton is used for carpets, blankets and coarse fabrics. The medium staple cotton fibre has a staple length in the range of one point five to three point five cm (American upland cotton belongs to this category). Long Staple (LS) and Extra Long Staple (ELS) cotton has staple lengths varying

between two point five cm to six point five cm. This is the highest quality fibre which includes varieties as Sea Island, Egyptian (Giza) and Pima cotton.

The importance of cotton has changed in time: although it was the prime driving force for industrialising Western Europe and the USA during the 18th and 19th Centuries, nowadays it only represents 0.12 percent of world merchandise trade (Baffes, 2007). Nonetheless, it is still the world's leading natural fibre used in the textile industry (UNIDO 2007) and one of the most important and widely produced agricultural crops in the world with around seventy countries producing the crop and one hundred and fourty countries involved in the export or import of cotton (FAO, 2006). Out of the sixtyfive cotton-producing countries in 2007/08, fiftytwo were developing countries, twentyone of which were indexed by the United Nations among the least developed countries (LDCs). Cotton is actually crucially important to several developing countries (UNCTAD). In a large part of sub-Saharan Africa (SSA) it is considered a critical cash crop with a role in poverty alleviation.

Table 1- Cotton producing countries per area

	Developed countries	Developing countries			Total
		LDCs	Transition	Other	
Africa		18		9	27
North and Central America	1			1	2
South America				8	8
Caribbean				1	1
Asia	1	3	6	12	22
Europe	3		1		4
Oceania	1				1
Total	6	21	7	31	65

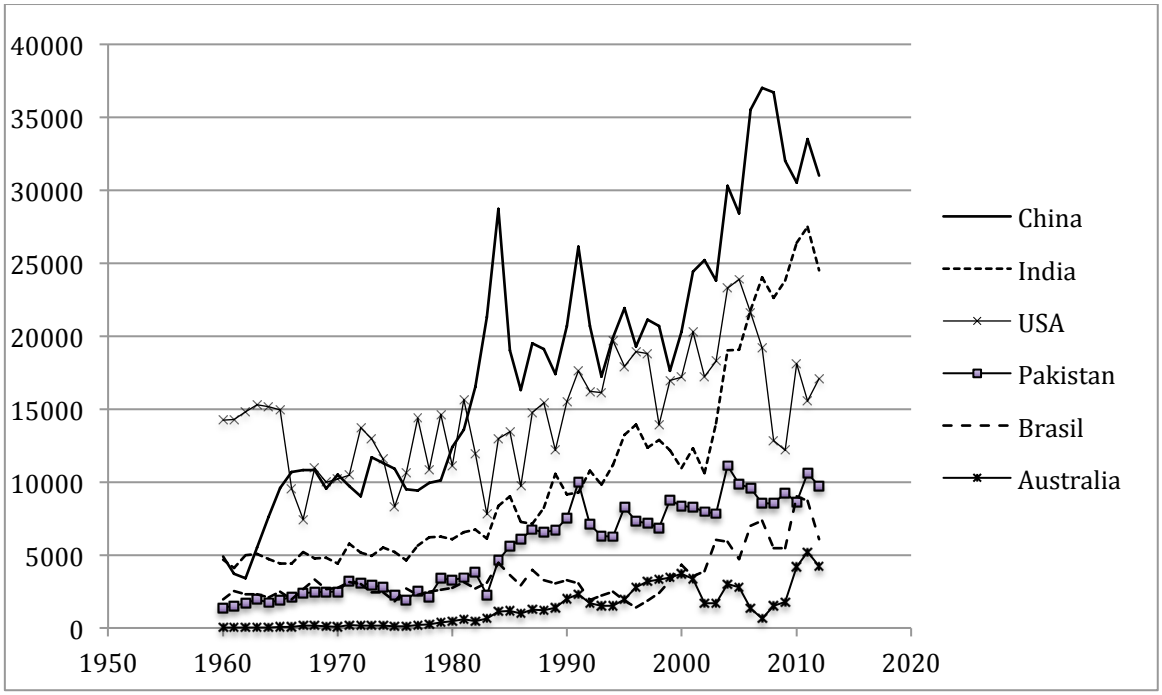
Source: UNCTAD

In general at the country level cotton contributes to national economic growth, employment and trade earnings, through exports of the raw material and through the provision of the raw material for domestic or international textile production. Cotton exports give access to foreign exchange. At the household level, cotton is an important cash crop for millions of farmers worldwide particularly for a large number of the rural poor in least developed countries. The income generated from the crop contributes to rural household food security and cash for non food purchases, especially in developing and least developed countries. UNIDO (2007) reports there are millions of people worldwide who derive their livelihood from the cotton's value chain and furthermore people are employed in the associated activities of trading and transportation of cotton.

World Cotton production trend

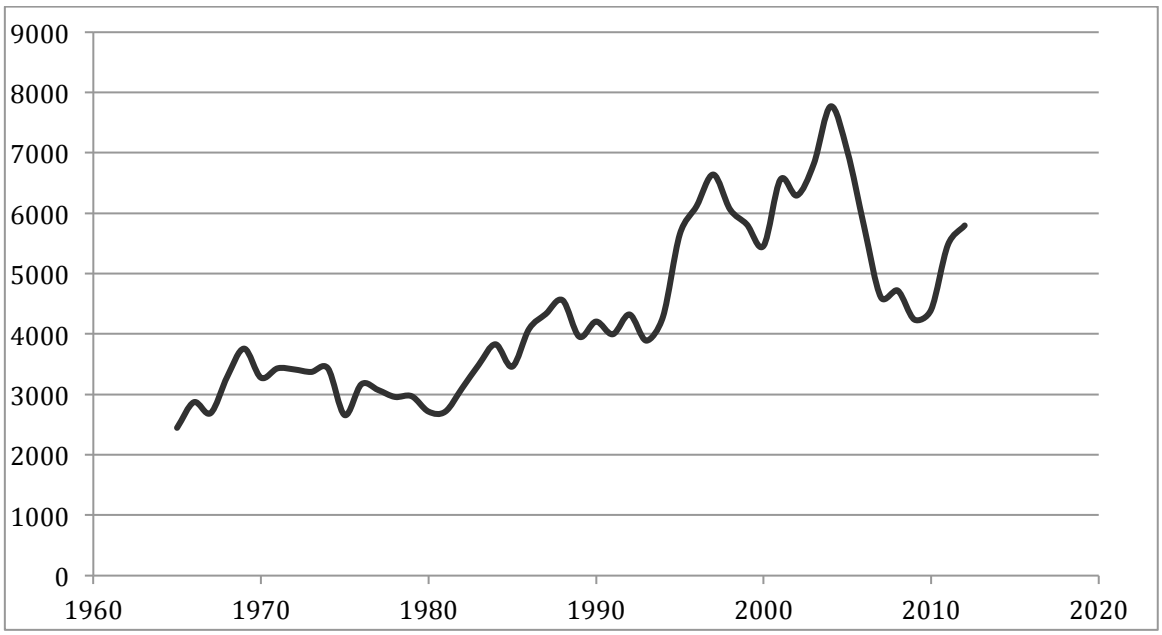
Over the past few decades world cotton production has steadily increased (FAO, 2007), mostly driven by the increase in yield since over the past fourty years the land cultivated with cotton has relatively stabilized while the average yield has doubled. A significant growth in production has also been registered in Africa (figure n.2) where production has increased by eighty-one percent from 1980 (FAO, 2005), though this was due to an expansion in cultivated land. In fact, many major producing countries in SSA such as Benin, Burkina Faso, Mali and Zimbabwe have seen their output more than double in the past twenty years and West and Central Africa (WCA) has gained importance in terms of production. When WCA countries are considered together, these are among the major cotton producers in the world. In the 1960s major cotton producers were the United States, China, India and Pakistan and as shown in figure n.1, little has changed since.

Figure 1. Cotton production from 1960 to 2011 for the world major cotton producers



Unit of measure: 1000 480 lb. Bales Source: USDA

Figure 2. Cotton production in SSA



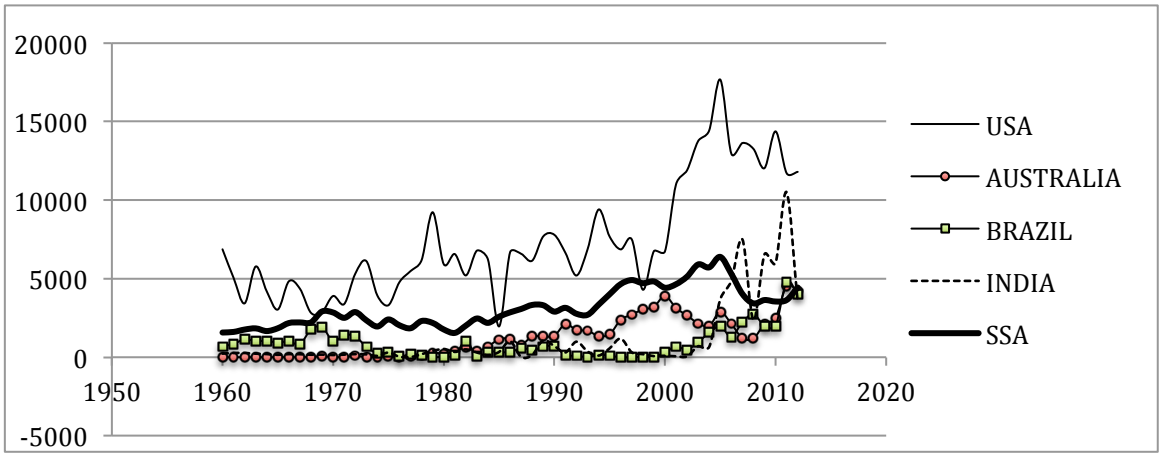
Unit of measure: 1000 480 lb. Bales Source: USDA

Cotton and Trade

Cotton is a heavily traded agricultural commodity in the world market and is greatly

influenced by trade in textiles and clothing. Although a large number of countries (nearly one hundred and fourty in 2006, FAO) are involved in the export or import of cotton, trade in cotton is dominated by a few importers and exporters. Four dominant exporters – USA, Francophone Africa, Uzbekistan and Australia - account for more than two-thirds of exports. China, Turkey, Pakistan, Thailand and Bangladesh accounted for sixty-four percent of world cotton imports in 2006 (FAO). In particular, China imported nearly forty-four percent of the world cotton traded (2006) becoming the leading importer of cotton, in line with the expansion in its spinning and textile industries. The past decades have been characterised by a shift in the geographic location of the cotton consumption and cotton yarn and fabric production from developed to developing countries as a consequence to the decline in cotton mill use in industrialised countries - namely in North America, Western Europe, Australia and Japan - and to the removal of textile and clothing quotas in 2005 (UNIDO). A rapid increase in mill consumption has contextually taken place in Asia which resulted in an increase in the demand of cotton with a consequential shift in trade flows from the four main exporting countries/regions to Asia, which now accounts for around seventy-five percent of world cotton imports (UNIDO, 2005). Over the past decades SSA countries have gained importance as a source of exports: Burkina Faso and Mali are estimated as the world's seventh and ninth largest exporters in 2012 (USDA).

Figure 3. World major cotton exporters



Unit of measure: 1000 480 lb. Bales Source: USDA

Prices

Cotton is in general priced in line with the Cotlook A Index pricing system although there exist a variety of pricing systems[2]. The Cotlook A Index is an index of the level of offering prices on the international market. The daily quotation is an average of the cheapest five quotations from a selection of sixteen upland cottons traded internationally. Prices are expressed in US dollars (or cents) per lb, c.i.f. (cleared, insured and forwarded) for delivery at a Northern Europe port. Premiums and discounts above or below the A Index are obtained in relation to various components. In addition to the A Index, there are quotations for coarser quality of cotton (the B Index), which is the average of the three least expensive of eight styles.

As for other major commodities, world cotton prices have been under intense pressure with a downward turn since the mid-1990s (figure 4). A number of factors are generally adduced to explain the instability and significant downward trend in prices. On the supply side, fluctuation in world market prices is influenced by unpredictable fluctuations in production in and export from India[3], Pakistan and China. The three countries are major producers and contextually major consumers of cotton; as a consequence lint is only exported when the cotton harvest is larger than domestic demand. China[4] in particular, is the main 'swing' factor in world cotton trade and has a very strong impact on cotton prices. Other reasons advanced, are supportive government policies enacted by few developed cotton producing countries, which are considered to have been to the detriment of world cotton prices. The immediate effect of subsidies is to increase and maintain cotton production at otherwise unprofitable levels, mostly in industrialized countries. The excess supply that is induced by such subsidies has a depressing effect on the world market price. The claimed magnitude of the impact varies from one study to another due to the range of assumptions used. Among

[2] In the US, domestic cotton is priced against the NYMEX cotton contract.
[3] This year's repeated news on India's ban on cotton exports has had an immediate (boost) effect on world cotton prices (Cotton Grower)
[4] in particular its decisions regarding cotton stocks

others, according to Poulton (2008), US, EU and Chinese subsidies depress world cotton prices by around ten to fifteen percent in the short-medium term, reducing returns to producers in other major exporting regions such as West Africa, that do not benefit of such protective policies. Other estimates (Marianne citing Badiane et al. 2002) suggest, that the removal of US subsidies would lead to a substantial fall in US production, with a consequential rise in the international price in the short term by as much as 12 cents per pound. On the demand side, demand for raw cotton is driven by demand for textiles which in turn depends upon population increase, economic growth, and the price of man-made fibres, particularly of synthetic fibres which fiercely compete with cotton. Synthetic fibres have increased their share of the textile fibre market from fourty eight percent in 1995 to fifty five percent in 1999 (Minot and Daniels, 2002). This has further depressed demand for cotton and cotton prices (Baffes, 2002).

Figure 4. World cotton price trend

Source: ICAC

Consumption

Independently from its price trend, consumption of cotton has stayed quite steady when considered per person and has generally been growing in line with world population. Things change when we consider the ratio in world total fibre consumption. Until man-made fibres

appeared in the market (1940) cotton consumption was more than eighty percent of world total fibre consumption (from the beginning of the 20th century until the end of the second world war). In the 1940s, when man-made fibres appeared, a decreasing trend in cotton demand started and hasn't stopped since. Cotton demand is strongly influenced by prices of man-made fibres (artificial and synthetic fibres) and since the early 2000's, cotton consumption has fallen to roughly thirtynine percent of world fibre consumption. Contextually, the share of synthetic fibres rose to fifty-eight percent up from five percent in 1960. Cotton consumption is higher in developed countries than in developing countries, but it is considered that the latter could play a key role in driving the increase in cotton consumption in the future. The current cotton consumption level in developing countries is actually very low, less than twenty-five percent of that in developed countries in 2004, but preliminary results of FAO/ICAC world cotton market projection for year 2015 suggest that world cotton production and consumption will continue to grow considering population growth and economic expansion.

2 Cotton in SSA

Cotton, which is an important cash crop as well as the major export commodity in many parts of the world, has an even greater importance in the African continent where the crop thrives thanks to climatic conditions. In Africa there are six cotton basins, the largest being the West African basin which stretches from Senegambia to South-Eastern Chad and even to the heart of the Central African Republic. Most importantly, cotton is a critical commodity in a large part of sub-Saharan Africa (SSA), which is acknowledged to be among the poorest regions in the world and where cotton is produced using relatively low levels of inputs and relatively cheap family labour compared to many other cotton producing regions in the world (UNIDO, 2007). In SSA, cotton production is mainly rain-fed and is concentrated in the tropical zone where dry seasons and humid seasons alternate. In SSA cotton is typically produced as a cash crop by smallholder subsistence farmers, on small family farms, with an

average size being less than one hectare. In West and Central Africa[5] (WCA) more than two million rural households rely on cotton production to earn their living (Baffes, 2007). The number increases to some 15 million people when the indirect dependence on the crop is taken into account (UNIDO, 2007; UNCTAD). In some regions cotton is the only cash crop and as such it represents the most important economic activity. In the Sahel for example there have historically been very few alternative crops. In terms of exports it ranks second to cocoa, but is more widespread through SSA and although we will not find Africa among the three world major cotton producers (table 1), West and Central Africa (WCA) alone is the world's third greatest cotton lint exporter (table 3). At the country level, cotton is also an important source of foreign exchange earnings and income from taxation for cotton producing countries in SSA. The cotton sector's share in the total merchandise exports of WCA ranges from 25 to 45 percent, while its share in GDP ranges from 3 to 6 percent (World Bank, 2004).

[5] Out of the 12 leading African cotton-producing countries, eight are in West Africa.

Table 2. Macro-economic importance of cotton in selected cotton producing countries

Average for 2006-2010	Cotton Lint Exports (in million US $)	Share in Country's Agricultural Exports
Benin	135.3	28,69 %
Burkina Faso	184.5	60,87%
Cameroon	88.1	11,47%
Chad	37.4	38,75
Mali	119.2	42,62%
UR Tanzania	65.7	8,39%
Zambia	45.9	12,14%
Zimbabwe	112.7	16,65%

Source: Faostat

Moreover, in contrast with the rest of agriculture, the sector has shown a three-fold increase in production from 1960 to 2001 and still shows to have an important growth potential on the world market due to the high intrinsic quality of the African fibre and to its relatively low unit production costs.

Cotton has been regarded as a major example of a "success story" in the agricultural development in SSA as confirmed by the big dimensions of the sector in most of the region. As such it is critical to rural economies and has consequences on macroeconomic stability. Consequently, world cotton price developments have major implications in the war against rural poverty. For example, it has been estimated that a forty percent decline in price would lead to a seven percent reduction of the rural income in Benin (Minot and Daniels, 2002).
The role of cotton as a major source of income, employment, foreign exchange, and tax revenues and thus as a pro-poor growth critical factor is generally recognised.

History

Cotton was only introduced into most of SSA in the twentieth century during colonisation (anglophone Africa) or right after independence (francophone Africa). The main reason for its introduction was the need to supply the colonisers' (or ex-colonisers') textile industries which had been deprived of their major sources of supply as a consequence to major strikes in India (1850's) and later the Civil War in the US (1861-1865) which resulted in the disappearance of the unpaid labour of slaves. The combination with the rapid development of the textile industry in Europe resulted in the pressure for new sources of cotton and European governments turned to their African colonies. In 1903, the English established in Nigeria the British Cotton Growers Association (BCGA) following the trials in The Gambia and Sierra Leone. The French government engaged in a few unsuccessful trials in the Senegal Valley, where a long-standing cotton tradition was already present, then the Casamance, and Mali. Finally, it was the savannahs of French Equatorial Africa (AEF), lying between Cameroon, Chad, and the Central African Republic, that constituted the first successful cotton basin. Since the 1970s, the latter is still the most important basin in the region (42% of West African production) ahead of the Nigerian basin (38%). In WCA cotton production was also given the role of engine of development in a broader rural scenario and governements assumed a primary role from the beginning. In those areas, cotton played a major role in rural development by facilitating input supply for other crops in cotton zones and helping farmers invest in animal traction and other equipment that improved overall farm productivity and incomes. In East and South Africa (ESA) instead, cotton cultivation originated from commercial or missionary activity, and local governments assumed a role in the sector only later on. A part from these differences, throughout SSA the sector was organised as a state monopoly[6], resulting in vertical integration and public companies providing factors that are to date still considered critical to the sector: input credit, research,

[6] Actually the organisation was a monopsony for seed cotton purchase and a monopoly for cotton input sale.

extension, and the price announcement system. It is often described as the *"cotton system",* which provided:

- the procurement of inputs (fertilizers, pesticides, etc.),
- the supply of agricultural services (extension, training and supervision, and support for producer organisations),
- the organisation of marketing, and the setting-up of basic economic and social infrastructure, such as roads, schools, health centres, etc.

Nowadays the sector is not as homogeneously organised and its design varies from the former vertically integrated system to a competitive system and all that can be in between. This will be analysed in chapter 2.

3 Value chain from cotton to garment

In this section I will first go through the cotton value chain in general, keeping an eye to its characteristics in SSA. I will then re-analyze the cotton value chain highlighting the criticalities peculiar to it in SSA.

In general

A cotton value chain may be generically thought of as a simple linear string of transformations of a raw material into a final consumer product. A value chain typically has about five stages: production, processing, distribution, retail, and consumption. For cotton this goes from growing cotton, followed by harvesting, to ginning, spinning and then knitting or weaving yarn into fabric, and finally to garment manufacturing. In fact, cotton travels through a much more complex supply chain, involving a number of interconnected stages which include (origin of) farm inputs, farm technology, cultivation, harvesting, storage, processing which entails the extraction of fibres, primary processing of the fibre for marketing, to secondary processing of the fibre to yarn, then dyeing and other processing to convert the yarn into fabrics, making clothes and garments. Each step also needs to be supported by services such as credit and transport, institutional services such as

infrastructure, markets, grading, standard, research and extension.

At a closer look

Cotton in SSA is produced by smallholder peasants whose farms range around two hectares. If we skip land preparation, a labour intensive activity rarely done with the aid of machinery in SSA, the first step in the cotton value chain will be planting and cultivation. In this stage inputs are: seeds, fertilizer, pesticide and labour. Of the total farming cost, pesticide takes the largest share. Actually, cotton is in general the most pesticide consuming crop (ICAC).

Following cultivation is harvesting. Cotton can be harvested either by hand or machine. Although 40 countries harvest some cotton by machine, only three (the United States, Australia and Israel) harvest approaching one hundred percent by machine (ITC). About seventy percent of the over one hundred million bales of cotton produced globally are harvested by hand. This is a labour intensive activity and as such it is suitable for the SSA region which is abundant in low cost labour.

The harvested raw cotton is then stored, usually in collection points. Adequate storage facilities for seed cotton are essential if we consider that weathering reduces its quality. Seed cotton may be stored in piles on the ground, or in sheds, storage houses, trailers or modules so long as it is protected from weather damage and from excessive ground moisture. Moisture content, length of storage, amount of high-moisture foreign matter, variation in moisture content throughout the stored mass, initial temperature of the seed cotton, temperature of the seed cotton during storage, weather factors during storage (temperature, relative humidity, rainfall), and protection of the seed cotton from rain and wet ground all affect seed and fibre quality during seed cotton storage.

Successively cotton makes its way to the ginner/s which are usually located in the cotton growing area but not necessarily. In this stage the conditions of existing infrastructure, i.e.

roads, railways are important.

At the gin the seed cotton is processed. The ginning process is classified into ginning and pressing, i.e., putting the ginned cotton into layers. First, large trash components such as burs, limbs, and branches must be extracted from the seed cotton before they are broken up and embedded in the cotton, this is the seed cotton cleaning stage. Subsequently, cotton is processed by the gin stand. Ginning is, in its strictest sense, the process of separating cotton fibers from the seeds. The technology used in ginning can be either saw gins or roller gins. In SSA saw gins are generally used. Fibre represents forty-two percent of the ginning output, the remaining fifty-eight percent is cotton oil seeds and planting seeds (ICAC, Cotton Facts). The next step is bailing and packing: staple fibres are compacted by mechanical means into bales (bailing)[7]. Bale packaging is the final step in processing cotton at the gin. Packaging materials have shown to be important related to the maintenance of quality of the cotton lint and the trend is to move towards packaging materials made of cotton themselves.

The ultimate objectives of the ginner are to produce lint of satisfactory quality for the grower's classing and market system; and to gin the cotton with minimum reduction in fibre spinning quality so that the cotton will meet the demands of its ultimate users, the spinners.

The extracted cotton fibres and cottonseed are then marketed. Cottonseed is predominantly used and thus sold in the domestic market[8]. It goes to domestic edible oil mills which process (crush) the cotton seeds mechanically to obtain cotton seed oil used for human

[7] Bales are formed at the end of the ginning, drying and cleaning process by accumulating cotton fibres in a chamber called a press box. While in the press box, bulk cotton fibre is compressed by hydraulic rams straps or bands are added at the press box to contain cotton fibres to form the bale. (Cotton Exporter's Guide)

[8] In many West ans Central African countries, cottonseed oil (used as oil or margarine) provides the main source of fat and oil supply and has several food applications. Actually, according to FAO statistics, it can be considered that only 3% to 5% of the African cottonseed oil production has effectively been exported over the 2000-2005 period. Cottonseed oil may also be further refined for use in soaps and cosmetics. According to the United States Department of Agriculture (USDA) statistics (December 2008), cottonseed oil ranked fifth in production among vegetable oils in the 2007/08 crop season with a bit less than 4% of world volumes. UNCTAD

consumption. The residue, i.e. oil cake residue or cotton seed meal, is high in proteins (about 40%) and is usually marketed for livestock breeding although it can have other uses such as fertilizer. The fibres instead, are sold to domestic or international textile and garment factories directly, or through international merchants after being classed.

Classing is the determination of the quality of the fibre. The quality of the cotton fibre is determined by three factors, namely, the colour, purity (the absence of foreign matter) and quality of the ginning process, and the length of fibres (USDA). Classification is not mandatory, but growers generally find it essential to marketing their crop. Prior to the development of official standards, cotton was marketed primarily on the basis of its variety and where it was grown, although some physical standards for cotton classification (sets of physical samples) were used privately. In 1914 the US Department of Agriculture established physical standards as a means of determining colour grade, staple length and strength, and other qualities and properties with the United States Cotton Futures Act. These standards have thereafter been agreed upon and accepted by the leading European cotton associations and exchanges (USDA). An invariably binding international standard has not been adopted as yet and there are cotton producing countries that have taken up their own standard related to their cotton.

Once it is graded, the cotton lint is marketed. The lint cotton is marketed through an auction process like cotton oilseed. The auction is usually held for each grade or specific quality of the lint cotton. While the domestic buyers, mainly the textile factories, obtain information about the tender directly from the local media, buyers from other countries access the market either through international trading companies or, less often, through direct contact with the producer. The majority of internationally traded lint is handled by trading companies which play a key role as bridges between ginners and spinning mills which represent the next stage in the cotton value chain. Trading companies buy cotton from far reaches of the world and

sell it through global markets.

The major end use of cotton fibre is wearing apparel, which accounts for about sixty percent of cotton consumption (ICAC). Other major end uses for cotton fibre include home furnishings (draperies eventually the third major end use, ICAC) and other industrial uses such as medical supplies or professional garments.

The second part of the cotton value chain starts with the fibre - obtained from the ginning process- reaching a spinning mill. Spinning is the process of making yarn from unbundled fibres: this is where the fibre is spun into yarns and threads. Cotton fibre reaches the spinning mills in the form of bales which undergo a series of processess before spinning takes place. In order to ensure homogeneity, which is particularly important in the spinning process, cotton bales are sampled in terms of lint quality and origin. They are then opened through bale openers to make lint fluffy and ready for the cleaning stage during which air-jet cleaners remove extraneous matter from the lint. At this stage loose fibres are not aligned and parallel in a single continuous strand. The carding stage separates, straightens, aligns and condenses fibres into a single continuous strand, removing impurities. A sliver of approximately one-meter width is then obtained. Carded cotton may be combed, but this is an optional process and is only used to produce superior quality yarn and with long, or extra long-staple fibres.

The yarn obtained from spinning can further undergo either weaving or knitting to obtain fabric. This can be then processed by a second group of business units specialized in finishing, i.e., bleaching, dyeing, printing and optionally other processes. The "finished" fabric can eventually undergo processing in the final group of business units in the chain, specialized in cutting garment and manufacturing (sewing) fabrics. Clothing is then produced and further distributed to retailers.

The finishing part of the chain accounts for a substantial part of the value added.

4 A Critical overview of the cotton value chain in SSA

In this secion I will critically go through the cotton value chain that is specific to SSA, accounting for the plusses and minuses (breakdowns in the flows of the chain) that characterize it.

Land preparation

Cotton is considered a particularly demanding crop: it causes land exhaustion possibly leading to soil degradation and eventually desertification. This has been experienced throughout the WCA region for example, despite the increased use of fertilizers (UNIDO, 2007). Thus, especially in cotton cultivation areas in SSA, soil fertility needs to be accounted for. At present, extension services are failing to educate producers on the correct use of fertilizers, successful crop rotation (with a culture of leguminous plant and one of cereal), fallow periods, replenishment of organic matter, tillage, water control and so forth as measures to avoid a decline in soil fertility, soil erosion and eventually desertification. In a UNIDO report (2007), laboratory analysis of soil by each farmer is recommended as a means to a more rational use of fertilizers and to increase productivity.

Planting and cultivation

Cotton is an input-intensive crop. Inputs necessary for cotton production are expensive for the small SSA farmer and cannot be done without if a profitable result is pursued. Due to lack of credit associations in the SSA area, farming inputs and equipments generally need to be taken on credit basis, offered based on an implicit agreement that the small farms will sell their final harvest to the ginners who give out the credit. Such kind of arrangement has remained to be the only alternative that the small farms have in the SSA area (Poulton et al. 2008; Abudullahi and Ayele, 2008). Input provision is often pointed out as the weak link in

the chain that makes competitive cotton sectors fail as a consequence to side selling - not enabling ginners to recover from the cost of input credit provision.

As far as seed inputs are concerned, particularly important is the quality of cotton seeds – determined by variety, production and storing- all of which have consequnces on productivity and fibre quality. Research plays a role not only in the development of seed variety but also in seed reproduction which contrasts the distribution of "second hand" seeds (which entails poor quality and low germination). One example for all is the drop in lint quality recorded in 2006/2007 in Uganda, in grand part due to the break down in the seed wave which has caused the sector to be using 2002 (old) seeds (Ministry of Agriculture Uganda, 2009). Quality of cotton is also hampered when seeds are distributed late in relation to planting time. Research including seed multiplication, remains mainly a public expenditure matter in SSA. The private sector participation in the research stage in the cotton chain is still trivial as a consequence to inadequate intellectual property rights legislation (UNIDO, 2007; USAID). These issues will be considered in more detail in chapter three which I dedicate to research in cotton in SSA.

Input provision, be it from producer organisations, cooperatives, ginners or private traders, also needs inputs to be selected, stored and distributed.

Harvesting

Cotton may be either harvested by hand or with the aid of specific machines (machine-picked). Hand picking sees farmers collect cotton flowers into a big bag each picker has. The material used for such bags has been on trial since in most cases polypropylene (PP) is used, which has shown to contaminate cotton in an undetectable way until it is dyed, thus having consequences on textile quality. Some ginners have therefore decided to distribute cotton-made collecting bags to farmers to avoid this problem. Contamination still remains a major problem which has consequences on quality reputation and thus on price. Extension services

should educate and train farmers not to collect cotton in PP bags nor allow presence of foreign matter in the bags or collection points (UNIDO, 2007). Use of cotton bags needs to be incentivized so as to assure elimination of contamination and the consistency in quality that international merchants seek for.

Machine picking is faster and gives a reliable result. Still it is less accurate –higher levels of vegetal matter leaf and twig fragments are left- and kind to the flower than hand picking and the quality of the resulting lint is lower. Machine picking of cotton also demands a defoliation stage before cotton flowers can be picked. In addition, the necessary machinery represents a non trivial cost which most SSA cotton producing countries are not yet able to face.

In SSA cotton is still mainly hand-picked. This was once considered an advantage since it better protects the quality of cotton and is considered to deliver cleaner cotton, thus making it a potential candidate for the premium price on international markets. Nevertheless, international merchants have been in recent years showing a preference for machine picked cotton because of its reliable though less ambitious results while hand picked cotton is more aleatory and is also subject to contamination from PP. As a result, machine-picked cotton currently trades at a premium over hand-picked. Poulton et al. (WB 2008) consider that if the institutional arrangements were put in place to give smallholder farmers strong incentives to avoid contamination of their seed cotton, hand-picked African cotton could achieve useful premia over the benchmark A Index lint price. An example is the Zambian cotton which has seen an increase of eight to ten percent in the total lint value with a rise in its premium over the A Index price. Contamination is a particularly important issue: according to a World Bank report (2008) solving the contamination problem means a "significant increase, both in quantity and in the unit price of WCA exported cotton…" and as such should be a top priority. Tschirley and Kabwe (2007), consider that there is an increased demand for quality in the world cotton market as the premia and the discounts have increased. The authors also

claim that contamination of cotton in Africa has been shown to reduce premia by up to twenty percent.

Harvesting is thus an important stage since it entails the cleanliness of the raw cotton. Cotton that will be processed by gins needs to be clean from trash – foreign matter such as vegetal parts and seed coat fragments- since dirt particles in the cotton flower can seriously damage ginning machines thus leading to additional costs. According to the International Textile Manufacturers Federation (ITMF) Cotton Contamination Survey 2011, "foreign matter, stickiness and seed-coat fragments in raw cotton pose serious challenges to the cotton spinning industry worldwide.". Notably, the survey also identifies where from and to what degree comes clean or contaminated raw cotton, which arguably has consequences on country reputation. In the 2011 Survey, very clean raw cottons were recorded to have originated among others in Benin and the United States, while the most contaminated cotton originated in Nigeria, Zimbabwe, India, China and Turkey.

Storing

Once collected, cotton is then sold either at the farm or in collection points where it is stored. There is a general lack of storage facilities close to producers. Contamination needs to be contrasted at this stage also for example by making better storage devices available instead of just leaving the harvested cotton in open air in collecting points.

Transportation to the ginner for processing

While it may be said that cotton is bulky to transport in general, additional considerations need to be accounted for when referring to transportation in the SSA region. Here SSA has in general, a competitive disadvantage which also needs to be considered in the stage after processing, when cotton lint is transported from the ginner to the port, to leave for international destinations. The competitive disadvantage is related to the region in general,

but landlocked countries are particularly concerned: transporting cotton from landlocked countries to ports is known to be costly, difficult and time consuming. The high transport costs are a consequence of a number of facts. First of all, the infrastructure of the transport network is not well developed as a consequence of neglected investment in basic infrastructure, namely roads and railways but also ports. However, there are more reasons and even when roads are reasonable, freight transport costs tend to be higher in Africa, for example in comparison to Asia: as of Poulton et al. (WB 2008) these are up to four-five times higher in Francophone Africa than in Pakistan or India on comparable roads. Among other causes are high costs for new vehicles due to high import duties, also on spare parts (higher in comparison to Asia), slow and corrupt border crossings, high fuel prices, and institutionalized rent-seeking in the form of trucking syndicates (USAID). Moreover, Asian drivers are also given a greater degree of responsibility for business performance than their counterparts in Africa which encourages them to use freight forwarding agents, and drive at much lower speeds with consequent lower fuel and accident costs (Poulton et al., WB 2008).

Ginning

Once the raw cotton has reached the gin, it is processed. The technology used to separate the cotton fibres from the seeds, i.e. ginning, can be either the saw-gin or the roller-gin. In SSA the saw-gin is used almost invariably (one exception is Zimbabwe). The reason is that the saw gin is much faster and as such less expensive to operate. The roller-gin instead, is slower, i.e. with a low ginning rate, but is on the other hand more gentle to the cotton flower and tends to break down less the fibres compared to the saw-gin. Notably, this makes the roller-gin more suitable for processing valuable long-staple cottons such as SSA ones. In fact, it is used in the US for ginning Pima cotton so as to protect its extra long staple which is acknowledged to increase the quality and thus the value of the cotton fibre. For the same reason, Egypt, a major producer of Long Staple (LS) and Extra Long Staple (ELS) cotton,

also uses roller-gin equipment. The saw-gin is actually more suitable for ginning short staple upland cottons. Ginning has a role in maintaining cotton quality, and is a prerequisite for obtaining good ginning outcome thus, it is not surprising that it is recommended that SSA cotton producers (UNIDO, 2007) invest in roller-gin installations instead of keeping the existing "obsolete equipment" operating[9]. In addition, the roller-gin has a robust structure with no major breakdown or maintenance problems. Maintenance of old equipment has actually been highlighted as the highest cost in the ginning stage, followed by the cost of power which is also a major problem. Criticalities related to electricity are its high costs[10] and the inadequacy of its supply which is hampered by repeated interruptions[11]. Electricity is actually a recurrent problem in SSA and the inadequacy in its supply affects also other stages of the cotton value chain.

Ginning has been described as one of the weakest links in the existing SSA cotton chain (UNIDO), due to the need of renovation in terms of technology, management and integration to increase capacity utilization. Still more than ninety percent of total ginning costs have been calculated to be variable costs showing that the cotton ginning business can be profitable and its profitability can be enhanced by incresed capacity of operation to harness economies of scale. Profitability in the ginning stage is measured by the Ginning Outturn Ratio (GOT), i.e. the ratio of lint to seed cotton produced by the ginning process. Anglophone SSA cotton producing countries seem to have in general a lower current GOT in comparison to Francophone SSA, this is in grand part due to low capacity utilization as a consequence of low cotton production[12] which also causes many ginneries to be in a state of disrepair or lie idle. The main problems ginners face in SSA include inadequate cotton

[9] It entails buying spare parts and costs for maintenance
[10] The Ministry of Agriculture (..) of Uganda reports that the costof electricity is more than twice that in competing markets of Bangladesh and China.
[11] Abudullahi and Ayele report that electricity interruption results in almost twenty percent of the idle time of the ginning factory studied in Ethiopia.
[12] According to the Report (2009) by the Ministry of Agriculture of Uganda the current ginning outturn (GOT) is 34% in Uganda as compared to say 44% in countries like Zimbabwe. Cotton ginning in Uganda is characterized by excess capacity and a low ginning outturn. Only ten-twenty percent of the installed capacity is used.

volumes, high cost of power and its reliability, lack of crop finance and high transport costs.

Bailing

Once the cotton is ginned and separated into lint cotton, cotton oil seeds and planting seeds, the lint is bailed and packed to make it ready for market. In this stage also, contamination must be fought against. Ginneries in SSA still mostly use PP to pack cotton which as mentioned, can create a problem to the final quality of the lint and is only detectable once the lint is dyed, thus late in the chain. Investment is needed if cotton packing is to be used (UNIDO, 2007), this also happens to be the most expensive among possible packing materials.

Classing of the cotton lint

International merchants have a preference for reliable and universally accepted methods of determination of cotton quality parameters. In the USA, Australia and Brazil and other cotton producing countries for example, instrument classification has been adopted (High Volume Instruments). High Volume Instruments (HVI) equipment enables a step towards standardized instrument testing for cotton. This equipment enables various physical parameters of cotton fibres, such as fibre length, short fibres, fibre length uniformity, fibre strength and elongation, micronaire, maturity, colour, and trash, to be measured and recorded instantly. Still even HVI need to ultimately make these measurements recognised invariably in the international trade of cotton[13]. In SSA, almost all cotton is still manually classed and graded. Manual grading is based on appearance and feel, and is accomplished mainly through the senses of sight and touch. Manual grading includes determinations for such factors as colour grade, leaf grade, staple length, identification of foreign or extraneous matter. These determinations are based upon visual comparisons with physical and

[13] HVI testing needs to overcome problems related to the uniformity of its testing

descriptive standards. This kind of grading causes the incorrect positioning of SSA cotton in the international markets to the detriment of prices obtained by exporters and growers (UNIDO). Exceptions are Côte d'Ivoire, Mali, Togo and Senegal where HVI systems have been installed. Consequently HVI data can be provided when selling cotton from such countries.

Another gap in the marketing infrastructure for cotton is a missing African standard for cotton and an African quality label. This would make SSA cotton quality recognisable in the world market and thus increase its market value. Virtuous examples do exist: official cotton standards have been put into practice– the Tanzania Cotton board for example has established quality standards for those attributes of cotton that affect quality in general in the cotton value chain, be it of the finished product or of the manufacturing efficiency; Benin has its own cotton labels for different quality grades.

From the ginner to the spinner

Once that the cotton lint is graded, it is auctioned off to domestic spinners or international trading companies - in place of international spinners. The reference price is the Index A Cottlook price, or Index B for short staple cotton. Each producing country will achieve a different export pricing due to a number of issues raging from differences in quality parameters (premia or discounts), to differences in geographic location. In particular, the amount of inland transport necessary to reach the nearest port, a warehouse or the designed spinner, will be to the detriment of the price eventually negotiated. Countries which enjoy coastal advantages have significantly lower transport costs. Additional pressures on exporting prices have been accused by Francophone African Countries owing to the liaison of their currencies to the Euro which has in recent years been strong against the US Dollar.

From fibre to garment

The cotton sectors in SSA are predominantly export oriented, as almost all the lint is exported in fibre (raw) form. It is estimated that about ninety percent of the fibres are exported, while only ten percent are processed into yarn and then textiles by local industries, partly considered to be due to the demand for foreign currencies by parastatal marketing organizations (ICAC, 2008). In fact, the textile and garment industrial capacity is considered to be the world's weakest in comparison to other cotton producing regions of the world (UNECA, 2009). The only development in this direction has been the traditional textiles industry, which has existed in the region for more than fifty years. The textile industry capacity is in general also much less than local cotton production in almost all sub-regions of SSA. This is a lost opportunity since the substantial part of the value added in the cotton value chain -about eighty to ninety percent of the value (UNECA, 2009)- goes to foreign ginners and textile industries. Hence, Africa's cotton production is considered to be generally under-exploited[14].

However, there are differences between Francophone and Anglophone SSA. Francophone Africa first recorded a boom in the textile industry from 1965 to 1985, which has then been eroded by a subsequent crisis. This has brought especially spinning, weaving and knitting plants to go out of business. Consequently, Francophone countries export more than ninety percent of the cotton they produce in the form of (unprocessed) fibres. In Anglophone SSA instead, up to ninety percent of the cotton produced is consumed domestically by the textile industry (e.g. Nigeria and Ghana). The Gambia, Ghana and Niger, actually have higher processing capacities than their actual cotton production, but their production of cotton is remarkably low compared to other SSA subregions. In fact, production of cotton in

[14] This is true as far as the production of cotton lint is considered, but not for the production of cotton seed oil or cottonseed cake. Infact, cotton grain is largely processed, particularly to extract the oil for human consumption and the cotton seed cake for cattle feed; cotton oil is ranked fifth in terms of global cooking oil consumption and oil cake ranks second in animal feed consumption, behind soya. (FAOSTAT)

Francophone countries is much more copious than that in Anglophone countries (Appendix 1).

In general, what is described as the "middle" of the value chain - specifically spinning plants, weaving mills, knitting units, and dyeing and finishing units - is largely missing in SSA (USAID, UNIDO, UNECA). Following is a review per step in the fibre to garment part of the cotton value chain.

Spinning

The existing equipment across SSA is old, obsolete or low-productivity. USAID (2006) reports that in Francophone Africa installed spinning capacity is just under four percent of the cotton crop and that in 2006 lint consumption by spinning mills was even less - only two percent. Spinning plants have been calculated to need a seventy-five percent rate capacity utilization in order to be profitable, in 2006 in Francophone Africa the rate was fifty-seven percent for spinning mills, much below the needed level (USAID). Anglophone Africa is not very different. Spinning capacity in Uganda consumes up to ten percent of domestic lint production (production is less copious than in Francophone Africa), but there are only two operational spinners that are also subsidized with much of its spinning capacity lying idle and about ninety percent of Uganda's lint exported raw i.e. not spinned.

In general spinning is hampered by various problems across SSA, including cost and reliability of power, human resource capacity and high cost of accessing seaport. The lack in trained personnel has spinning and weaving depend on expatriate staff, entailing higher hiring costs. The spinning stage is also affected by the shortcomings in cotton classification afore reported: spinners demand certain fibre characteristics (notably length, strength, uniformity of fibre and maturity) which are not comprehensively accounted for by manual classification, thus calling for investment in machine testing also related to spinning

imperatives. Recovering this part of the chain is not trivial since spinning requires large investments in new or good-quality used machinery, sufficient scale and reasonable energy costs (USAID).

Weaving

Weaving capacity is utilized to up to fifty-eight percent in Francophone Africa, thus more fully than are other segments of the value chain (USAID). Most of the looms are narrow width which can do little else but make base fabrics for African prints and, to some extent, fabrics for the cotton growing and ginning industry (cotton picking bags and bale cloth for example). Thus, a large part of this capacity is used for weaving African print and wax cloth. A concern is that the African print market is shrinking as a consequence to legal and illegal cheap African print imports from Asia and the growing demand for western type clothing so the survival of the operating weaving mills is endangered. Wide-width looms are few and where they have been installed, there is no wide-width dyeing and finishing equipment, relegating these companies to producing sheeting and fabrics for the cotton growing and ginning industries in greige state. The recurrent constraint of the lack of technical staff affects this industry also and using expatriate technicians is costly. A needed expansion of the weaving industry asks for companies to invest in new or good second-hand equipment which is costly.

Knitting

Knitting capacity is six percent of weaving capacity across Francophone Africa and is poised to expand, albeit modestly in the short run (USAID). Knitting investments are considered to be the most in place in SSA since they can be smaller scale and require less capital.

Finishing (bleaching, printing, dyeing..)

Over half (52%) of the dyeing and finishing capacity is in Ghana, where actual utilization is only thirty percent of capacity. Across Francophone countries, utilization is forty-one

percent of installed capacity. As other stages also dyeing and finishing require more up-to-date machinery. Peculiar to this stage is the compulsoriness of a big quantity of water, which sees countries with very limited supplies of water -particularly dry Sahelian countries- as poor candidates for a finishing industry expansion.

Cutting

In SSA only a limited range of fabric is available due to the missing industries mentioned afore. This causes apparel producers (for the U.S. and EU markets) to source fabric primarily from Asia. An expansion of the cutting industry could be enhanced if fabric were traded across African regions for example from Southern African countries, especially South Africa, Mauritius and Lesotho, which are able to provide a wide range of fabric, including woven and knit cotton, polyester, mixes, viscose, acrylic, and wool. USAID considers that prices would be more competitive as well as delivery time (seven to ten days) than if sourced from Asia (four to six weeks). Timing is becoming increasingly important as time to market, from order to delivery, is currently twelve weeks or less for most garments.

Sewing

Limited availability of yarn, particularly waxed yarns and synthetic or mixed (polyester/cotton) yarns keeps the industry at a non-professional level in the whole area.

5 Concluding Remarks

It is acknowledged that three types of "flows" can be distinguished within a supply chain: flows of materials, flows of services, and flows of information; each of which have equal importance.

Among other failures, flows of information and services particularly seem to wreck the correct functioning of the chain. Information flows communicate characteristics related to

quality, safety, and consumer demand. Information flows are transmitted in both directions and breakdowns in information between actors can lead to inefficiencies. Existing capacity results highly under utilized.

A recurrent problem affecting the chain in SSA is generally high-cost electricity and power, as hydroelectric power is limited and most countries are dependent on fossil fuels to generate electricity. Limited and difficult access to finance also affects the cotton value chain as a whole since it undermines almost every stage in the chain: from production of the crop to the textile industry. Investor incentive packages are highly variable, ranging from good in Ghana and Mali to incomplete or poor in Senegal and Benin; and some governments are considered not to really understand foreign investor needs and requirements (USAID). Bureaucracy intended as port operations and document clearing, customs clearance and freight forwarding are generally slow and inadequate considering rapid global communications and trade and increasing pressure to reduce time to market. The lack of availability of industry-experienced production and quality managers which results in dependence on expatriate technicians and managers in textile and apparel operations particularly affects the textile industry part of the chain as much as a more general absence of an industrial-production work culture, where workers specialize in performing a limited number of repetitive operations rapidly, within production-line teams, and with minimal errors in a larger production facility. The existing textile industry albeit uncompetitive internationally, is the second largest employer in West Africa after agriculture[15] which makes the shrinking of the domestic market as a result of second-hand clothing imports and smuggling of Asian imitations of African prints, even more penalizing.

The investments needed to enhance the textile industry in SSA require huge amounts of capital not to mention the scale the industry needs to achieve in order to be competitive with

[15] Between sixty-five and seventy percent of Malian artisans, fifty percent of Burkinabe artisans and thirty to fourty percent of Ghanaian artisans operate in the traditional textile sector.

plants in Asia (UNIDO). The rationale behind such investments could be according to UNIDO, that US and EU buyers do not want to be entirely dependent on Asian apparel and fabric suppliers and sourcing from SSA would give buyers an alternative, as the global apparel market becomes increasingly dominated by Chinese and South Asian suppliers. Another reason is "time to market" for which it is no longer viable for garment manufacturers in SSA to rely on the roughly five to six weeks fabric delivery time from China. Moreover, a vertically integrated mill (yarn to garment) is more competitive than individual operations situated in different countries, given communication difficulties and transport and coordination problems (USAID). Another option for garment producers is to look in the direction of sourcing closer to home, namely in South Africa or Mauritius, and Lesotho for denim. Fabric prices tend to be higher (10-25%) in these countries than in China or India, but shipping times and thus costs to West and East Africa are considerably shorter (seven to ten days from South Africa). Nevertheless, it is not considered economically sensible to make costly investments in weaving or knitting units invariably in all African apparel producing countries. Such costly investments are considered due where there is an emerging critical mass of garment manufacturers (USAID), like Ghana and Cameroon.

Chapter II

The Dynamics of the SSA Cotton Sector

Introduction

The purpose of this chapter is to analyze the dinamics of the SSA cotton sector and eventually indicate the features of the sector that have not allowed for a succesful reform outcome. One of the prime motivations driving cotton sector liberalization was a belief that costs in the sector could be reduced, thereby affording a higher margin to the farmers themselves who are always residual claimants. This suggests an examination of the relative movements of input and output prices over the pre- and post-liberalization periods. A number of authors (Goreaux, 2003; Poulton and Hanyani-Mlambo; Tschirley et al. 2009, just to mention some) have examined this issue without a clear consensus emerging, in part because of differences in the input and output prices available for analysis. This thesis takes a different route.

The chapter is divided in two parts. In part I, I begin with analyzing the dynamics of the SSA cotton sector under an industrial organisational perspective. I then give a comprehensive bird's eye view of per country reform experiences and status quo of the cotton sector. I conclude part I highlighting the features that have shown to be sensitive to sector design.

In part II, I introduce the reform experiences of three other SSA success cash crops that share a number of features with cotton: coffee, cocoa and tea. I eventually consider the reasons underlying the greater success achieved by reforms in such sectors and those that have brought to a disappointing outcome in the cotton sector instead.

Part I

The SSA Cotton Sector

1.How the sector was designed

Cotton production was introduced in SSA by Anglophone and Francophone colonizers[16] due to the need of resources for their textile industry. Although in Francophone SSA countries the State was much more participating, at independence (1960s) the sector was initially organised as a state monopoly[17] throughout the SSA region. This resulted in a vertical integration of the sector with parastatal companies providing factors that are to date still considered critical to the sector.

1.1Before political independence

Although the cotton sector was organised as a monopoly throughout SSA, originally slight differences did exist between the ESA and WCA regions. The French government created a dedicated parastatal company – the Compagnie Francaise de Developpement des Fibres Textiles (CFDT)- to develop cotton cultivation from the provision of inputs to farmers to the marketing of lint[18], thus organizing the whole supply chain and entrusting the cotton sector to become an "engine of development". When WCA countries gained independence they retained the design of the sector with cotton companies passing from CFDT to national governments (with CFDT still holding shares in the companies), leaving the cotton sector a vertically integrated supply chain and the role of development instrument. In ESA instead, cotton cultivation had its origins in commercial or missionary activity and governments assumed a greater role later in time. Before independence the sector was partly private: ginning and seed cotton purchase were dominated by Asian businessmen while governments were responsible for seed multiplication, research and extension, quality control and lint

[16] In Mozambique it was the Portuguese
[17] Actually the organisation was a monopsony for seed cotton purchase and a monopoly for cotton input sale.
[18] Cotton exports was marketed by a CFDT's affiliate, the Compagnie Cotoniere, or COPACO.

export. However, at independence governments started playing an increasing role in the purchase and ginning stages, monopolizing the whole sector at the expense of the private sector. Thus, after independence the cotton sector was designed as a state monopoly throughout the SSA region.

1.2 Characteristics of the SSA cotton monopoly

The cotton state monopoly was a vertically integrated sector organisation characterized by a marketing board controlling and regulating all aspects of the cotton value chain: from the sale of planting seed to the marketing of cotton and its by products. The marketing board provided the sector with factors that are considered critical to it: a price announcement mechanism, input credit, research, extension, and marketing. Following is a brief description of the factors the (centralized) provision of which characterize the vertically integrated parastatal system.

Price announcement mechanism - In cotton sectors designed as monopolies competition for purchase of seed cotton is not allowed and decisions about pricing are made at a central level. One firm has exclusive right and implicit obligation to purchase all seed cotton from farmers. In these systems, prices are fixed by governments or administrative bodies. They are announced before planting time in order for farmers to know what they will receive for the seed cotton once they harvest and thus decide whether to produce cotton, or turn to another crop. Once the parastatal monopolistic ginner announces the price at which it will purchase the seed cotton from the farmers, it bears the risk of possible differences with the world price it is in turn paid when selling the cotton lint in the world market. Differences between producer price and cotton world price can in general be due to the volatility of world commodity prices or to exchange rate fluctuations. In order to face such differences the price mechanism was generally linked to a stabilization fund (at least until 2004) (Tschirley et al., 2009). The general purpose of the fund was to avoid that losses in the cotton sector be covered by direct government subsidies, but also that of supporting

producer prices when the world price was low. The internal mechanism of the fund was simple: when the world market was high the fund would be replenished by paying in turn lower producer prices.

Input credit - or contract farming, sees the parastatal ginner make the necessary investments and solve the input provision problem typical to intensive input crops production in SSA (I will analyze this in the next section), by providing the farmers with the necessary inputs for seed cotton production. The farmers pay back the inputs once they harvest their seed cotton and sell it back to the ginner.

Research - in the cotton sector research is about seed variety and multiplication, soil fertility and pest management. Throughout the region research programs were implemented in the public sector (usually by the Ministry of Agriculture), thus guaranteeing the necessary sustained and constant investments and the distribution of good quality seeds all of which are conditional to the attainement of high quality lint and yields. Extension services were implemented by parastatal ginners.

Marketing - the grand part of SSA cotton was and is exported and marketing of cotton was managed by one large parastatal company with consequent credibility[19] in the world market since able to ensure year-round shipments and relatively consistent quality standards.

1.3 General advantages of vertical Integration

The advantages and disadvantages of vertical integration vary from industry to industry but there are general issues defined in the literature.

In his article, "the Nature of the Firm", Coase (1937) describes vertical integration as the "coordination of the various factors of production" which is "carried out without the intervention of the price mechanism". Mahoney (1992) argues that "the vertical integration strategy may be implemented by a continuum of governance structures which include spot

[19] Reliability of export quantities is important when dealing with international merchants.

markets, short-term contracts, long-term contracts, franchising, joint ventures, and vertical financial ownership (hierarchy)". Thus, vertical integration does not always mean vertical financial ownership. Actually, *quasi-integration* means that different functions in the value chain are integrated through joint ventures, franchises, minority equity investments, loan guarantees etc. Coase states that the dynamics of a firm getting larger or smaller, and thus, the degree of vertical integration, is determined by transaction costs[20] which he intended as the "costs of using the price mechanism" (Coase 1937). In line with Coase, in 1975 Williamson specifies the transaction costs that firms try to minimize by vertical integration; these originate from the opportunism[21] and bounded rationality of firms and their suppliers, the uncertainty and frequency of transactions, and asset specificity in supplier-firm or firm-customer relationships. According to Williamson (1981), it is these factors which determine the efficient boundary of a firm, and thus, the degree of vertical integration.

In general, accepted advantages of vertical integration are: decreased marketing expenses, stability of operations, certainty of supplies of materials and services, better control over product distribution, tighter quality control, prompt revision of production and distribution policies, better inventory control, and additional profit margins or the ability to charge lower prices on final products. Mahoney (1992, citing Porter) adds to the list of benefits, a reduced uncertainty of demand and supply in that vertical integration assures the firm that it will receive supplies in tight periods or have an outlet for its products in periods of low demand.

Mahoney (1992) further classifies the advantages under the following categories; profit, coordination and control, audit and resource allocation, motivation, and communication. In

[20] According to Coase (1937, 390-391), these costs are related to finding out prices and searching for suppliers from the market, as well as negotiating and making contracts with them.

[21] *Opportunism* means that a firm can take advantage of information that other firm does not have to lie, conceal information, misrepresent facts, or mis- lead the other firm in pursuing its own ends (Williamson 1975). *Bounded rationality,* which enables opportunism, means that a firm cannot foresee all the possible contingencies in a transaction, making it extremely costly to write, monitor, and enforce complete contracts (Mahoney citing Grossman & Hart 1986). Similarly, And finally, the relationship is asset-specific if the assets of the firm cannot be profitably deployed for any other application. (Afuah 2001, 1212)

particular, vertical integration facilitates information flows and coordination, consequently improving the overall control by gaining the control over critical elements such as the schedule, costs and product quality (Mahoney citing Usdiken et al. 1988). According to Mahoney, companies may integrate vertically also to control supply and distribution channels.

1.4 Translated into the cotton sector

The SSA cotton value chain was generally vertically integrated also through backward quasi-integration i.e. integration of suppliers through contract farming. Acording to Goldsmith (1985), this can be due to peculiar physical charcteristics of the crop that make such an organisation[22] design preferable. The technical factors the author mentions are: perishability, bulkiness, permanence, need for processing, and variations in quality.

Among these, cotton particularly seems to fit in the factors "*Need for processing"* and "*Variations in quality*". According to the former, crops requiring extensive processing are most appealing to agribusiness which can then use its processing facilities to discipline suppliers. Sufficient production and assured and regular inflows of supplies are actually necessary to guarantee efficient operating in ginning plants and avoid costly over-capacity.

The latter refers to crops that can vary significantly in quality and for which quality is important in processing, as such they are also considered suited for core-satellite production. Quality standards are desirable (particularly in cotton) and are more easily achieved by central coordination and contract farming. Actually, vertical integration enables comunication benefits through facilitated information flows particularly salient in the domain of classification and grading stages which in turn keep an incentive for quality perdurance; also through the implementation of extension services -often directly by the ginners-, which enable the necessary link between producers and R&D outcomes.

[22] Goldsmith talks of core-satellite farming or contract farming.

Goldsmith himself mentions in his paper (1985) that as other agribusinesses, also cotton companies "find compelling reasons to remain integrated to the field level".

However, other characteristics even outside the SSA cotton sector make it sensitive to sector design. Among these, the failure in financial markets in SSA makes input credit schemes arguably necessary as shown by their collapse and consequent depletion of the sector in the attempts of a liberalization of the sector. In turn, coordination in input credit schemes has shown to be necessary for the ginner to be repaid and avoid side-selling.

Following is an explanation why also extension and contract farming give scope for vertical integration.

Extension

Agricultural extension is a service with the objective of linking research-based knowledge to the rural sector in a broader perspective of enhancing rural development; it enhances and accelerates the spread of useful know-how and technologies to rural people. The expected outcome is increased and sustained productivity, increased income and well-being of farm people, and eventually the promotion of national food security and economic growth. The instruments used are non-formal education, training programmes, two-way technology transfer and feedback systems. From the farmers point of view, extension is a form of assistance with the objective to improve their know-how, efficiency, productivity and profitability. Politicians, planners, and policy makers consider extension service as a policy instrument to increase agricultural production, thus achieve national food security and alleviate rural poverty and be a contribution to agricultural and rural development (Davis, 2009).

Extension in SSA

In Africa, the view of extension has passed from being focused on increasing production,

improving yields, training farmers, and transferring technology to encompass assisting farmer groups in dealing with marketing issues, and partnering with a broad range of service providers and other agencies (Oladele, 2009).

Extension in SSA was generally public. Despite the yield increases, in the 1980s public extension systems came under attack as a consequence to their financial burdening along with criticisms of irrelevance, inefficiency, ineffectiveness, and lack of equity (Davis 2009 citing Rivera, 2001). Consequently, many extension systems were reformed through privatization, decentralization, outsourcing, and participatory or demand-driven model implementation. Most African countries today are still experimenting with reforms to existing extension systems.

The evaluation of certain of these reforms have unveiled a number of problems. For example, decentralized extension has seen the use of extension agents for non-extension purposes, lack of financial sustainability, and paradoxically, difficulties in linking to research. In particular the fee-for service model[23] has not been well taken up in the few countries where it has been attempted (Davis, 2009).

The current status of extension in SSA sees two main forms of extension policy: provisional extension policies and legislated extension policies. The former is the most common form in developing countries in general; in the absence of more formalized extension policies a provisional or ad hoc policy is used with decrees and proclamations issued by the head of state which do not go through the process of consultation and debate involving various stakeholders and beneficiaries. The latter, legislated extension policies, are embodied by the country's highest law-making authority (e.g., congress or parliament) and tend to produce well-organized and financially stable extension systems (this is the system used for the

[23] One example is extension in tea sector in Kenya

extension service in the U.S.[24]). Odalele (2009) considers extension policy in selected SSA countries and from a list of twenty-seven countries under review, only four[25] have adopted the legislated form of extension policy considered to be the best option among different forms of extension policy.

In general, little is known about the capacity, quality of service, and performance of extension systems in SSA; due to many infrastructural variables and other factors affecting agricultural performance in complex and contradictory ways. Moreover, benefits are generally difficult to quantify making extension impacts per se are difficult to compute, especially in terms of attribution and quantitative cause and effect linkage (Davis 2009, citing Anderson, 2007).

However, it is generally acknowledged that a major problem is the absence of a legal and policy framework for providing the service. This is confirmed by most SSA countries being ranked among the most difficult countries where to enforce a contract[26]. In addition, consequent to the increasing number of players and stakeholders, coordination and regulation turn out to be crucial also in the extension stage and underlines the need for the government to remain involved in extension (Oladele, 2009).

Contract Farming

Outgrower or contract farming encompass a variety of institutional arrangements of vertical integration. A general classification distinguishes 'market specification', 'resource providing' and 'production management'. In the first, the transaction between growers and buyers is agreed on in terms of what is to be produced (product and quality attributes) and what the commitments for future sale (timing, location and price) are. The second model, adds the

[24] the Smith-Lever Act of May 8, 1914 established the Cooperative Extension Service in the United States

[25] Uganda is an example of legislated extension policy in SSA: in 2001 a program was created with the goal of increasing market-oriented production through empowering farmers to demand and control extension services (Oladele 2009)

[26] World Bank Facility for Investment Climate Advisory Services 2011

provision of farming inputs to the former contract type; key inputs are provided on credit, often with cost recovery upon farm product delivery. In the third model, growers additionally agree to follow precise technological guidance on how to produce.

In the SSA cotton sector it is the resource providing or production management models of contract farming that are implemented. Contract farming in the SSA cotton sector particularly, has shown to be a succesful organisation of the production stage. To begin with, in cotton special care is required in the cultivation and harvesting of the plants (as seen in chapter 1) and qualified family-run farms have shown to produce a considerably higher quality than big plantations. Further, the inaccessibility to loans for SSA small-scale farmers, unless they can support their requests with sales contracts and guaranteed sales prices (see box 1); makes the guaranteed sales and access to high quality input envisaged in contract farming very desirable features of the scheme. On the ginner's side, contract farming is interesting in that it enables to ensure inflow of supply and quality control. In addition, it can be an element of risk diversification for harvest risks, for example due to climatic conditions, that can be avoided or reduced thanks to the geographical spread of the contract farmers.

However, contract farming in SSA has shown to be design-sensitive. There are risks to contract farming that have been unveiled with the liberalization of the sector. A core problem of contract farming in general can be the non-compliance with contracts (Brüntrup and Peltzer, 2006). This can come from both parties: considerably higher than planned yields can cause prices to decrease, consequently companies can be tempted to avoid buying from contract farmers or only buy from them as a last resort; on the contrary, poor harvests and consequent high prices will incentivate farmers to sell on the market rather than to the company at the agreed lower prices. Furthermore, farmers can always be tempted to sell their harvest to traders not involved in the input credit scheme and as such buy without discounts. As experienced in the cotton sector, repeated breaches of contract undermine the outgrowers scheme and consequently deplete the sector.

Brüntrup and Peltzer, 2006 claim that successful contract farming needs a careful design that is customised to the specifics of the region, the product and the parties' interests. In relation to the SSA cotton sector, they add that there is a consensus developing that privatised cotton companies should continue to have regional monopolies. Actually, this would enable the necessary coordination to avoid the collapse of the input credit schemes. Experience has shown that wherever this is not the case, cotton companies find themselves eventually unable to provide input credit to the farmers as a consequence to their systematical breaching of the contract and failure to supply the harvest despite advanced finance and consultancy services. In such a context sanctions need to be applied and companies must be able to rely on rule of law.

2. The WCA experience

The above described organisation of the cotton sector has made it possible for Francophone Africa to account for a ten fold increase in its cotton production from the 1960s to the 1990s (WB). It is recognized that this is to be partly due to the fact that the vertically integrated system has shown to perform the highest degree of farmer coverage on input credit and extension provision. Actually, the system was backed by high and stable repayment rates from farmers due to the impossibility of side selling (Tschirley et al., 2009), a problem unleashed with a competitive organisation of the sector instead. Sustained investment in research and extension has been of primary importance and the cotton sector benefited from this resulting in chemical inputs and seed varieties adapted to local conditions to produce high yields[27] and consistently top-quality cotton thus raising the productivity of large numbers of farmers. National monopolies also showed to have a very good performance on

[27] Yields increased dramatically in most countries until the mid-1980s, thanks to intensified use of fertilizer (made possible through input credit), development of animal traction, and development of new varieties with higher yield potential, as well as higher ginning outturn ratios.

value added per capita in that there were strong returns to a very large number of farmers consequently keeping them interested in producing cotton. As a result of such positive feedback, during the 1980s the national cotton companies increased ginning capacity, further developed input credit schemes, invested in transport for seed and cotton lint, and created their own extension services to disseminate technical packages. Cotton production grew rapidly further with an increasing number of farmers dedicated to cotton, and further increased farm yields[28] and ginning outturn ratios. Lint quality also improved. The vertically integrated system brought cotton to be among the few African success stories and to be called Africa's "white gold" with Francophone SSA alone accounting for more than two thirds of African cotton production. The flourishing of the cotton sector had positive overspilling effects also on other sectors which benefited from the public goods and services delivered by cotton parastatals – i.e. in WCA much has been invested to improve transportation infrastructure and road maintenance.

3. The downside of the monopolistic design

Towards the end of the nineteen eighties after the considerable expansion of cotton companies (especially in WCA), due to a number of factors among which were declining world cotton prices[29] and overvalued local currencies (in the case of WCA), SSA cotton companies began facing financial difficulties. The cotton state companies had grown into inefficient organizations with poor governance and high operating costs and oppportunities for rent seeking and corruption (particularly in ESA, according to Poulton, 2009). Moreover, while on one side producer prices were not in line with world prices resulting at times in low producer prices[30] - particularly apparent when world prices were high- since governments absorbed much of the difference between domestic and world prices through various taxes;

[28] Data in the appendix
[29] also consequential to developed countries' support policies to domestic cotton (ICAC)
[30] At others, parastatals paid prices lower than world prices, to the detriment of farmers, showing a countercyclical nature which is thought to be common of support systems in agricultural policies.

the price announcement mechanism was a much critised state support intervention considered it caused parastatal ginners to pay, at times, unsustainably high prices instead (politically backed for social purposes), which eventually contributed to sector financial crisis and consequently to state budget problems. The price announcement mechanism was also accused of subsidizing producers far from processing centres to the detriment of those near to ginning plants due to its being pan-territorial (other than pan-seasonal).

Linked to the price mechanism are stabilization funds which have also generally been considered disappointing: often used inappropriately, i.e. not for their declared objective, when the funds were eventually needed to face world low prices they were empty and national governments were forced to intervene to flesh out producer prices, with consequences on the national financial stability. However, there have been examples of a virtuous use of the stabilization funds as in Burkina and Faso Cameroon though they have nonetheless eventually fallen victim of a combination of world declining prices and an effort of independently keeping high producer prices (Akiyama, 2001; Serra, 2012).

4. Sea change

Although cotton parastatals brought the cotton sector to be considered „a rare success story in Sub-Saharan Africa", in the nineteen-eighties when the mentioned difficulties started emerging important donors and international financial institutions (IFI) as the World Bank (WB) and the International Monetary Fund (IMF) started calling for reforms of the sector. Advocated reasons were initially that the price announcement system failed to reflect world prices in producer prices, which were considered to be generally low hence not helping the smallholder farmers to exit poverty. Later, reasons ranged from rent-seeking opportunities to poor incentives for cost efficiency in parastatal ginning, which had supposedly undermined the sector´s international competitiveness and its contribution to the wider economy. The

pan-territorial and pan-seasonal pricing schemes were also considered to jeopardize national financial stability and to clamp down on rural development.

Furthermore, the sector was generally not considered competitive on the world market and this would presumably jeopardize its survival due to competition from other fibres, particularly synthethic ones with their continuous pressure on prices. This implied a need to cut costs, raise productivity and quality management and marketing, efficiency of research and extension in order to be able to enhance pro-poor growth by maintaining returns to farmers (Tschirley et al., 2009).

In general, the claimed objectives of such reforms were: farmer welfare, industry innovation, technical and economic efficiency, and value addition. In the subsequent decade, reforms were taken up in almost all SSA cotton producing countries although reform choices differed strongly across the region.

5. Post liberalization organisations

The present organisation of the cotton sector in SSA varies considerably from West to East Africa ranging from the early national monopoly system to competitive systems and concentrated systems depending on whether reforms have been undertaken and to what extent. Tschirley et al. (2009) have identified three macro classes of the cotton sector organisation in SSA: regulated, market based and hybrid system. Monopolies (especially state monopolies) are more easily found in WCA where gins are still owned and operated by public or, at most, mixed companies. ESA instead, implemented reforms more thoroughly, also due to the fact that the sector suffered from corruption and had lost in performance in a more marked fashion (Tschirley et al., 2009).

As mentioned, where the system is "regulated" the competition for purchase of seed cotton is not allowed, these sectors include national and local monopolies: company/ies with exclusive right/obbligation to purchase all seed cotton from farmers either at a national or

local level (concession area). Market-based systems instead, can have many buyers of seed cotton – i.e. competitive systems- or just a few – i.e. concentrated systems. Concentrated systems are most similar to duopolies or oligopolies with two or three ginners competing for the right to transact with producers both on services to producers and seed cotton price. In such organisations, the input credit system is generally maintained along with extension advice service, and although the coverage of farmers is not as complete as with national monopolies, consequences on yields as well as on quality have shown to be positive (Tschirley et al., 2009).

However, what international institutions have been calling for is in fact, a competitive organisation of the sector. Since it is generally accepted that market structure influences performance, competitive systems are expected to positively influence production also in the cotton sector in SSA, and hence outperform concentrated and regulated sectors (Tschirley at al., 2009). Competition is expected to improve the share of the world price in producers' price consequently increasing the number of farmers wishing to turn to cotton cultivation, with positive consequences on total production in turn avoiding ginning undercapacity; on the ginners' side it should incentivize to minimize costs, soft budget constraints, excessive employment or political interference (Baffes, 2007).

5.1 Reforms and status quo

The cotton sector has been reformed in almost all of the SSA region but there are differences in the ESA and WCA regions: while WCA can be defined as still lingering in the process, the East African countries have largely completed their reforms. In this section I will briefly analyze the reforms the cotton sector has undergone in the various SSA cotton producing countries divided in WCA and ESA macro areas and lingering on what I consider noteworthy examples.

ESA[31]

Uganda

I begin with what I consider a meaningful example: the story of the cotton sector in Uganda. Cotton was introduced into Uganda in the 1900s by the contemporary British colonial government and until the 1950s cotton was Uganda's major export crop. Uganda has a high-grade fiber of medium-staple (Serunjogi et al. 2001). After independence in 1962, it was decided for the ginning industry to be vertically integrated: the government assumed direct responosibility for research and extension, seed multiplication, quality control and lint export, keeping these activities under the Ministry of Agriculture and marketing was up to the newly created parastatal Lint Marketing Board. The ginning industry was thereafter taken over by cooperatives. Uganda soon became the third largest cotton producer in Africa reaching an all-time high output of more than 86,000 tons in 1969 after a constant growth from 1962 (USDA) though the increased production was due to an expansion of the cultivated area rather than increased productivity since farmers had been attracted by the high prices paid to growers (Baffes, 2009). The sector contributed roughly fourty percent of Uganda´s foreign exchange earnings (You, Chamberlin, 2004).

Follwing the military coup in 1971, cotton output collapsed. It decreased at a growing rate during the following eight years which produced general economic decline and social disintegration. Animal population was depleted[32], ginning operations were poorly mainatined, research was disrupted, and cooperatives started delaying payments to farmers. Production had collapsed from roughly 84000 tons in 1970 to 4000 tons in 1980. Thereafter the sector never really recovered completely though it stopped decreasing and started slowly growing with a few stops during other political turmoil years such as in 1985. However, it never reached the pre-1970 production highs. As a consequence, in the early 1990s a reform of the sector was decided for.

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[31] I do not consider Somalia

[32] Importance relative to animal draught and plowing

The reform was introduced in 1993 and the combination with high world prices of the mid-1990s led to a good response in cotton production which doubled from 1993 to 1994 (USDA). Farm prices had improved and growers were receiving payments regularly. Many new actors entered the cotton value chain (Baffes, 2001), and up to thirty buyers[33] were competing on price to farmer production post reform. Again, production growth was primarily due to an expansion of the area cultivated on cotton[34] since productivity[35] didn't increase and declined instead (Baffes, 2009).

However, the liberalization attempt unleashed a series of weaknesses of the sector which obliged to reverse the reform course. Thus, limits to the degree of competition were imposed by the state to stem the detrimental effect on the provision of inputs and extension. Regional monopsony rights were established between 2003 and 2008 to eliminate competition changing Uganda's cotton sector to what Tschirley et al. (2009) call a hybrid organisation. Direct competition among ginners was eliminated so as to facilitate coordination among ginners and enable them to invest in extension provision and input supply securely[36]. Production increased by about ninety percent in the following two years.

Despite production expansion, current production in Uganda is still about a third of its historical peak in the 1960s (USDA). Considering Uganda has a comparative advantage in producing cotton, both in terms of favorable agroecological conditions and the stable (even growing) world market for its cotton with high-grade fibre of medium staple length (You, Chamberlin, 2004), the question on the reasons for the sector's declining yields and stagnating production, remains. General faults have been attributed to the collapse of the input credit system since declining cotton yields are commonly explained by lack in input

[33] This is partly due to the fact that Uganda ginning has historically been dominated by roller gins which are cheaper and with fewer economies of scale, thus need fewer initial investments which makes entering the market easier for new ginners (Tschirley et al.).

[34] sixteen percent annually from 1994 to 2000- (Baffes, 2009)

[35] According to You and Chamberlin, most data sources estimate the average yield of seed cotton in Uganda to be below 500 kg/ha which is quite low even when comparing to neighboring countries in East Africa, where average yield is 900~1100 kg/ha in 1990s (Gibbon 1998).

[36] Efforts by individual companies to provide input credit had had to be quickly abandoned during competition, because the credit could not be recovered.

supply and extension provision (Baffes, 2009; Tschirley et al., 2009), which collapsed following liberalization. Other factors include inadequate information support, inadequate government support, underutilization and technologically aging ginneries, insufficient research and training. To date, there are thirty-three operational ginneries of which two operate saw gins and the rest use roller gins of which only one is a cooperative union the rest being private.

In ESA Uganda is by no way an outlier: the rest of ESA cotton sectors have had similar experiences.

Tanzania

Tanzania liberalized its cotton sector in 1995 even though it had no apparent reasons to do so since it was having excellent production performance. After an initial increase in production following liberalization, again combined with high world prices, seed cotton production plummeted until 2000. Individual companies experienced they could not face the input supply challenge on their own and a sector-wide solution was instead necessary. Negative impacts were seen also on lint quality since seed varieties were mixed as a consequence to the lack of input credit. Thus, it was decided that the Tanzania Cotton Board (TCB) would thereafter provide seed, pesticide and quality control. However as Tschirley et al. claim, moving in the reverse direction is not as smooth as moving from a monopolistic to a competititve system. Currently (as of Cotton 24/7 june 2012) the cotton sector in Tanzania is described as threatened by collapse unless the government intervenes with subsidies for input provision and a guaranteed minimum price to keep farmers interested in cotton. Consequently, some of Tanzania's top textile mills have temporarily shut down in view of the scarcity of cotton to spin. The cotton industry in Tanzania employs about forty percent of its overall population and ranks sixth among SSA cotton producers (Appendix 1).

Zimbabwe

Similarly to Tanzania, Zimbabwe lived a short boom induced by high world prices during liberalization, but production fell sharply straight after (1993). Until liberalization was realized in the privatization of the national ginner Cottco and the entry of only two other competitors -who only had twenty percent of the market-, Cottco was able to retain its input credit scheme with high coverage and repayment record. The country was able to retain the reputation for high quality lint it had gained in international markets during the state monopoly and producer prices were also high (Poulton et al., 2009).

However, things changed dramatically in 2001 when a more thorough implementation of liberalization took place and many more competitors entered the sector making the previously successful private input scheme collapse. Achievements in quality control and producer prices were also undermined. State intervention turned out to be unavoidable for the survival of the sector and limits were imposed to the degree of competition. In 2006 regional monopsony rights were established to eliminate competition. In 2009 the government of Zimbabwe further introduced new legislation on cotton regulating the entire chain from production to marketing and compelling contractors to provide all necessary inputs to farmers at the beginning of the planting season. Cotton contractors now also have their own experienced extension officers who offer technical assistance to farmers.

According to the Gain Report 2012, contract farming has "contributed to the stability and growth of the cotton industry by providing inputs and extension services to cotton growers, thereby ensuring consistent production". In June 2012 the government has made a further step by making cotton a controlled product giving the Minister of Agriculture the power to fix cotton prices.

Zambia

From 1977 the cotton sector of Zambia was organized around the state-owned cotton company "Lint Company of Zambia" (Lintco). The company provided certified seed,

pesticides, sprayers, and bags and provided extension advice to farmers and purchased seed cotton from farmers at a fixed price. In 1994, it was decided that the sector be reformed and Lintco was sold to two private companies (Lonrho Cotton and Clark Cotton). The two companies were given separate regional influences on cotton with the intention to limit competition between them – i.e. concession area system. Reform had organised the sector into a duopoly and each company was successful in implementing outgrower programs having little problems with credit repayment. Rapid growth in cotton production followed also spurred by the high cotton prices on the world market, with a growing number of farmers involved in cotton and improving quality of lint.

However, the expansion in the cotton production attracted new entrants also in the processing business. The inflow resulted in ginning overcapacity (also caused by a decline in production) in turn causing a competitive scramble for cotton among ginners making outgrower schemes fail. The entry of several new small ginners and traders more commited to trade in it self caused a first crisis in the sector in 2000. Lonhro was crushed by the crisis and its repayment scheme dramatically failed, consequently the company sold its liabilities to Dunavant - a US private cotton company. In general ginners cut back on their outgrower support schemes resulting in a fall in production. The sector later recovered thanks to innovation in the outgrowers schemes proposed by Dunavant and Clark providing a greater coverage of farmers –they expanded their production- and thus boosting production.

In 2005, a second crisis hit the sector. Among reasons were: the appreciation of the local currency severely affecting the profitability of cotton to ginners, and the entry of more established ginners (most of the small ones had left after the first crisis) resulting in a decreased concentration of the sector and bringing the number of ginners to at least eleven (Tschirley and Kabwe, 2010). The crisis resulted in Dunavant not honouring its preplanting minimum price for the first time. In general, companies reacted by reducing the content of their input credit package for the following year and by trimming the covered number of

farmers. The result was a serious credit default followed by plummeting production which fell by more than half from 2006 to 2007, before recovering somewhat in 2008 and 2009. Currently, the two original companies remain the dominant players with still eighty percent market share (2009), but the new companies seem to be large enough to change the dynamic of the sector towards more competition. The cotton sector is considered to be at risk since farmers bear both the production and marketing risks and the global drop in the price of cotton adversely affects them since cotton is both capital and labour intensive.

Kenya

Poor performance of the cotton sector after the implementation of liberalization has been experienced also in Kenya where cotton is mainly grown in arid and semi arid areas where there are limited other economic activities.

Cotton was first introduced to Kenya in the 1900s, but it was adopted across the country only in the 1960s when cotton became a commercial crop. In 1984/1985 the sector reached its to date all time peak: it employed over 200,000 small holder farmers producing over 39,000 million tonnes of seed cotton (ICAC). In 1991, the vertically integrated system for input supply, extension and seed cotton purchasing collapsed under structural adjustment policies with the withdrawal of government from the provision of credit and inputs. The combination of the latter with falling world prices resulted in thousands of cotton growers abandoning the crop and production hit its lowest (14,000 MT) in 1994 (USDA). Considering that before liberalization, cotton was one of Kenya's main foreign exchange earners and the potential of Kenya as a cotton producer[37], cotton has been identified as a key sub-sector in the government's policy for adressing poverty "Kenya Vision 2030". Further, in 2006 the government was provided with the legal framework to re-organize the cotton

[37] The cotton sector is considered to have the potential to benefit eight million people in the drier areas of the country. The Cotton Development Authority estimates currently that there are 350,000 ha in the country suitable for cotton production, with a potential production of 50,000 tonnes annually (ICAC)

sector with the Cotton amendment Bill which resulted in increased production (9,800 tonnes in 2006 from 5,090 tonnes in 2005 – ICAC). The positive trend has continued with a calculated twelve percent increase in production from 2002 which has been driven primarily by the government's efforts to revive the sector through the Cotton Development Authority which had been set up to coordinate rehabilitation of the sector (Cotton 24/7). At present, the commodity chain is made up of licensed and unlicensed private traders and ginning companies buying cotton on an *ad-hoc* basis. There is no zoning or concession system but some ginning companies distribute inputs on credit to farmers in order to ensure adequate cotton for their ginneries. However, this is not a homogeneous practice thus it provides opportunity for 'side-selling'.

Overall the cotton industry in Kenya is still considered much under its potential with low productivity, low utilization rates at ginneries, limited access to quality seeds, weak service markets, missing link between research and field implementation, and distrustful relationships within the market.

Malawi

Malawi now ranks thirty-third in world cotton seed production (*appendix chapter I*, USDA, 2012) but it has been a cotton growing country since the colonial era and cotton has traditionally been an important cash crop in the country ranking third among its export cash crops (Faostat).

The Malawi cotton sector has seen better times before the nineteen nineties. From the mid 1960's until 1994 the Agriculture Development and Marketing Corporation (Admarc) was the sole buyer of seed cotton. In 1994 the market was liberalized and Admarc scaled down its involvement selling its ginneries to two big cotton companies (Great Lakes Cotton Company and Clark Cotton Malawi Limited now Cargill). In the early 2000, another two (small) companies entered the sector but instead of increasing competition, the companies started colluding to purchase cotton resulting in low producer prices. The consequent

reduced farmers' profitability pushed farmers out of cotton production resulting in plummeted country cotton production.

Recently, the Malawi Government has incorporated the cotton sector as a key element in its poverty reduction and growth strategy, the objective being to "increase cotton production and improve quality in order to meet local demand and export any surplus." (Ministry of Agriculture Report, 2006). The President of Malawi declared cotton as one of the strategic crops for growth for the country and has identified one way of improving minimum farm gate price through contract farming. A government fertilizer subsidy programme has also been implemented and it is under discussion that other inputs –cotton seed, pesticides and spraying equipment - are included. In its objective to promote cotton production, the government has initiated a project focusing on cotton seed multiplication, extension services, organizing farmers in groups, technology development, and support to research activities.

The crop is grown on about 70,000 ha and supports about 200,000 small holder farmers, three ginning companies and input providers. Over the years the average yield of cotton has improved.

Mozambique

Cotton has an important role in the economy of Mozambique where it was introduced by portuguese colonizers. It ranks third among agricultural export commodities and has an important socio economic stabilization role in rural areas as confirmed by that ninety-seven point seven percent of cotton production comes from family smallholders (ICAC), also whitnessing the potential contribution of cotton in the fight against rural poverty.

The production of cotton in Mozambique has yet to experience liberalization. The legal framework of the sector sees the sector organised into a concessions system with the government signing a promotion and rural extension contract for cotton in a given territory with a given company which defines the terms of rendering mandatory services to cotton

farmers – input provision, extension training – and guaranteeing exclusive right for purchasing (observing the minimum price), ginning and trading the seed cotton. Although the government is not involved in any commercial transaction, it establishes the minimum price for cotton on a one year basis as a result of a negotiated proposal between the farmers - united under the National Forum of Cotton Farmers (Fonpa)- and the ginners -assembled under the Cotton Association of Mozambique.

The government has set a priority for the cotton sector to be gradually reformed in a ten year horizon heading towards liberalization.

Nigeria

Cotton is a major cash crop in Nigeria. Production is dominated by small scale farmers, with farm sizes ranging from three to five hectares all under rainfed ecologies, hence it is of considerable social and economic importance. Cotton production in Nigeria dates back to 1903 with the British Cotton Growers Association taking the lead until 1974, when it was replaced by the Cotton Marketing Board to develop, gin and market the produce. Cotton then grew to play a vital role in the Nigerian economy and in the seventies and eighties, the cotton industry was the highest employer of labor after the government (ICAC).

In 1986 the Nigerian economy was deregulated and the Board was abolished as well as the economic activities it provided. Under the reform policy the government also gave up all control over prices. Following liberalization the number of functional ginneries reduced from fifty-three to seventeen with capacity utilization estimated at thirty-seven percent, the number of mills has decreased from one hundred seventy-five in the seventies and eighties to less than fourty in 2009. At present about seventy percent of cotton used by local mills is imported ; and textile imports in 2007 alone was valued about six times higher compared to 2003. The opening of the cotton sector has also brought about a set of undesirable flaws such as unfair tactics, fraud against sellers and buyers, preemption and undesirable

collaboration both among farmers and ginners (Onu and Okunmadewa, 2008). The wrecking of the sector moreover resulted in the social dislocation of over two million Nigerians including 0.25 million cotton farmers and about 30,000 fabric processors and garment/apparel workers (ICAC).

The Nigerian Government is from 2009 in its effort to revive the industry authorizing the establishment of a cotton/textile/garment (CTG) fund through the Bank of Industry (BOI) for onward lending to businesses along the CTG value- chain (ICAC).

Ghana

Although it is the smallest among ESA cotton sectors, the experience of Ghana is worth mentioning. It can be considered symbolic because of the extremes it reached. It was the first to liberalize the cotton sector, in 1985. After experiencing the impossibility of maintaining whatsoever kind of input credit scheme when multiple companies compete on the same territory, the main players of the cotton sector were obliged to plead for State intervention and persuade the Ministry of Agriculture to institute back a local monopoly system (2000-2001).

There are now four private cotton companies operating in the sector and a number of problems to be solved among which are poor quality seed, inadequate extension services, lagging research, lacking labour and poor producer price.

Ethiopia

In Ethiopia there is an enormous potential for the production of cotton following its suitable agro-ecological zones and the availability of water. According to the Ministry of Agriculture, the suitable cotton production area is estimated to be equivalent with the fourth largest producer, Pakistan (2,575,810 ha). Despite this huge potential, however, Ethiopia currently produces only from a total area of 42,371 (Agridev, 2003). Cotton is produced for 70% by

private commercial farms and the remaining 30% by smallholders. The processing stage is dominated by private ownership.

WCA

WCA has a different story compared to ESA and the reform process has been tackled more cautiously and definitely at a slower pace. Though cotton had formerly been introduced to supply the French textile industry, the integrated supply chain system created by the French government turned out to be very successful in involving a sheer number of farmers and assuring a great number of poor rural households with revenue from the crop production since gins were obliged to purchase all seed cotton produced, furthermore at a fixed price set by the government. The sector flourished even after independence of WCA states, when parastatals passed on to national governements (1960s). The partnership with the French Development and Textile Company (CFDT), the French statal company with which the cotton sector was initiated, and the Cotton and the Exotic Textiles Research Institute (IRCT) survived independence and concretised in an uninterrupted strong support in research, extension, and assistance to farmers' organizations. This allowed substantial improvements in cotton cultivation with the introduction of new production techniques like the ox-plow, mineral fertilization, and pesticides, along with high-yielding seeds. The result was a two-fold increase in cotton yields over the 1980s. The public companies grew in ginning capacity to face the growing production of seed cotton: WCA increased its share in world cotton trade from one percent in 1960 to eleven percent in 2006. The cotton sector flourished and the ample cotton profits were invested in rural infrastructures (roads, education, and health), further improving farmers' living standards with general positive spill overs. Ginners also expanded side activities investing in transport for seed and lint, created own extension services and in some countries companies were given direct responsibility of rural development in cotton areas (Mali and Cameroon). In brief, the organisation of the sector

had been successful in increasing production and yields, in developing new ad hoc seed varieties and in achieving high lint quality. Thus a liberalization of the sector was made difficult from a social and political point of view: introducing far-reaching reforms in Francophone WCA would supposedly have a detrimental effect on the revenues of farmers, particularly least productive ones and, consequently on poverty rates. There has therefore been a longlasting debate on whether the highly integrated WCA system should be reformed.

Benin

In WCA Benin stands out for being among the countries most dependant on cotton and for being the first to have embarked in a liberalization of the sector. Since the 1980s cotton is considered the basis of the whole rural and agro-industrial sector contributing to more than ten percent of GDP, accounting for seventy to eighty percent of agriculrural exports and benefiting more than 300,000 small farmers (Gergerly, 2009).

Cotton production existed in the country before colonization but it was only after the end of the marxist regime (1972-1978) that the sector developed more markedly. The cotton sector was then managed by a government owned cotton company (Sonapra, 1984), which had a monopoly on the purchase of seed cotton, the sale of lint cotton and the delivery, on credit, of cotton inputs to farmers. At the time, the sector compared favorably even to other West African cotton sectors, with higher yields and higher prices paid to producers (Gergerly, 2009). However, the heavy losses in which the company incurred by the end of the decade had the government decide to withdraw from cotton production and liberalize the sector.

Benin was the first country in WCA to deeply reform its cotton sector in the 1990s, suppressing the characteristic single channel relationship between ginners and farmers. The vertically integrated monopoly was broken into distinct horizontal functions, allowing entry by different private operators. Liberalization was implemented in stages involving the input distribution function first and then the sale of quotas for buying and processing seed cotton

production to new ginning companies. The privatization of the cotton parastatal only took place many years later.

The outcome of those reforms has been "far below expectations" (Gergerly, 2009; Serra, 2012), and resulted in a sharp decline of the performance of the sector. There was a marked deterioration in the key services along the value chain, particularly in input distribution and quality; a fall in credit recovery rates, and an overall uncertainty due to the continuously changing rules for awarding quotas (Serra, 2012). Even though reforms didn't put in place a pure competition model but a concession area scheme - resulting in a quasi-monopoly with each company in the market being assigned a given cotton zone over which it would hold exclusive monopoly and monopsony rights (concession areas) rather than competing with each other - there have been coordination failures along the chain[38]. The consequent serious liquidity problems of the major cotton company resulted in a reversal of the privatization process with the state intervening with its own funds and once again becoming a majority share holder (sixty percent of shares). To date a price determination mechanism is still in use, and there is the intention to establish a smoothing fund.

The difficulties experienced with the reform process in Benin contributed to a large extent to a reluctance to reform among cotton sector stakeholders in other WCA countries.

Mali

Among WCA countries Mali is the country that has least moved towards reforming its cotton sector. Cotton is the country's success story and an element of national pride, source of livelihood for millions of rural people, main generator of political rents, and the second major source of foreign exchange earnings. Cotton production covers about one third of the cultivated land and about fourty percent of rural households, or two and a half million

[38] Furthermore, only two companies were allowed to enter (Faso Coton and Socoma), covering, together, about 15% of the seed cotton market, allowing SOFITEX (SOFITEX became 35% to the state, 30% to the UNPCB, 27% to the former CFDT, then renamed DAGRIS, and 1% to local banks and the rest to some national private actors)to retain the lion share).(Serra)

people, rely on cotton production and related activities for their income (Unctad).

The government refused to consider a cotton sector reform throughout the 1990s, but then, pushed by donors and a precipitating cotton sector crisis (Serra, 2012), it created a task-force for the restructuring of the cotton sector in 2001, formally committing to both privatizing the state company CMDT and liberalizing the market. The only step taken towards reform has to date been the division of the CMDT into four subsidiaries each operating in a different cotton zone (East, South, Central and West), thus committing to a local monopoly scheme, and the offering of their shares for sale through a tender process. However, no bid seems to have measured up to expectations and the privatization process of the four CMDT subsidiaries has not progressed (USDA). In general, the process has not been completed and has stalled due to several reasons, including favorable conditions in the international cotton market and the impending 2012 general elections (Serra, 2012). Mali has been more keen on institutional reform, especially at the level of producer associations.

Central African Republic

Cotton is the second largest source of export receipts in the Central African Republic. Cotton cultivation employs more than 100,000 people and another 800,000 are involved in cotton-related activities (Unctad). The "Société Centrafricaine de Developpement des textiles" (Socadetex) is the main corporate actor in the cotton sector. Socadetex was established in 2002 following the liquidation of the state enterprise Sococa ("Société Cotonnière Centrafricaine"). It is controlled by foreign investors (fourty nine percent share). The state holds a fifteen percent share and the local private sector accounts for the remaining thirty six percent.

Côte d'Ivoire

Although cotton is not the prime cash crop in Cote d'Ivoire it accounted for about three

percent of agricultural exports from 2001 to 2003 (Baffes, 2007). Until 1973 the sector was managed by CFDT and in 1973 it passed to the "Compagnie Ivoirienne de Développement des Textiles" (CIDT), a state enterprise which was responsible for organising all services needed for cotton production and marketing. Under the CIDT the sector was vertically integrated and thrived reaching an all time high production of one hundred and fifty tons in the mid ninety nineties, also thanks to the CFAF devaluation and world high prices for cotton (Baffes, 2007).

In the late nineteen nineties the government decided to undertake a reform of the sector and privatize most of the cotton industry: CIDT was broken down into five smaller companies with a concession area scheme (Baffes, 2007), only one of which has remained in the hands of the government. The conflicts that have hit the country especially in the northern region where cotton is grown, make it difficult to asses the outcomes of the undergone reforms. In any case the reform did not lead to competition as the price of seed cotton remained equal among zones and each company retained exclusive purchasing rights within its zone. Further, the government continues to support the cotton sector with the highest farm gate price in the sub-region (USDA) and subsidizing inputs. If the government meets its expectation, production will have seen a thirty-three percent gain over 2011/12 (USDA).

Niger

Producers are provided with seeds imported by the state enterprise "Société Cotonnière du Niger" from Benin. Two companies dominate cotton production and processing in Niger:
- The "Société Cotonnière du Niger" (SCN), jointly owned by Aiglon (70%), DAGRIS (25%) and the Niger Government. SCN handles about 90% of domestic cotton production.
- The Niger United Cotton Industries (CNUCI), controlled by Chinese interests. Established in 1998, it primarily markets cotton from the South-Western Gay and Dosso regions.

Senegal

Although Senegal only ranks fourty-ninth among world cotton producers (USDA), cotton is the second largest agricultural export for the country accounting for around sixteen percent of total agricultural exports (USDA). It is grown in nearly every region and covers almost one third of cultivated acreage. Cotton was introduced in Senegal in the early 1960s after independence and was developed by the CFDT -later (1974) replaced by the Society for the Development of Textile Fibres (Sodefitex)- which distributed free inputs to cotton growers and ensured the collection of seed cotton. In the early eighties, the company also implemented a policy of technical training of villagers with the objective to increase production.

In 1989 cotton producers started a process of organisation completed in 1998 with the creation of the National Federation of Cotton Producers (FNPC) bringing together Cotton Producer Groups (GPC) as a reaction to Sodefitex unilateral decision to halve subsidies on insecticides with a consequent significant drop in production. In January 2007, the partnership between Sodefitex and the FNPC went even further with the creation of the Senegalese Interprofessional Cotton Association (ASIC) which acts as an arbiter between the different actors in the sector.

In 1998 it was decided that the sector be liberalized in order to face the need of substantial financial resources of Sodefitex to refurbish its facilities and vehicles. However, it was not until 2003 that Sodefitex was privatised: the State sold fifty percent of its shares to a private operator – Dagris, who became the majority shareholder. Producers acquired thirty percent of the company's shares (USDA) while the government retained ten percent and local spinners received the remaining shares (Baffes, 2007). The disengagement of the State was done with a view to protecting the national interests of the industry. Since the privatization in 2003, the cotton growers and Sodefitex have developed their relationships as partners, sharing responsibilities – e.g. for the procurement and management of inputs, which were

controlled by Sodefitex and are now managed by the FNPC. The company is said to be still striving to fully use its ginning capacity (USDA).

Chad

Chad was the first WCA country to cultivate cotton. Cotton was introduced in Chad during the colonial period and has since dominated the economy. The sector is crucially important to the national economy both in terms of income generation for farmers and for export revenue: almost fourty percent of the country's total population is occupied in the sector (Unctad) and its parastatal is the third largest employer in the country[39] (Baffes, 2007). As such it plays an important role in poverty reduction (WB). During the colonial period, cotton was produced and marketed through the French CFDT and Cotonfran which was replaced in 1971 by the parastatal Chad Cotton Company (CotonChad) after independence.

Cotontchad had and has the monopoly of all cotton activities in the country. It provides farm inputs to farmers on credit and manages the distribution of such inputs; purchases, collects and transports seed-cotton from the villages to its cotton ginneries; gins the seed-cotton, and commercialises the lint. The producer price for seed-cotton is set each year by a committee consisting of representatives of farmers and CotonChad.

During 1970-75, Chad was the most successful cotton producer in WCA, its cotton output was almost twice as much as Mali's average and three times as much as Benin's and Burkina Faso's average (Baffes, 2007). However, Cotonchad faced serious difficulties following the price decline and a drought both in 1985, which resulted in almost halved production. The sector was also burdened by a civil war, a war with Libya, and heavy taxation. Consequently, it was decided to evaluate reform startegies which was made through an ad hoc Cotton Sector Reform Committee. However, the only step actually taken in that direction has been the privatization of the lucrative oil-soap factory in 2002 under the auspices of the IMF. The

[39] after public administration and the army

divestiture of the latter and the disengagement of the state are by some (Enda editions, 2007) considered among the reasons of the following deepening crisis of the chadaian cotton sector and the momentum for reforms has further weakened following the country's windfall revenue from crude oil. Nevertheless the state embarked upon a radical restructuring of the cotton company in an attempt to revitalize the sector. The Chad Cotton Company was dissolved by the government in September 2011 and a new company was created in its place: the *Société Cotonnière du Tchad Société Nouvelle* (CotonTchad SN) to which all operating assets and liabilities were transferred with the State acquiring the remaining assets and assuming the remaining liabilities. The state also assumed responsibility for financing the strategic liabilities of CotonTchad which have been transferred to CotonTchad SN (WTO). Since the creation of the new state-owned cotton company, CotonTchad SN, farmers have planted more cotton with the increase of the farm gate price (2009/10) which had been fixed for many years and the area planted for 2012/13 increased fifty seven percent from 2011/12 (170,000 ha to 267,000 ha) (USDA). The long ago planned privatisation of Cotontchad has so far not yet been achieved: the government is still the majority shareholder (seventy five percent), followed by Dagris (nineteen percent), and the local private banking sector (six percent) (Baffes, 2007).

Togo

Although the crop was introduced only relatively recently, cotton cultivation plays an important role in the economy of Togo. Cotton is the largest source of export receipts providing important monetary resources to the State, and contributes to food security of the rural populations, accounting for up to seventy percent of income of farmers (Unctad).

Until 1995 the sector was operated through a state-owned company, the Société Togolaise de Coton (Sotoco) created in 1974, in charge of providing input supply and marketing activities as well as research, extension and maintenance of the road network (Baffes citing World

Bank 1988). With the vertically integrated system, cotton growing experienced a boom and production increased significantly in the 1980s, as well as following the 1994 devaluation. The boom is to be credited to infrastructural interventions in agriculture promoted by the state. As a result, in fifteen years cotton became the third most important cash-crop of Togo, behind cocoa and coffee.

However, declining world cotton prices combined with an appreciating exchange rate and inefficient local marketing and processing, heavily affected the performance of the sector with cotton production dropping to less than half of the decade's average and Sotoco going bankrupt. In 1995 Sotoco lost its monopoly on processing and the external marketing of cotton as a result of the liberalisation of the ginning and spinning sectors that has allowed the entry of three new companies: Sicot-sa ("Société industrielle de coton"), whose main commercial partner is the controlling swiss company "Aiglon"; Sopic ("Société de production industrielle de coton"); and Socosa ("Société Cotonnière des Savanes") established (as for Sopic) by the Continental Eagle corporation (sixty-five percent) and the trading company Louis Dreyfus (twenty percent). Nonetheless, Sotoco which has meanwhile (2009) become "La Nouvelle société cotonnière du Togo" (NSCT) a mixed partnership company with sixty percent shares held by the state and fourty percent by cotton producers, still has a dominant purchasing position and is the sole provider of fertilizers and pesticides. Actually, cotton produced by farmers is first purchased by Sotoco, then half of the crop is sold to the three private ginneries in a fixed share per ginnery set as a proportion to its respective ginning capacity, at a price equal to the price paid to the producers plus marketing and transportation costs (Baffes, 2007).

The performance of the sector has shown to improve since the 2011-2012 campaign has been successful and cotton production has increased to reach objectives. The Ministry of Agriculture maintains that the New Cotton Company of Togo will be privatized (US state department, 2012).

Cameroon

Similarily to Mali Cameroon has implemented the least reform introducing the least changes to its cotton system which is still dominated by the state controlled company Sodecoton. Cotton was introduced in Cameroon in the early 1950s through CFDT. Initially, it was cultivated with only limited use of inputs but following two decades of stagnation, the government promoted the use of inputs, resulting in boosting yields during the mid-1980s. Since then, cotton production increased consistently and reached 100,000 tons of lint by 2000 only lately decreasing.

Since 1974 the cotton parastatal has been in charge of most aspects of marketing and trade of cotton. A privatization plan has been adopted by the government under IFI pressure in 1994 during structural adjustment and then reproposed in 2003 but has to date resulted in minority shares of thirty and eleven percent held, respectively, by Dagris and Smic, a private local company. The privatisation project is thought to have failed due to the lack of internal political agreement[40] but also due to the fact that the cotton sector performance has been satisfactory throughout[41], and that the state parastatal is generally considered solvent thanks to effective institutional arrangements between the company and producer groups (Serra, 2012). However, according to Serra, privatization is not to be completely excluded and the national producer association is trying to find resources to get hold of a twenty percent share in the cotton company once the opportunity is on the table.

Burkina Faso

Burkina Faso's cotton sector is one of the strongest agro-industries in Africa. Cotton was introduced in Burkina Faso towards the end of the colonial period and is the most important cash crop in the country. It is the main exported commodity in terms of value and accounts

[40] Baffes, 2007: "It appears, however, that there is not much political interference in the sector."

[41] "Cameroon: A well-managed sector—so far, so good" Baffes, 2007

for almost two thirds of total merchandise exports (Baffes, 2007). Cotton generates income for approximately two million people in the country.

The sector was developed by the CFDT which was solely responsible until 1975 when it was first replaced by a joint venture between the government and CFDT, and in 1979 by the new cotton company "La Société Burkinabè des Fibres et Textiles" (Sofitex). In 1991 it was decided that the sector be reformed and that management responsibilities be transferred to growers and to a cotton company. Following came the transfer of thirty percent of shares from the state to growers grouped in the "Union Nationale des Producteurs de Coton du Burkina Faso" (Unpcb), and another thirty-four percent to Dagris (Développement des Agro-Industries du Sud). In 1999 a committee was formed to coordinate Sofitex and UNPCB in the determination of the farmgate and input prices and management of the research program. In 2004 two other private companies (Socoma, Société Cotonnière du Gourma, and Fase Coton) were allowed to enter the sector covering together about fifteen percent of production. However this was under a temporary concession system with exclusivity zones conceded for eight years. In 2006 an umbrella organization was created to coordinate the actions of all three cotton companies.

Compared to other WCA cotton-producing countries the reform process in Burkina Faso was considered a success story. Indeed, between 1995 and 2005, cotton output in Burkina Faso increased five-fold, from 64,000 to almost 300,000 tons (Baffes). However, it appears that despite the entrance of private ginneries as well as the restructuring of the ownership of Sofitex, the government is still the key decision maker in the sector. Actually, despite the state's divestiture, it still retains a thirty-five percent share and the enterprise is still integrated along the value chain (Unctad) and is still responsible for most of the commercial and industrial activities of the sector. The involvement of producers moved forward in 1999, when the national cotton producers' association ("Union nationale des producteurs de coton

du Burkina Faso" - Unpcb) purchased a thirty percent share in Sofitex. Dagris ("Developpement des Agro-Industries du Sud"), a French public holding company dedicated to cotton cultivation in the franc zone, holds a thirty-four percent share, whereas the government has retained a share of thirty-five percent. Private sector banks hold the residual one percent share. Transport has been liberalized.

Sudan

Cotton is the leading cash crop in the country since the early twentieth century. In 1970 cotton trade was nationalised under the Cotton Public Corp. (CPC) later (1986) renamed Sudan Cotton Company Ltd. (SCCL). The company was privatized in 1993 and several stakeholders own the SCCL: cotton farmers in Gezira, Rahad and New Halfa along with the Farmers' Commercial Bank and the National Pension Fund. The management of cultivation, ginning, marketing and exporting involves both government, tenant farmers and the private sector. The cotton sector of Sudan, however is not as relevant to this research since it is not based on smallholder production. Actually after the completion of the Sennar dam in 1925, ninety percent of sudanese cotton has been grown in large irrigated farms.

Guinea

Cotton was introduced in Guinea post independence by the French Development and Textile Company (CFDT) which provided all management of the secor from the distribution of inputs and granting of credit to the production and marketing of cotton fibre. The State has encouraged cotton production in all regions with ecological potential as the crop had shown to be growth enhancing and to be a means to get to substantial cash income and build public infrastructure.

In 2000 the sector was liberalized and the Guinean Cotton Company (CGC) was established. The major shareholder was the state, the second largest shareholder was meant to be CFDT but the shares were sold to the country's private sector instead. This resulted in the

withdrawal of the sector's main technical and strategic partner with consequent plummeting of cotton production due to disaffection to the crop by producers. Although the state tried to give cotton back its role through continuous support, the cotton sector continued to face enormous difficulties. In 2004, there were no ginning plants in the country and the crisis became worse with the difficulties to supply producers with inputs who had to travel to Mali to find some during the 2005/2006 campaign. In addition to difficulties encountered by cotton producers, the assistance of the state has been growingly scarce (*Privatisation and Liberalisation of African Cotton Sectors*, Enda editions). To date production has not recovered.

6 Design sensitive factors

Reform experiences have highlighted that two of the critical factors in the cotton value chain have shown to be particularly sensitive to changes in the design of the sector. One is input credit. Cotton is an input intensive crop -as confirmed by cotton being in general the most pesticide-using[42] crop (ICAC)- and external inputs –seeds, fertilizer, pesticides- are critical. Moreover, the inputs used must be the right inputs[43] in order for farmers to be able to earn reasonable returns from the crop and for production to be enough for gins to avoid costly undercapacity.

The SSA cotton sector is characterized by smallholder, undercapitalized farmers which makes saving from one season to the other to purchase the costly necessary inputs unlikely; as is formal lending due to a general financial scarcity and lack of collateral on the farmers' side (box 1). While in the vertically integrated organisation of the sector the problem was solved by implementing contract-farming schemes, allowing to copiously increase production also by involving a growing number of farmers; the input credit system has shown to be

[42] In the 1990s, the use of crop protection chemicals on cotton peaked, accounting for some 20% of all global insecticides applied annually for agricultural purposes. ICAC

[43] the quantity of fertilizer and pesticide is important as is the quality of seeds.

difficult to apply in a competitive organisation of the sector in SSA. Competitive systems in the cotton sector are characterised by having a large number of ginners operating with open market competition for seed cotton purchase at harvest time and due to the difficulty in horizontal coordination among firms to prevent side-selling from farmers, there is no incentive to provide any preharvest service in such systems. Thus, among other services, also input credit is not provided.

The combination of the characteristic market failures in SSA seasonal rural credit (Baffes, 2007; Ikpi, 1999; Tscirley et al., 2009) and the absence of an input credit system from the ginners, have direct consequences on yields and participation in cotton cultivation on a large scale: farmers move in and out of the crop production, making the quantity of production irregular and generally decreasing, thus making long term programmes for productivity growth difficult[44]. Furthermore, volatility in production has a negative impact on key relationships with international merchants, who are sensitive to consistency of production.

Input provision is also strictly related to the quality of seed cotton since the latter in grand part depends on the seed variety that is planted and thus distributed to producers.

Box 1

SSA rural credit markets are known to be plagued with inefficiencies and this is especially true for seasonal agriculture in general and grain crop production in particular (Dorward et al.). They are generally characterized by inflexible formal bureaucracy on one side and a weak informal component on the other (Ikpi), resulting in credit rationing, politicisation, poor management, lack of emphasis on savings mobilisation, and unsustainably low interest rates (Dorward et al.). SSA does have MFIs, but they tend to be in urban areas or when in rural areas these are less poor areas with better access and less dependence on seasonal agriculture, thus leaving out of the picture those who are most in need i.e. smallholder subsistence farmers. In other regions of the world, direct lending for seasonal agriculture exists and is considered in the litterature (there are examples in Latin America), as mentioned by Doward et al.. Unluckily the method seen is considered to be hardly feasible among SSA smallholders since the experienced lending technologies require use of collateral and of household budgets which are unlikely to be appropriate for subsistence crop producion, and in any case loan size is large. Doward et al. also mention that there do exist a few African MFIs trying to fill this gap in rural financial credit markets, but they tend to exist in more favourable areas where seasonality and climate risks are not majour features. In any case, they conclude that there is „as yet, no successful working model for such provision". Some kind of financing for inputs in the cotton sector has shown to be a sine qua non to keep the sector living, since in the absence of input provision farmers have shown to turn to other crops.

[44] This is confirmed by the fact that although an increasing number of markets have become competitive, fifty percent of production in SSA still originates from non-competitive systems where input services are provided and prices are fixed.

The other design-sensitive point in the value chain, is the quality of seed cotton and lint. Before the cotton boll opens, cotton fiber quality is affected by research (seed variety, fertilizers, pesticides and production operations), extension and input provision; after that, nothing can be done to improve the quality of cotton but all subsequent operations can alter it for the worse. Following operations that affect quality include harvesting, storage (place and time), transportation, classing and grading functions, and operations at the gin.

While monopolistic systems are burdened by the obligation to buy all seed cotton produced and thus have less possible impact on quality enchancing/perfomance, they also often have a rigorous and centralised cotton grading and lint classification system, sustained investments in research and extension which concertedly enable delivery of consistent high quality cotton. On the other side, although one of the expected results of a competitive cotton sector was an accrued quality performance encouraged by a higher connection to final market requirements, what actually occurred was a decline in support and quality control services which eventually turned out into a deterioration of quality.

Among causes is that the primary worry of ginners is to avoid over capacity which results in a scramble to secure the purchase of a sufficient volume[45] of seed cotton, regardless of its quality. This has turned out in a depletion of grading at the primary marketing stage due to the possibility of farmers to take their seed cotton to an alternative buyer who will purchase it irrespective of quality, since quantity comes before quality for ginners. Consequently, producers do not have the incentive to implement quality-enhancing practices.

The achievement of high quality cotton also requires that ginners are able to control their supply chain[46], impling some form of contract farming that is difficult to maintain in a competitive organisation of the sector.

[45] to cover their fixed costs

[46] As mentioned the quality of cotton seed and lint is partly consequent to the quality of inputs farmers use, thus dependent on the provision of services as input credit, research and extension.

Two consequences stem from low quality. A short term, direct impact on the price received on the world market: differences in quality affect the value that manufacturers can get from the cotton lint and consequently the price that they are prepared to pay, resulting in a lower price received by producers and processors - price differentials are quite wide, with a ratio of about 1:4 between the lowest and the highest quality (Estur, 2008). The second is a non trivial, long term impact on country reputation from which premiums and discounts partly derive, and that is much considered by international merchants when deciding where to purchase cotton lint and at what price. Moreover, it is aknowledged that it is easier to destroy this kind of good reputation than to establish it, let alone re-gain it. Quality maintenance and improvement requires a concerted effort involving all actors in the chain from researchers, producers, ginners, to transporters. Chapter four analizes quality in the SSA cotton sector.

Box 2

Benin, seed cotton grading and lint classing remained regulated and carried out by the government following the liberalization of ginning. However, lint quality has remained irregular since liberalization, with the proportion of production classed in Standard 047 (the highest quality) dropping from 82 percent in 1996/97 to less than 40 percent during the following three seasons, and fluctuating between 43 percent and 62 percent over the past five years.

Uganda cotton was considered the best upland cotton in Africa. The country still occupies a special niche-market position by supplying roller ginned lint, and fiber quality is still considered relatively high. Yet, the quality control system at the primary collection level has largely broken down. Ginning overcapacity has led to a scramble for cotton and a large number of buyers purchase seed cotton regardless of quality, forcing others to do the same. Indiscrimate buying is correlated with high levels of contamination and because Ugandan cotton is reputed to be very contaminated, the premium its lint attracts has shrunk during the last decade.

PART 2

Comparison with other Cash Crops' Value Chains and Implications on Market Organisation

In this section I consider three other SSA success cash crops sectors which have undergone liberalization. I have chosen among those crops that similarily to cotton are highly labour intensive and where smallholder production dominates. I describe each crop -coffee, cocoa and tea- separately, beginning with its main features and then describe pre and post liberalization organisations of the sectors including advantages and disadvantages reported in literature. I eventually consider the reasons that have brought to a different outcome in the cotton sector.

7 Coffee

In developing countries, towards the end of the nineteen-nineties, coffee was the second most important commodity after petroleum in terms of export earnings. Many countries, especially those in Sub-Saharan Africa and Central America, still depend heavily on coffee as a source of foreign exchange and of employment in rural areas. SSA is the third largest world producer and exporter of coffee following Brazil and Vietnam with Ethiopia alone ranking eighth among world coffee producers (USDA, 2012). In SSA coffee production is characterized by smallholder production.

7.1 Crop Features

Coffee is usually cultivated between latitudes twenty-five degrees North and twenty-five degrees South.

Coffee cherries grow on bushes which take three to five years to develop from seedling to full-producing shrub. The shrub is productive for around fourty years although production is prime between its fifth and fifteenth year (Agro-Industry Profile, Coffee; WB 1986). The first stage in the coffee value chain is input provision. Inputs are tipically fertilizers and pesticides

which play a decisive role in the quality of coffee; coffee seedlings are necessary only at the beginning of the productive stage. Farmers carry out pruning, fertilizer application, pesticide spraying and then harvesting which all have consequences on the quality of the crop. Harvesting is particularly labour intensive since it is done by hand, even more so when "wet processing"- which demands for "selective picking"[47]- is to follow. The harvested coffee beans are then sold to local collectors and further to coffee processors for export. Coffee processors dry, grade and even size beans to be sold to exporters. There are two varieties cultivated commercially: Arabica and Robusta, of which Arabica is more refined.

7.2 Sector Design Prior to Liberalization

For many SSA countries coffee is a source of foreign exchange and government revenue[48]. Before the nineteen-nineties the sector was designed as a vertically integrated single-channel marketing system with state monopolies, stabilization funds and marketing boards. A pricing system was part of the organisation and producers received a fixed advance payment price and a second payment, usually linked to quality. Prices were fixed pan-seasonally so as to protect growers from price fluctuations assuring them a minimum price providing a degree of security and keeping incentives to production. Marketing boards were responsible for promotion, quality control and export processing. The centralized system was typically successful in keeping the information flow in the whole value chain and as such was considered to provide quality incentives to cooperative societies part of the chain and (less directly) to farmers (Fold and Ponte, 2008). Parastatals provided technical assistance in production, processing, and marketing and helped farmers establish interest groups. Smallholders delivered coffee to cooperatives or private domestic traders. The cooperatives passed the coffee on to cooperative unions for hulling, and private traders hulled and sold

[47] Wet processing requires soft fruit that is pulpable,so only ripe cherries are harvested (selective picking). Strip picking instead, removes all fruit from the tree aftiier most of the fruit has matured.The result is an uneven end-product since a large proportion of the fruit may then be over-ripe, immature or even green. In this case cherries are thn dry-processed.

the coffee to the Marketing Board. The difference between the producer price and the border price was an important source of revenue for the government with coffee providing up to ninety percent of foreign exchange and fifty percent of government revenue e.g. in Uganda. The private sector was either completely left out of the sector or had very limited action – mostly confined to hulling and internal trading (Fold and Ponte, 2008).

7.3 Downturn to the pre-Liberalization Organisation

The vertically integrated systems were considered inefficient and losing money at various points in the chain. The price stabilization mechanism was associated with high costs resulting in lower proportions of the export price given to the farmers (Ponte, 2002). Payments to farmers were often late (Ponte, 2002). Stabilization funds which were to be replenished when world prices were high were misused and consequently malfunctioned and the possibility of moral hazard opened the door to corruption (Akiyama, 2001). Furthermore, the sector was generally burdened by high taxes (Akiyama, 2001).

7.4 Sea change and Liberalization

A state control of marketing and the described price mechanism have long been considered necessary by SSA governments because of coffee's importance as a source of foreign exchange and government revenue (Akiyama, 2001). Moreover the functioning of the system was backed by the existence of the International Coffee Organization (ICO) created in 1962, which established and monitored an international export quota system suporting coffee prices above market levels (Gilbert, 2007). The ICO export quotas stabylizing system actually made fixed-price policies sustainanble for governments (Akiyama, 2001). This set of factors has made it possible for the African share of Robusta producers to grow and reach a peak of twenty-four percent of world production in the beginning of the nineteen-sevnties (Gilbert, 2007). This is in line with the view that African producers have been "sheltered" by the ICO to the detriment of other larger producers such as Brazil. In July 1989 the ICO export quota

system collapsed and export quotas were eliminated. Coffee-producing countries reacted exporting large portions of their accumulated stocks, causing a sharp decline in coffee prices – a fourty percent drop (Gilbert, 2007). The quotas being lifted, fixed–price policies became hardly sustainable having to face the combination of a sharp decline[49] and fluctuation in world prices. The revenues of all coffee producing countries were affected and parastatal marketing boards started suffering financial difficulties. As a result many governments were forced to look to international organizations and donor countries for financial assistance which came on the condition that they would undergo market reform. Liberalization was implemented in the nineteen nineties in almost all SSA coffee producing countries.

7.5 Following liberalization

Reforms resulted in significant changes to the coffee subsector with a substantial reduction of government intervention in the marketing and pricing of coffee. Among changes were new marketing systems, growing private sector participation and increased producer prices (Akiyama, 2001). Where reforms were implemented, private exporting firms were gradually allowed to export and soon began handling almost all coffee exports. The most significant change since liberalization was in producer prices which were now linked to world prices and rose significantly in terms of the share of the border price; farmers were also exented from the long waits for payments that characterized the previous system (Ponte, 2002). Input provision was passed on to the private sector, be it commercial banks which provide financing-for example in Uganda, or private exporters - like in Togo where they have taken up crop financing with prefinancing and cash advance to farmers.

However, a number of critical services previously provided by parastatal agencies have come to miss. To begin with, research and extension services have been weakened by reforms and obtaining credit at reasonable interest rates has shown to be very difficult for small local

[49] Not only because of the de-stocking of coffee producing countries but also because of coffee's "catching up" its negative price trend resulting from productivity advance, common across all agricultural commodities. (Gilbert)

exporters and producers, one of the primary reasons for this being the mentioned weakness of financial institutions (box 1).

Producers' groups and cooperatives have been adversely affected by reforms (Akiyama, 2001; Ponte, 2002) having difficulties in competing with private traders on price[50], with a consequent dramatic decrease in their share in produce handling to the advantage of large scale producers. The weakening of cooperatives and the high levels of buyer competition also increased the speed at which all negotiations take place: traders need to move coffee quickly in order to minimize costs[51]. The coffee is bought all at one price with pre-functory checks only: good and bad coffee is all mixed together and exporters can only perform a partial selection process to re-separate high quality for speciality exports, thus leaving out of possible premiums the small-holder producer and sharing no information with farmers[52]. This results in a disincentive to produce high quality coffee among small-holder producers to the advantage of estates[53] and threatens the supply of speciality coffee and the economic viability of high quality producers (Ponte, 2002).

Another consequence to the disruption of the information flow in the value chain is that producers are left to acquire price information and handle negotiations with traders independently, thus having to decide whether prices traders offer are adequate. Farmers also face volatility of prices which is passed through much more directly to them as a consequence to the dismantling of domestic marketing boards (Gilbert, 2007).

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[50] "If they pay a lower price than traders, they fail to get coffee from farmers. If they pay a high price, they risk losing money if the market price goes down, plus fail to make a second or third payment in relation to quality. As a result, they have either gone bankrupt, or have competed on the same basis as commercial traders – but without their speed and flexibility." Ponte

[51] consequently they cannot afford to spend time to evaluate small batches of coffee or preserve the identity of the batches for a future payment related to quality.

[52] Both country-based actors and farmers have lost power in the marketing chain to the advantage of consuming-country operators who take advantage of the asymmetry in quality information with a substantial part of total income being transferred from farmers and producer-country operators in general to consuming-country operators. However, other authors along with Gilbert (2007) dissent arguing that in more than one study, USDA among others- resulted in a one-to-one adjustment of roast coffee price to the price of green coffee.

[53] Gilbert (2007) observes that there is some evidence that small holder production is superior in quality in comparison to estates.

Two general consequences to reforms have been the fall in production, as registered by the loss of market share by African Robusta producers –from a twenty-four percent share to nine percent- after the collapse of the ICO quota system and liberalization of the coffee sector with an increase in concentration of world coffee production in Brazil and Vietnam (Gilbert, 2005); and a general deterioration in the quality of the export crop resulting in price discounting in international markets and a consequent loss of reputation for those origins (Ponte, 2002). However, looking at export data per country, some countries like Ethiopia and Togo have actually slowly increased their production and exports while other like Uganda and Tanzania are either recovering or have not changed much (Appendix 1). Comparing the whole SSA region to Brazil there is a fall in exports after year 2000 (an all time peak) and until 2005 but a slow recovery thereafter.

8 Cocoa

The world's production of cocoa is dominated by four West African countries: namely Côte d'Ivoire, Ghana, Cameroon and Nigeria. Together they account for about two thirds of total production with Côte d'Ivoire alone contributing over fourty percent being the world's major cocoa producer.

8.1 Crop features

Cocoa is a tree crop (derived from the tree Theobroma cacao) grown only in tropical areas and is suited both to small farmer and estate systems. Traditional varieties cultivated commercially are Criollo, Forastero (commonly Amelonado), and Trinitario which is an accidental hybridization between the former two. Traditional varieties start yielding beans about five years after planting and hybrid varieties after about three years. Production is prime after eleven years for traditional varieties and after seven years for hybrids. Given the right conditions, high yields are maintained for twenty to twenty-five years, and trees will continue yielding for between thirty and seventy years. Pods that are ripe for harvest are available all year round but there are peaks, mainly as the result of climatic factors - especially

temperature and rainfall. Time of harvest is not as critical as with other crops; pods which are not fully ripe can be fermented as easily as fully ripe pods, and ripe pods can be left on the tree for two to three weeks. However, frequency of harvesting influences bean quality which is best maintained when harvesting takes place every one or two weeks. The obtained raw cocoa is then cleaned, roasted, winnowed and ground to produce "nibs" which are further processed into liquor, cocoa butter and powder. The latter three are traded internationally and used in making chocolate.

Cocoa processing can be divided into two parts. Primary processing is carried out in producing countries by producers themselves - stages are pod opening, fermentation (box 3) and drying. Secondary processing has been concentrated in consuming countries.

Box 3
Fermentation
Correct fermentation and drying are critical operations and no subsequent processing can compensate for poor practice at this stage. The objective of fermentation is the production of cocoa beans possessing the desired stability, flavour, and aroma from which good chocolate can be manufactured. Desirable effects of fermentation on the beans include reduction in bitter taste, destruction of the seed, facilitation of shelling, and most importantly, development of flavour and aroma precursors. Without these precursors chocolate flavour will not develop during roasting.

8.2 Sector Design prior to Liberalization

Until the 1980s Africa's cocoa was produced and marketed under state-controlled systems, through marketing board systems and stabilization funds. The marketing board system was characterized by a parastatal with a monopoly over internal and external crop marketing: the crop was handled by the marketing board from the moment the crop was purchased from the grower to the moment it was exported (Akiyama, 2001), also accounting for quality requirements. Producer prices were determined administratively by the marketing board and government authorities and were fixed pan-seasonally, or even for several years, and pan-territorially so farmers would receive a uniform price irrespective of their location. The

objective of the price mechanism was to provide some degree of insulation against fluctuations in world market prices. Stabilization fund systems were designed to accumulate reserves when prices are high and support producer prices when prices decline, thus providing a degree of price stability in the face of international price volatility. The fund, or *caisse,* was a government-controlled marketing agency regulating the internal market and exports but did not handle the physical crop directly - it licensed agents to do so determining how much they would be paid according to a mandatory schedule of prices, costs, and profit margins for each stage of internal commercialization and exporting.

8.3 Downturn to pre-Liberalization Organisation

In the general scenario of falling world cocoa prices, marketing boards and stabilization funds grew to become cumbersome and often politicized organizations characterized by high operating costs absorbing a significant share of export earnings and high marketing costs ascribed to the administered price mechanism (Akiyama, 2001). Price mechanisms tend to be unsustainable when word prices are low since governments soon face fiscal constraints as they are obliged to finance the difference between the guaranteed producer price and the actual export price. The combination of factors exerted significant pressures on farm incomes (Akiyama, 2001). Experience in West Africa has shown that cocoa farmers in countries with stabilization funds and marketing boards have been poorly remunerated as parastatal marketing agencies and governments have appropriated a substantial part of the export price (Akiyama, 2001). Moreover, funds have rarely been used for their presumed purpose and have not fulfilled self-financing.

8.4 Sea Change and Liberalization

Although there were no distortions in the world cocoa market to be phased out/eliminated[54],

[54] "The International Cocoa Agreement (ICA) of the International Cocoa Organization (ICCO) operated a buffer stock program aimed at defending world cocoa prices (represented by the ICCO's daily price) within a certain price range, or band. During the late 1980s the decline in world cocoa prices forced the buffer stock to

during the last 20 years, world cocoa prices have exhibited a pronounced downtrend as a result of producers' response to attractive prices in the late seventies and early eighties which induced them to increase cocoa plantings (Akiyama, 2001). Hence, supplies and stocks of cocoa increased and prices fell due to the inverse relation between global cocoa stocks to grindings and real world cocoa prices. Cocoa prices were at historically low levels in the late 1980s and early 1990s. Not surprisingly, stabilization agencies and marketing boards that attempted to maintain high producer prices found themselves facing serious financial difficulties (Gilbert, 2008) and consequently longing for financial assistance. Major donors conditioned financial help to the implementation of a liberalization of the cocoa sector. Reforming the sector was seen as a way to reduce the high marketing costs, raise incomes of farmers by increasing farmgate prices, and open up the cocoa sector to private operators (Gilbert, 2008). All four of West Africa's largest cocoa-producing countries- Cameroon, Ghana, Nigeria, and Côte d'Ivoire-plus Togo (a smaller cocoa producer) undertook such reforms with the objective of improving efficiency thus reducing costs and increasing producer prices. The reforms undertaken in Cameroon, Côte d'Ivoire, Nigeria, and Togo have been profound, Ghana's reforms have been more gradual.

8.5 Following Liberalization

Where reforms have been fully implemented the marketing chain comprises many private agents with market forces determining prices and without a direct involvement of the government in marketing the crop. Producers sell at the farm gate or at village markets to local traders or cooperatives which then transport the cocoa to secondary markets or to a port and sell it to private exporters directly or through intermediaries. International dealers or traders subsequently sell to final users - generally chocolate companies - or processes the cocoa for sale. One general result of liberalization is that in free market sytems, producers

its limit (it reached 250,000 tons in 1988), and efforts at price stabilization were effectively abandoned. Recent renewals of the ICA do not contain economic clauses (that is, there is no price support or price stabilization) and in 1997 the buffer stock held by the ICCO was liquidated." (Akiyama)

receive a much higher percentage of the f.o.b. export price than in other marketing systems (Akiyama, 2001). In Cameroon and Nigeria producer prices increased from around fourty-five percent and twenty percent, respectively, before the reforms to over seventy percent and eighty percent afterward (Akiyama, 2001). Producer prices in Togo increased from sixty percent of the f.o.b. price prior to reforms to about eighty percent thereafter (Akiyama, 2001). Increased producer prices are the result of growing competition among local traders, lower marketing costs and margins, and the abolition of state marketing agencies and thus implicit taxes - comparison studies show that marketing costs and taxes are lower (Akiyama, 2001 citing a study in 1989 and 1995) than in monopolistic statal systems. In fact, marketing costs and taxes declined dramatically in Cameroon and Nigeria following market liberalization. However, although the market system is free the government may retain involvement in quality control, taxation, and general monitoring and supervision. In general market liberalization has had a positive impact on producer prices and on production which have both increased (Akiyama, 2001).

8.6 Downside to liberalization

Reforms also unleashed a number of problems.

Collapse in forward sales - Forward sales in the cocoa market allow to hedge from the uncertainty of future prices, they reduce the risk of seasonal price stabilization, and they allow producing countries to capture the "forward premium" - the difference between the forward price and the spot price at the time of the forward sale. Thanks to an established reputation in the market as a reliable counterpart, marketing boards were able to sell forward even well ahead of harvest time –up to eighteen months ahead. This was also made possible thanks to the confidence agencies had in the availability of cocoa beans for sale in the coming crop thanks to the control of exports through direct sales and granting export rights. The presence of a monopoly marketing agency such as a marketing board generally greatly reduces performance risk in forward sales (Akiyama, 2001). While prior to liberalization

cocoa exports were in grand part sold forward before the new crop year thanks to the governement agencies acting as counterparty risk in international transactions; since liberalization, private exporters have become the counterparties in forward transactions, thus raising the performance risk. Consequently, there has been a collapse in forward sales (Akiyama, 2001).

Concentration of exporters – after rising in number immediately following reforms, the number of exporters dropped dramatically in the post liberalization period with a consequent concentration of exports in foreign-linked companies. This happened in Cameroon for example, where two foreign-linked exporters control around eighty percent of all exports (Akiyama, 2001), leaving out of the business local exporters (Fold, 2008) who have been reduced to traders, selling to either foreign-linked exporters or the local processing factory, also thanks to the difficulties local traders have in accessing credit.

Declining quality – A number of reasons lie behind the declining quality of cocoa following reforms experienced by most cocoa producing African countries. After liberalization, the rush for market share by both experienced and new domestic traders resulted in higher prices offered to producers and less attention oriented to quality requirements. In the attempt of reducing time between borrowing and repayment and to increase the speed of capital turnaround due to the costs of capital as a consequence of its scarcity and with the objective of maximizing their profits, new domestic buyers and exporters showed little regard for quality paying the same price for all beans. Consequently, low and high grade[55] beans would be increasingly mixed together to the point that cocoa would be purchased even if it was not properly dried or fermented for the fear of losing potential shipments. On their side, farmers would take advantage of the oppportunity of selling quickly to local buyers, consequently paying less attention in the processing - drying and fermentation- resulting in the erosion of

[55] "Low quality is caused primarily by high bean humidity at the arrival points in the port of shipment and the resulting mould that easily develops. High humidity content is a consequence of inappropriate and reduced drying times at village level (…)" (Marianne, Fold)

the general quality level (box 3). The trend was exacerbated by the abolishing of government quality controls and of grading at the village level (Fold, 2008 citing Atse). The general result has been a loss of consistency and consequent reduction in price premiums. This has been experienced by Cameroonian cocoa which used to command a premium over Ivorian cocoa but saw it extinguish after exporters have taken full responsibility for quality control, and where average quality sunk to such low levels that during one season, a considerable part of the beans was declared unacceptable to Northern exporters and grinders (Fold, 2008 citing Marchés Tropicaux). Nigeria also lost its premium due to a number of reasons among which the abolition of quality control and standards following a too rapid liberalization. For the same reasons Ivorian cocoa quality started declining with the implementation of the first reforms in nineteen-ninety. Although it might be too simplistic to attribute a deterioration in quality entirely to market liberalization or to the advent of a free market system as Akiyama claims, other authors argue that the situation has remained substantially the same ever since the first 'post-liberalization rush' (Fold, 2008).

Increased price volatility exposure – given out the protection performed by marketing boards, market liberalization has brought farmers to be directly exposed to price volatility from fluctuations in the world market[56].

9 Tea

In Africa, tea is produced mainly in East Africa with Kenya, Malawi, Uganda and Tanzania being the largest African producers and exporters of tea. In the world market, Kenya is the third largest producer of black tea after India and Sri Lanka. In this section I will consider solely the case of Kenya for a number of resons I hereafter briefly explain.

Tea is Kenya's top export (Faostat), whereas it is less important in the other African

[56] This is shown by Gilbert and Varangis for example, in the comparison table between price variability before and after globalization.

producing countries' economies. Kenya has been the world's top exporter of tea in 2007 and 2008 and has been second only to Sri Lanka since (Faostat). The Kenyan tea sector is peculiar in that its smallholder production is one of the greatest success stories in the country's agricultural sector. Kenya's tea is the most important agricultural sub-sector in the country and the second leading foreign exchange earner, contributing about twenty six percent of the total foreign exchange earnings (Kagira citing the Tea Board of Kenya). The sub-sector employs approximately ten percent of the Kenyan population (Kagira citing Gesimba et al., 2005) and further has to do with poverty reduction since it enables farmers to accumulate assets[57].

9.1 Crop features

Tea (black, green and white) comes from an evergreen bush (Camelia sinensis) which thrives at fairly high altitude in the humid regions of the tropics and sub tropics (1400-2500 m). Although usually grown in large estates, it is also cultivated on small farms. The tea plant starts to yield usable leaf two to three years after planting, reaching full production after seven to ten years. Yields of made tea vary depending on climate, variety and cultivation practices. The quality of tea produced is closely linked to growing conditions and cultivation practices. Quality depends on the characteristics of the leaf which vary according to the plant's growth patterns and growing conditions as well as cultivation and harvesting practices. Tea is harvested or "plucked" year-round and is particularly labour intensive (needs to be plucked every seven to twenty days). Plucking helps determine the quality of the final product and has a significant effect on the growth of the plant. Plucking is usually hand made, higher quality tea is produced from "fine" plucking of "two leaves and a bud". Mechanical harvesting is also possible but results in "coarse plucking". Tea bushes are

[57] Kagira et al. assert that involvement in tea production improves the quality of life of rural families enhancing the wellbeing of communities living in rural areas.

typically plucked once every one to two weeks depending on the season; great skill and care is required to ensure that the plant remains productive. Other significant factors are shade and pest control. Once the leaf is plucked it is taken to the factory for processing in the least possible time - less than twelve hours - so that bacterial attack and leaf deterioration do not occur. Poor handling results in bruising and consequently in uncontrolled fermentation and overheating. The processing stage in itself does not involve complicated machinery or sophisticated technology. However, it is time, space and usually also labour intensive. The main purpose of tea processing is to allow chemical changes to take place within the leaf. The fundamental process in black tea manufacture is enzymatic fermentation of polyphenols within the leaf. Different processes prepare the leaf, establish optimum conditions for fermentation, and end the process when it has gone far enough. The two most important factors affecting the final product are the temperature and the duration of the process. Fermentation is the simplest but most important stage in tea processing.

9.2 The Case of Kenya

The cultivation of tea for commercial purposes was introduced in Kenya in 1924. At that time tea growing was restricted by the government and colonial settlers, to large scale farmers and multinational companies. Natives were not allowed to grow the crop until after independence (1963) when the government created the Special Crops Development Authority (SCDA) to promote growing of tea by Africans with the support of the ministry of Agriculture, thus opening tea-growing to local indigenous farmers. In 1964 the liabilities and functions of the SCDA were taken over by the then established Kenya Tea Development Authority (KTDA) with the mandate to promote and develop the growing of tea in local smallscale farms. Since then tea growing is wide-spread in Kenya and although large scale farms still operate, smallholders contribute the biggest percentage of the output - approximately sixty-two percent of the total tea crop in Kenya is produced by more than

562,000 small-scale farmers – and have more acreage, covering sixty-six percent of the total area under the crop (Kiarie, 2012 citing Mwaura & Muku, 2007).

KTDA is to date the management agency of the smallholder tea farmers. Until 1997 KTDA operated as a parastatal and had exclusive management control over the smallholder tea value chain including provision of planting material and extension services, provision of inputs and services, collection and processing of the green leaf, management of the factories and marketing of the processed leaf. The sale of the processed tea was organised by KTDA through its contracted agents at Mombasa and London auctions, once it received the sale proceeds it arranged the payments to farmers on a monthly basis. KTDA also insisted on the "two leaves and a bud" plucking style, which kept quality high and KTDA tea generally sold for higher prices than estate teas (Tyler, 2006). Average yields were on a par with Kenyan estate levels, which in turn were on average the highest in the world.

The exclusive KTDA control over the smallholder tea value chain worked well when membership was small (CPDA) and until the nineteen eighties the industry was well organised and farmers promptly received good prices for their tea (CPDA). According to Tyler, KTDA's early success was also due to its high level of integrity, which gave confidence to smallholders that they could deliver their leaf to KTDA and then would be paid a fair price without excessive deductions or KTDA overheads. Consequently, a growing number of farmers went into tea growing or expanded their tea acreage also encouraged by the government.

However, as the number of tea farmers grew throughout the country, the centralised system started to show weak spots (Keraro et al., 2012). The administrative and financial control of all tea factories was in the hands of KTDA, which started being accused of high overhead costs that reduced payments to farmers. As KTDA grew into one of the biggest enterprises in Kenya its reputation of integrity slipped: politicians recognised that there was money and

patronage to be squeezed out of KTDA and by the nineteen nineties KTDA had become a politicised institution. Farmers felt they had limitated power in decision making on the processing and marketing of their tea, thus they started calling for a decentralization of the authority and privatization of the tea sub-sector (Keraro et al., 2012).

In 1999 the liberalization process of the tea sub-sector began and KTDA lost its monopoly rights being privatised as the Kenya Tea Development Agency Limited in 2000, through the issue of shares to its smallholder growers. To date, smallholder farmers produce and sell their tea through the Kenya Tea Development Agency (KTDA), which has become the largest single tea agency in the world with sixty two tea factories in the small scale tea sector serving over five hundred thousand growers. KTDA functions include factory unit management and support services, sales and marketing, financial services and tea management consultancy services (KTDA, 2011). It also provides extension services, production inputs, green leaf collection, processing and marketing of processed tea on behalf of small scale tea farmers (KTDA, 2011).

9.3 Outcomes of Liberalization

One outcome of privatisation was that the directors in the KTDA board are directly elected by the farmers to represent their interests in the tea factories (Keraro et al., 2012). Privatization was called to bring about more efficiency and transparency in the operations of the company and according to Keraro et al. it was actually successful in improving management expediency in decision making, eliminating redundant bureaucracy and accruing transparency in factory operations. However, Keraro et al. (2012) also mention the poor quality of the new board directors – read inexperienced- and other problems unleashed with liberalization.

In general the outcome of the undertaken reform is not clear. In fact, if on the one hand there are authors like Keraro et al. (2012) who bolster the privatization of the Kenyan tea

through studies that reveal that liberalization has resulted in "significant positive impacts" which have led to the growth of the sub sector and benefited the farmers; there are other studies that claim that results of privatization have fallen short of expectations. The CPDA study for example reveals that instead of accrueing transparency, KTDA has become increasingly corrupt[58] and inefficient after privatisation as a result of being shielded from direct public scrutiny. While Keraro et al. claim that privatisation has particularly benefited smallholder farmers[59], CPDA asserts that farmers have reamined isolated at one end of the value chain and have little if no weight in decision making and influencing the sector. Further, even though the prices smallholder attain on the world market are similar to those for plantation tea, the crowded smallholder tea value chain, the high management fees charged by KTDA and its management inefficiencies reduce the payments received by the small scale farmers which thus remain lower than those for plantations.

CPDA also claims that following liberalization, quality has taken a declining trend which in turn negatively affects prices obtained by the small scale farmers. This is confirmed by Kagira et al. (2012) who claim that farmers in Kenya have specialized in production of bulk undifferentiated low quality tea with a focus on volume rather than quality. Kagira et al. (2012) also consider that smallholders have been negatively affected by liberalization as far as the information flow in the value chain goes: when the sector was run by the parastatal, farmers used to get extension services (including information on better tea farming practices) from the Ministry of Agriculture; following liberalization, such services are available only on fee and most farmers are unable to pay or ignore the usefulness of the service. One example for all is that the Tea Research Foundation of Kenya has developed forty-five varieties of tea which have not been adopted yet because many farmers ignore their availability (Kagira et al.,

[58] as a result of being in the hands of a "small club of powerful elite businessmen who enjoy political patronage"

[59] "The study revealed that farmers have a much bigger say in the management of factory companies now than before liberalization."

2012). The adoption of improved varieties of tea is one way to tackle the declining quality problem following liberalization and is among KTDA duties to ensure that farmers adopt these technologies but it has shown to be unable to do so.

Following liberalization, farmers also need to deal with fluctuation of world tea prices which is a major problem especially when the small scale farmer family does not have other sources of income (Kagira et al., 2012). This is directly linked to tea hawking: high poverty levels among smallscale farmers often takes them not to be in the position of waiting the payment terms of KTDA and obliges them to sell their tea to non-KTDA outlets or sell to middlemen for immediate though much lower payment (Kagira et al., 2012). According to Kagira et al. (2012, citing Kegonde 2005) tea hawking is wide spread in Kenya tea growing areas. This has showed to lead to poor tea husbandry, low returns to the farmer and non-repayment of farm input-loans advanced to the farmers by the factory companies to which these farmers belonged (Keraro, 2012).

So although as Chepengeno et al. claim, liberalization has brought smallholder tea farmers to have more channels for their produce instead of having only KTDA as an outlet, and that the structure of the sector has actually changed and become competitive at the farm level with increased participation by private firms and individuals with the private sector participating in the marketing of smallholder tea; the structure and performance as well as the benefits of this new organisation of the sector remain unclear (Chepengeno et al., 2012 citing Nyangito, 2001).

10. Conclusions: Different Sensitivities, Different Impacts

I have chosen to compare the afore described crops to cotton for a number of reasons. As for cotton, the absence of scale economies at the growing stage of these chains and their

agronomic characteristics make these crops particularly important to the rural poor in SSA. Furthermore, they all are SSA smallholder production success stories; they share with cotton a number of stages in the value chain and all four crop sectors were originally organised as state monopolies and have subsequently been reformed.

The reforms in the considered SSA sectors have given outcomes that are hardly interpretable univocally: in all four sectors reform outcomes are usually described as mixed, and much depends on the viewer's perspective. However, following liberalization two facts have generally taken place: a wellcome raise in producer prices as a share of f.o.b. export prices, and a dismemberment of the value chain with a consequent fall in quality. The four sectors have been affected unequally by such changes: while Kenya and Côte d'Ivoire retain their position as the world's major exporters in tea and cocoa respectively, and the SSA region as a whole shows recovery in coffee production with Ethiopia even increasing its share in coffee exports (Appendix 1); declining quality and the consequent loss of country reputation has turned out to be more serious an issue when related to the cotton sector.

The reasons are to be searched for in the dynamics of world market requirements per crop. In the coffee sector, the development of new processing techniques, i.e. steam cleaning, have resulted in the possibility of substituting low-cost robusta coffee to high-cost arabicas providing the potential to reduce bean costs by mixing different quality of beans (Kaplinsky, 2004). Thus, high quality beans and traceability have lost criticality in exports but for speciality coffees. In cocoa, at the basis of a homogenized demand for lower quality are the changes in transportation technology: beans are now transported in bulk making segregation of quality beans costly (exporters can distinguish different quality lots but only losing the cost advantage from bulking) and resulting in a downward shift in exporter's demands for premium quality cocoa (Gilbert et al., 2002). In tea, blending makes different tea qualities become interchangeable.

None of this seems to work for cotton. The difference in cotton lies in the lasting criticality of its design-sensitive features: inputs and quality. The timely need of inputs is a consequence of the intrinsic charcateristics of the crop: it is input-intense and it is a year crop. Instead inputs are not as critical in coffee, cocoa and tea which are tree crops with a consequent difference in investment/planting decisions and related credit problems. In cotton, inputs are needed seasonally and some kind of coordination has shown to be necessary for input credit provision to be viable. Where there is no input provision quality plummets and farmers have shown to turn to other crops with a consequent fall in cotton production which undermines consistency of exports and eventually country reputation.

In cotton, quality is still the main source of differenciation in end-markets. As confirmed by increasing price differentials between the A Index and the B Index[60], quality parameters determine the price obtained in international markets. The demand of quality originates from the imperatives imposed by consumers of cotton lint, i.e. spinners. The spinning industry has progressed into high technology and increased competition, making management of lint quality increasingly influential and resulting in a new demand for quality.

Competition in the textile industry originates from market saturation consequent to plentiful supply of cotton (mostly from the US and China) and results in an inclination toward differentiation rather than standardization in products. This can be partly achieved through a greater accuracy in the assesment of fibre properties and the measurement of an increased number of properties of cotton, providing a greater scope for differentiation. This demand is partly satisfied by HVI testing and there actually is a trend toward a mechanical calibration of fibre properties but, those properties which are crucial for spinners remain tested on an experience basis. Two reasons lie behind this: first, calibration is based on samples from each bale and some properties need to be tested for more generically instead; and second,

[60] equivalent to the A Index but for coarse low grade cotton

uncertainties about reliability of test results[61] resist. Consequently, spinners and thus international traders still rely on country reputation on which also cotton blending depends since most spinners, contrarily to grinder and roasters, have a preference for specific blends of specific different national origins in order to obtain the desired yarn properties. Once reputation has suffered and customer spinners have changed their blend, it is difficult to regain the specific market segment. This results in a rigidity in substitution, which make quality and the related country reputation entry barriers to the different spinning end-markets.

Importance of reputation is exacerbated by the way seed cotton is traditionally transported, i.e. in bulk. This kind of transportation doesn't allow for segregation of quality and makes free-riding possible among producers, particularly concerning contamination. Classing and grading stages at the primary market have shown to be critical in maintaining an incentive for producers to keep levels of quality high – through cautious harvesting for example.

Progress in the spinning technology demands for better characteristics of cotton lint. The achievement of this involves almost every stage in the cotton value chain: quality is the resultant of a concerted action among research, input provision, extension, harvesting, storage, classing and grading. Actually, high-speed spinning and the technologically advanced equipment require fibre quality that is of premium cotton (National Cotton Council of America) the limited[62]production of which in fact make quality a determinant of the world trade of cotton (box 4).

[61] test results have shown to be sensitive to different laboratories, humidity grades, colour gradings etc.
[62] There is a high demand for Egyptian cotton with a limited supply; this drives up the price also.

Box 4

China is the biggest producer and at one time importer of cotton which makes any decision on its cotton policy the main swing factor in world cotton trade with prompt repercussions on world cotton prices.

China could be self sufficient but big parts of the cotton it produces are stocked. One reason behind this policy is that much of the Chinese cotton crop does not meet the quality required by mills, particularly those with export markets for their yarn and textiles. Consequently, China needs to buy cotton abroad and Chinese spinners have used an increasingly large amount of imported cotton to supply its growing mill capacity in the past decade. This is confirmed by trade flows which have shifted destinations from Europe and the US to countries in Asia.

Chapter III

Research and Development

Introduction

In this chapter I adress cotton research and development (R&D) in sub-Saharan African (SSA) selected cotton-producing countries. I begin with briefly describing R&D in agriculture in general and then in SSA; I then pass to R&D in cotton specifically. Following is a per country analysis of agricultural R&D within which I frame cotton R&D. I consider financing of agricultural R&D and of cotton R&D specifically indicating the trend of expenditures in the two cases.

The issue of a contingent sensitivity of R&D in cotton to a liberalization of the sector is problematic because data on specific R&D expenditure is limited. However, I consider (unpublished) ASTI data on full time equivalent cotton researchers[63] per country as of 2001 and 2008 (to the best of my knowledge this was the only data available).

1. In general

Research and development (R&D) in agriculture are in general fundamental. Driven by innovation and tecnological change agricultural production methods have changed dramatically over the past century. As of the USDA, agricultural production in the United States from 1920 to 1995 has seen crop land, agricultural labour force and the number of people employed in agriculture dramatically decline, while agricultural production has more than tripled. Agricultural productivity has increased and agricultural production methods

[63] ASTI calculates its human resource and financial data in full-time equivalents taking into account the proportion of time that researchers spend on R&D versus other activities. University employees, for example, spend the bulk of their time on activities other than research, such as teaching, administration, and student supervision. These hours are excluded from ASTI calculations of human resources invested in agricultural R&D. Thus, four faculty members estimated to spend 25 percent of their time on research would individually represent 0.25 FTE and collectively be counted as 1.0 FTE.

have changed significantly; agricultural research, be it public or private, is a key driver of this growth.

Agricultural R&D investments are reconned to be a crucial determinant of agricultural productivity through the introduction of improved crops and cropping practices, labor-saving technologies, improved quality of storage, processing, and marketing. In terms of the production frontier, R&D is what provides the necessary technology to move the production frontier out by enabling the representative farmer with a fixed amount of inputs to get more output without using more resources.

The relationship between R&D in agriculture and the consequent economic and social impacts are the rationale to why both the public and private sector invest heavily in it. Nevertheless, there are downturns to R&D that make such investments not an obvious practice. To begin with, R&D demands high and continuative investments. Moreover research is known to be plagued with uncertainty: results are not necessarily achieved and even when they are, there is a considreable lag between the necessary continuous expenditure and the expected returns. Alston et al. (1995), have approximated the lag to be about eight years from the initial investment. Others, like Thirtle et al. (2010), consider a lag of twenty-five to up to forty years comprehensive of the diffusion time of the innovation to the productivity gains at the farm level. Furthermore, regardless of the time it can take to achieve possible results, outcomes of research are not necessarily marketable. Sunding and Zilbermann (2000), distinguish between innovations that are embodied in capital goods and hence can be marketed, from those which are „disembodied“ and are thus not so easily commercializable and more prone to be defined pubblic goods. They consider such classification useful for directing pubblic investment decisions in R&D and state that the adoption of innovations is affected by economic forces. Investments in R&D can come from the private sector or the public sector and distinction is considered useful to direct public investment in innovation generation: private investment is less likely in disembodied

innovations because the final product is difficult to sell. Even in the case of embodied innovations private investment requires a series of appropriate institutions for legal enforcement of intellectual property rights. As a consequence, public expenditure on R&D in agriculture is particularly important.

Economic analysis has shown that the payoffs to investment in agricultural research are large. There is a vast litterature advocating a strong link between public investments in research and innovation in agricultural productivity growth. However, although there is considerable empirical evidence that indicates high rates of return to public agricultural R&D investments[64], towards the end of the 20th century most countries have shown a decline in public funding of agricultural R&D (Beintema et al., Thirtle, Masters, Pardey et al. 2006). Furthermore, expenditure has been retargeted from productivity enhancing to other public interest areas such as the environment and food safety (Alston et al. 1999) so the decline in (agricultural) productivity enhancing R&D is substantial. This direction change in public R&D investment has consequences on countries beyond the high income group considering that in the past, both developing and developed countries have been dependent on technology spillovers from a few of the world's affluent countries.

Beintema et al. state that innovations in agriculture fostered by public investment in agricultural R&D have helped alleviate poverty throughout the twentieth century. Thus the slow down in industrialised countries public agricultural R&D and its retargeting towards environmental objectives, food quality and safety, and other objectives raise questions about the future of agriculture in the more disavantaged countries. According to the authors, developing and least developed countries will have to become increasingly self-reliant in the creation of innovation in agriculture, although complete self-reliance will be beyond many countries.

[64] Alston et al.´s „Meta Analysis of Rates of Return to Agricultural RD"; Fan and Saurkar

Unluckily SSA is no exeption to the declining pattern of public investment in agricultural innovation and total public agricultural R&D spending has been decreasing since the early 1990s (ASTI).

2. SSA R&D in Agriculture – a History

The origins of agricultural research and development in SSA can be found in the colonial botanical gardens that were introduced in the region by European colonisers in the late nineteenth century. In 1900 around twenty-four botanical gardens and model farms had been established in the region. Their aim was mainly to study and propagate tropical export crops but, as they slowly turned into experiment stations they also laid the foundation for an agricultural research infrastructure in Africa. By 1920 at least one station had been established in every country in the region. In the following years they further evolved, expanding research and specializing with the upcoming of commodity specific research stations.

Until WWII these research stations were administered by local colonial admistrations. This was true but for the French colonies where two types of stations were established: local and federal agencies. Federal agencies were administered by the relative federal government and they coordinated the work of the local agencies. Funding generally came from local in-country sources (Pardey, Roseboom, and Beintema, 1998) while metropolitan governments invested directly in higher education to form specialized staff destined to work in the colonies. The French were precursors and established the "Ecole Supérieure de l'Agriculture Tropicale" in 1902, while the Imperial College of Tropical Agriculture in Trinidad was established in 1921.

After WWII attention from metropolitan governments on colonial research agencies grew and an expansion and reorganization of agricultural research followed, particularly in the British and French colonies. Soon after, the political independence achieved by African

countries changed the picture again and the existing agricultural research structures passed to the newly formed African governments. However, the transition followed different patterns in Anglophone and Francophone colonies. The British left the occupied countries more promptly but they just as promptly contracted the flow of financial and technical support for research from the UK, thus leaving the responsibility of funding and managing the research institutes to the incoming governments.

In Francophone Africa instead, the French retained administrative responsibility continuing to fund, manage and execute agricultural research for many years following political independence. Cooperative bilateral agreements were signed by all the French African territories except Guinea and Mali, from which French research staff and equipment were withdrawn immediately. In the rest of the ex-colonies, France continued to provide scientists and cover the related costs, and local research structures were affiliated with the French commodity institutes, while the host country provided support staff (Pardey et al., 2006; and Roseboom et al., 2009). This organisation lasted until the 1980s when African states took over complete control over the research agencies on their territory. Nevertheless, support with regard to agricultural research remained important and expatriate scientists continued to play an important role in former French Africa countries.

3. SSA R&D in Agriculture – Today

Contrarily to what mentioned for the developped world, in developing countries agricultural research is still mainly public (Ecvheverria and Beintema, 2009) and SSA is no exception. Public agricultural research is conveyed by government agencies, higher education agencies, and nonprofit institutions. Government agencies are directly administered by the national government and are typically departments or institutes within a certain ministry.

The majority of SSA countries have a single national agricultural research agency that accounts for the bulk of agricultural R&D capacity and investments. The agencies that rose during colonization and were then taken over by local governments, developped into National Agricultural Research Systems which perform public agricultural R&D. In most of Africa these have then undergone further re-organisation to enable cost minimization and better resource allocation and an organisation of research by commodity. This new organisation is defined as the „single agency" model: the National Agricultural Research Organization (NARO). Nowadays this is the dominant[65] structure for public agricultural R&D in Africa (Pardey, Roseboom, Beintema, 1995). Other two organizational models exist: the „two-agency model" and the „multi-agency model". In the former, two separate agencies perform public agricultural research typically separating for crop and livestock research together accounting for the bulk of research in agriculture. The multi-agency model instead, has a moltitude of agencies none of which represents the dominant share of the country's total agricultural research.

Along the mentioned agencies an important part of agricultural research is performed in the higher education sector: Pardey, Beintema and Roseboom (1995) identified 105 among faculties, university colleges, or schools of agriculture, forestry, and veterinary sciences throughout Africa. It is notable though that they generally represent only a small share of the overall research effort and that they only combine university level education with research. Echeverria has found that most universities allocate less than twenty percent of their time to research and that it is more often discipline-based research than applied research. Moreover initial efforts were devoted to educating graduates for the emerging national bureaucracies, thus research was adressed only gradually. Nevertheless, university-based agricultural research has expanded more rapidly comparing to government and semipublic R&D agencies over the past three decades.

[65] There also exist agencies that are non NAROs, but these employ (6.5 times) less researchers, have less research stations and typically concentrate on one commodity or at most a group of commodities.

Non profit institutions complete the picture of public research. These institutions have no explicit profit objective and are characterised by having more freedom than their publicly funded counterparts not being directly controlled by the national government. They are often linked to producer organisations or commodity boards and funding comes in grand part from levies on production or exports (Echeverria and Beintema, 2009). Agricultural Science and Technology Indicators (ASTI) show that researchers employed in the sector have increased in absolute terms, but the overall growth has been low compared with the other two public research sectors (Echeverria and Beintema, 2009).

Research is implemented also across country borders and from 2000 a number of institutions[66] have helped create networks aiming at the collaboration of national agricultural R&D in the SSA region. According to Beintema and Stads (2011), as a result of such collaboration information is shared more easily and the specialization in particular fields of national agricultural research systems is made possible. These networks have proved to be particularly beneficial for small countries which do not have a critical mass of agricultural R&D.

Agricultural R&D in Africa is conducted also by international organisations and among these important to mention are the centres under the Consultative Group on International Agricultural Research (CGIAR). These centres are identified by Beintema and Stads as a source of innovation since they can for example provide new crop varieties which are then tested at the national level by local R&D agencies under local conditions.

Private sector agencies exist but still play a very small role in the sector. These agencies generally have the production of goods and services for profit as their primary activity so that R&D is not their main activity (Beintema and Stads, 2011). In some cases private for-profit companies have a unit dedicated to R&D, but in general companies tend to depend on

[66] The Forum for Agricultural Research in Africa (FARA); the Association for Strengthening Agricultural Research in Eastern and Central Africa (ASARECA); the West and Central African for Agricultural Research and Development (CORAF/WECARD); and the Food, Agriculture, and Natural Resources Directorate of the Southern African Development Community (SADC) (Beintema, Stads 2011)

government agencies or universities for research. In any case information on expenditure trends in private agricultural R&D in SSA is little (Beintema and Stads, 2011).

To sum up, agricultural R&D in SSA is still dominated by the government which represents the main source of funding and the main executor of research activities. According to Echeverria the government sector in 2000 accounted for more than three-quarters of total agricultural R&D staff. However, since then new ways of financing are being experimented and new partnerships are rising so that the balance between public agencies is changing, ASTI show that the relative share of staff employed by the governmnet has declined over time. Nonetheless, government agencies still employed seventy-three percent of full-time equivalent public agricultural R&D staff in 2008 (Beintema and Stads, 2011) and the government is still the main source of funding for agricultural R&D in SSA.

4. R&D in Cotton

In Africa cotton is closely related to general agricultural R&D all the way from its origins. It has been introduced in the continent through the botanical gardens that represented the embrios of the present agricultural R&D infrastructure and its success is in grand part due to the work of such early research establishments. The relationship has shown to be two-way, since the success of the commercialization of this cash crop in turn enhanced the demand of additional research outputs to answer the growing demand to improve production and innovate the necessary technologies. The success of cotton in SSA advocates the importance of the allocation of resources to specific research areas which is considered one of the most critical policy and management aspects directly influencing the ultimate effectiveness of a research system (Pardey, Roseboom and Beintema 1998).

Agricultural R&D in cotton is not different from agricultural R&D in general: also in the case of cotton it is a long term endeavour. Pardey, Roseboom and Beintema (1996), find that

it generally takes from seven to ten years to breed a new crop variety for example, and more for it to get to the fields.

In general, R&D in the cotton sector can be divided into three domaines: entomology, agronomy and varietal selection. Following is a brief description of each section.

Entomology has to do with the phytosanitary protection of the cotton plant. This division of R&D develops and then executes correct action protocoles in the domain of phytosanitary protection of the cotton plant. The primary objective of the studies in this domain is the reduction of the impact of deseases (especially of destructive insects and acarids), in order to promote the potential of the varieties selected and of the agronomic techniques advised, also keeping in mind environment protection. This division developes a treatment programme for every sowing campaign; indicating a list of certified products to be used and concretely suggesting the amounts of treatments to be used per hectare.

More in detail, research activities in this division concern the dinamics of destructive insects. The evolution of the population of different families of insects is studied on a yearly basis, in order to measure their impact on the production of cotton and hence to evaluate the consequences on an economical basis and judge the efficacy of the used treatment. It also concerns the chemical *war*, the insecticide composition efficacy, protection programmes, techniques and treatment devices. The action against bugs is also dealt with by studying the combination of various methods against such destructive bugs with the aim of minimalizing the use of insecticides. Laboratory work is aimed to study the sensitivity of bugs to the active molecules that are spread in the fields, to the massive breeding of insects, to the biological evaluation of the insectisides used, but also to maintenance of an assortment of insects.

Agronomy is about soil fertilization and the technical itinerary to be followed. The objective of this division is to give the producer/farmer new technical methods that are compatible with his initial resources and that enable the management of a lasting agriculture contextually improving productivity. The activities of this section of R&D regard the following points:

research regarding soil fertility, mineral fertilization, technical production procedures, experimentation of herbicides and of regulators of cotton growth.

This division studies the persistence of mineral elements like phosphore, potassium, nitrogen and sulphur in the soil, since such mineral elements are deprived by continuous cultivation. The deficiency of such minerals has clear negative consequences on the cotton plant and the difference with regularly fertilized plants is stark. Experiments on the types of fertilizer, and on combinations of fertilizers are implemented. A particular problem faced rdcently is substitution of urea fertilizer since its price is growing.

Technical itineraries of production has to do with setting a specific date for sowing for each agro-ecological area, deciding the density of sowing, the timetable for fertilizer spreading considering changing climatic constraints of each agro-ecological area (zone agro-écologique) and the practical application of manure. Different types of herbicides are experimented as well as growth regulators (régulateurs de croissance) of the cotton plant. Herbicides pre and post self propagating plants and of cotton plant, total herbicides for chemical weeding and regulators of cotton growth are supplied by agro-paharmaceutical firms in order to be tested to achieve a certification. Efficiency and selectivity tests enable to estimate in two to three years the herbicides pre plant of cotton plants and self propagating plants. The best products are selected and made available to producers after certification.

The objective of the genetic section of R&D in the cotton sector is to improve the quality and quantity of production through the creation of new varieties which are more performing and better adapted to the needs of all of the actors of the "filière", to the different constraints of the areas and to the different production systems.

The genetic improving of varieties is generally done in the research station. The two starting steps of the creation process are: the evaluation of the new genetic material followed by the

creation of the variability through cross-breeding and then selection. Experiment results are then tested on the field in stations. Another type of genetic improving practice is done directly by the producer/farmer and then passed on to the lab so that it can see the technological aspects of it, such as the ginner out-turn ratio, the characteristics of the seed and the quality of fibre it produces. After testing, a number of plants are chosen and replanted. This division also usually takes care of seed multiplication and testing shelling with different gins.

As mentioned, agricultural R&D in SSA is in grand part fed by public expenditure. This is also true for research in cotton and is particularly true in Francophone Africa where part of the revenues from the sector were invested in R&D before the vertically integrated system was dismantled (Depleuch and Leblois, 2011). In ESA instead, research on export crops was more often financed by processors through commodity levies. This is still true in Tanzania, Kenya and to a lesser extent, Uganda (Beintema and Stads 2006). Following is a per-country analysis of agricultural and cotton R&D for selected SSA cotton producing countries[67].

5. R&D in Agriculture and Cotton - Organisation and Expenditure Patterns in Selected SSA Countries

Benin

In Benin research in agriculture is in grand part implemented by the Institut National des Recherches Agricoles du Bénin (INRAB) which is the main agricultural R&D agency in the country accounting for close to sixty percent of the country's agricultural R&D expenditure and capacity (ASTI). INRAB was founded in 1992 as a scientific and technical institution, endowed with a legal personality and financial autonomy and is supervised by the Ministry of Agriculture, Livestock and Fisheries (MAEP). The mandate of the institute is to generate technologies for the farming community and foster scientific progress. The institute is

[67] Countries have been chosen depending on whether ASTI data for relative cotton researchers was available; thus excluding those countries for which there was no data.

decentralized and composed of a scientific direction in Cotonou; six agricultural research centers (CRAs) of which three centers with a regional focus (CRA Sud in Niaouli, CRA Centre in Savè, CRA Nord in Ina); two commodity-based centres (Centre de Recherche Agricole Coton et Autres Fibres Textiles, and Centre de Recherche Agricole Plantes Pérennes); and the CRA Agonkanmey, which has national scope. INRAB cooperates with a number of African regional organisations and with CIRAD and other ONGs.

Two non-profit agencies perform agricultural research in the country: the Benin Centre for the Environment and for Economic and Social Development (CEBEDES) and the Network for Sustainable Agricultural Development (REDAD). However, research carried out in these two institutions is rather of a socioeconomic nature although it concerns topics that are connected with agriculture.

Higher education agencies also play an important role in research in agriculture in the country. Since the 1990s, the share of the higher education sector in agricultural R&D has grown - from twenty-three percent in 1990 to forty percent in 2008. This has come at the expense of INRAB and is explained by university salaries being up to thirty percent higher than those paid at INRAB and by the government freeze on recruitment and permanent employment contracts at INRAB. The country's principal higher education agency in the field of agriculture is the University d'Abomey-Calavi (UAC) which also witnessed the main increase in agricultural R&D capacity - in 2008, UAC employed forty-four fte researchers, compared with twenty fte researchers in 1990. The only other higher education agency involved in agricultural R&D and not placed under the supervision of UAC, is the Faculty of Agronomy of the University of Parakou. In 2008, it employed just two fte agricultural researchers.

Research focus is on crops: in 2008, forty-two percent of Benin's agricultural researchers conducted crop research. Cassava is the most researched crop and absorbed ten percent of INRAB's fte researchers and thirty-eight percent of UAC's Genetics and Biotechnology

Laboratory (LGB) researchers in 2008. Other important crops included cotton with 13.9 fte researchers (all at INRAB).

Financing research across institutions comes from the government and international donors. As of 2007 there has been greater willingness to provide funding for agricultural research from the national government and INRAB's level of expenditure has increased. However, during 2001–08, the national government only contributed by one third of INRAB's funding, with foreign donors and regional and subregional networks providing around fifty percent of funds, the rest (seventeen percent) generated internally (mainly through production sales - oil palm, maize, and cowpea seeds). Particularly, Denmark and Germany have been involved in funding Benin's agricultural sector since 1997. Other external funding sources include the West and Central African Council for Agricultural Research and Development (CORAF/WECARD), AfricaRice, the International Institute of Tropical Agriculture (IITA), the West and Central Africa Collaborative Maize Research Network (WECA- MAN), the African Development Bank (AfDB), and the Government of the Netherlands and a World Bank loan expected to take place in 2011. UAC's research is also donor funded and is in close competition with INRAB for the available funds.

Total public expenditure for agricultural R&D has grown. In 1995 the public expenditure for agricultural R&D was 13,1 million 2005 PPP$ with the Government providing a 48,1 share and donors a 38,6 share, and 21,6 million PPP$ in 2008- Government providing a 40,6 share and donors a 38,1 share (ASTI data). In terms of percentage of agricultural GDP, public expenditure in agricultural R&D was 0,37 in 2001 and 0,69 in 2008. The recipient of such funds is the Institut National Recherches Agricoles du Benin (INRAB). The share solely dedicated to cotton research is calculated to be, in terms of full equivalent researcher, 6,49 fte in 2008, no data is available before that (Figure 2).

Research in cotton is conveyed by the Centre de Recherhe Agricole Coton et Fibres (CRA-CF) a national cotton program inside the INRAB. CRA is responsible for designing,

developing and implementing programs on cotton and other fiber crops. The centre includes three departments: agronomy, phyto-sanitary protection, and variety improvement which are involved in genetic improvements, sustainability of cotton related production systems, plant protection, and lint quality improvement. The activity programme of CRA-CF is established each year jointly by CRA-CF and AIC (Association Interprofessionelle Coton), which contributed to its financing each year until 2008 (partly financed under a project from the World Bank).

The budget for AIC's contracting is financed by setting an annually negotiated fee on producer prices although the fee for critical functions has never in fact reached the required amount since the agreed on fee -calculated to be around a high fifteen percent of price received by producers- has progressively decreased in years (except 2005/06). Thus, necessary funds were eventually remitted by the Government and partly by a World Bank project in support of the sector reform process which terminated in June 2008. In general, the budget for the season comes from core funding, funds from projects, contracts executed, and equities from the sale of agricultural products and services (ICAC).

The AIC also provides funding for the production of seed. There is a national commission on seed, which provides guidelines and monitors cotton seed multiplication from field through ginning and packing. Once researchers develop a variety ready for release, the variety is presented to the Commission with its technological features. The Commission reviews, discusses and decides whether or not to approve the variety for commercial production.

As far as extension and advisory services to cotton farmers go, after reforms the AIC has been increasingly responsible for these critical functions although, in 2007 extension activities were transferred back to the Direction du Conseil Agricole et de la Formation opérationnelle (DICAF) and the Centre d'action regional de développement rural

(CARDER) by the Government in line with a de-liberalization policy. The Ministry also recruited more than 1000 new extension agents.

In the past the cotton R&D programme was successful and has been responsible for the progress in yields and lint ratio (Gergely, 2009), two varieties have been introduced successfully - STAM 18A in 1997, STAM H 279 in 2003. One consequence to the reform was that before researchers had to satisfy only the parastatal ginner but, according to Goureaux's WB report, after reforms they had to satisfy both growers and cotton companies who had different requests: ginners being interested in ginning rates and fibre length and producers in yield per acre, resistance to insects and ease of harvesting. A recent study on the assessment of the reform program notes also a lack of linkage between research and extension, resulting in poor dissemination of research findings.

Côte d'Ivoire

In Cote d'Ivoire research was initiated as early as in the 1890s with the establishment of experiment gardens most of which later evolved into experiment stations that focused on a very small number of crops. At the time of independence (1960), most of the existent agricultural research facilities were managed by the French and instead of nationalizing the research infrastructure, Côte d'Ivoire chose to continue close collaboration with the French institutes - such as with the Study and Research Group for Tropical Agricultural Development (GERDAT, CIRAD's predecessor). Nevertheless, in the 1980s and 1990s the French local research activities were gradually taken over by national institutes which merged to become the National Agricultural Research Center (CNRA).

CNRA is the principal agricultural research agency, accounting for two-thirds of total fte researchers and three-quarters of total research spending. CNRA was established as a semi-

autonomous private institute in 1998. According to the WB project which began in 1998, CNRA should be forty percent government owned and sixty percent privately owned. The centre is regionally based with a network of five regional offices, thirteen research stations, three central laboratories, and five experiment and production stations. Research at the CNRA is conducted across five primary research streams: perennial crops, annual crops, animal production, production systems, and technology with particular focus on crop research - in 2001, close to two thirds of researchers employed at CNRA conducted crop research. CNRA's primary research crops are fruits, cotton (fifteen percent) and oil palm.

Other government agencies conduct agricultural research, together accounting for seventeen percent of the total 2001 agricultural R&D capacity.

Higher-education is involved in agricultural research with six agencies, five of which accounted for sixteen percent of the country's total agricultural research capacity. The Advanced School of Agronomics (ESA) is responsible for most of these activities. Teaching is the most important activity at ESA, but the school carries out some forestry, water, and crops research.

Only two private companies undertake agricultural research activities in Côte d'Ivoire. Many of the larger private companies do not employ research staff, contracting research out to CNRA and other agencies. CNRA has active research agreements with the two sugar companies in the country[68]; the cotton companies Ivorian Textile Development Company, Ivorian Cotton Company, and Ivory Cotton; and with the Ivorian Company of Oil Seeds Trituration and Vegetable Oil Refinery.

Côte d'Ivoire is one of the few countries in the subregion that does not depend heavily on large-scale donor funding to pursue its agricultural research resulting in greater freedom in setting its research priorities and in being less subject to external pressures than are

[68] Sucrivoire and the African Sugar Company

numerous other countries in West Africa (ASTI). Agricultural research in Côte d'Ivoire has largely been funded by government revenues and commodity sales, but also World Bank loans, and other donor funding. World Bank contributions took the form of two consecutive projects the first of which was implemented during 1994-97 to streamline and decentralize agricultural services, the second from 1998-2010 which focuses on strengthening adaptive research and extension, supporting farmer organizations, and creating a decentralized national agricultural research institution that would be sixty percent privately owned. However, as a consequence to the break out of civil war in september 2002 and to the government failure in supplying its share of funding, the second WB project was interrupted and the World Bank froze its aid to Côte d'Ivoire. Nevertheless, the centre still received ten percent of its funding from other donors including the African Development Bank (ADB), the United Nations Development Programme (UNDP), France and Belgium. As a result of the low level of disbursement by the government and the World Bank, revenues generated by production activities have been one of CNRA's main sources of funding (sixty-four percent of CNRA's total funding in 1999). However, due to the decline in world market prices these funds have decreased considerably since then and the government had to raise its contributions to CNRA in order to keep the centre operational - in 2001 government contributions accounted for about two thirds of CNRA's total funding. However, in 2008 government funding covered only fifteen percent of CNRA's total expenditures and the remainder of CNRA's funding was accounted for by the private sector, through FIRCA[69], and internally generated resources.

In line with funding trends, fte researchers have decreased from 2001 to 2008 although only slightly especially in comparison to fte researchers conducting research in cotton who have halved (Figure 2).

[69] Fonds Interprofessionnel de la Recherche et du Conseil Agricole (FIRCA) is a funding system, which is unique and exemplary in Africa. Through FIRCA, research has become more demand driven and the system's solidarity mechanism ensures the availability of research funds to assist those agricultural production sectors in which the volume of raised subscription fees is low. (ASTI)

Research in cotton is implemented through the Cotton Program at CNRA (Centre National de Recherche Agronomique-CNRA) and undertakes research on all aspects of production research. Program planning is done under the coordination of the Fonds Interprofessionnel de la Recherche et du Conseil Agricole (FIRCA) where also funding mainly comes from. However, the CNRA station in Bouaké cotton was totally destroyed during the war and the government is still seeking funding for reconstruction of the station. Seed multiplication is ensured by cotton companies under the control of INTERCOTON[70].

Despite the civil war and relative problems and CNRA being most severely affected; funding levels for the last few years reveal a relatively stable trend and investment levels in agricultural R&D are comparable to or higher than those in other African countries (ASTI). Furthermore, Côte d'Ivoire's agricultural research, and in particular that of CNRA, ranks among the best performing and most innovative in Africa (ASTI).

Ghana

Agricultural research in Ghana began in 1890 with the establishment of the Government Botanical Gardens at Aburi which created the basis for the Department of Agriculture Research and the experiment stations created between 1900 and 1910. Initially, research focused primarily on oil palm, cocoa, and rubber. In addition to the Department of Agriculture, several regional research organizations were established throughout British West Africa in the late 1940s and early 1950s. With independence (1957), the regional institutes created under British rule were nationalized. In 1968, the Ghana Academy of Sciences, established a few years earlier, was restructured as the Ghana Academy of Arts and Sciences, and the Council for Scientific and Industrial Research (CSIR).

[70] L'Association Interprofessionnelle de la filière Coton (INTERCOTON) was established in 2000. Its purpose is to group professional cotton producer organisations and ginners.

CSIR is still the primary agency for agricultural research implementation in Ghana. It coordinates all of scientific research in the country, accounting for roughly two-thirds of both total research spending and agricultural researchers. CSIR oversees thirteen research agencies, nine of which conduct agricultural research. The central administrative body for CSIR's agencies, falls within the Ministry of Environment, Science and Technology (MEST). In 2001, the Government of Ghana legislated changes to CSIR's mandate with a shift towards commertialization, introducing a private-sector funding target of thirty percent for each agency's budget. The process was supported by a WB loan that had previously been approved (2000). CSIR collaborates with various United Nations agencies among which the FAO and the United Nations Development Programme (UNDP) and international science entities like the Commonwealth Science Council, the Pan-African Union for Science and Technology, and the African Academy of Sciences.

Four other government agencies are involved in agricultural research among which the Biotechnology and Nuclear Agricultural Research Institute (BNARI), under MEST, which focuses on the use of biotechnology and nuclear technologies to address sustainable agriculture, health, and industrial needs. Among agencies not associated with CSIR, the Cocoa Research Institute of Ghana (CRIG) is the most significant.

Higher education agencies are also involved in agricultural research and in 2001 accounted for seventeen percent of human resources. Most of this research was conducted at the five main universities of the country: the University of Ghana (UG), the Kwame Nkrumah University of Science and Technology (KNUST), the University of Cape Coast (UCC), the University of Development Studies (UDS), and the University College of Education of Winneba (UCEW). With thirty-two fte researchers in 2001, UG's Faculty of Agriculture is the largest agricultural research entity in higher-education in Ghana.

No private for-profit organizations conducting agricultural research were identified in

Ghana.

In 2001, more than sixty percent of fte researchers conducted crop research.

Currently all agricultural research, with the exception of activities related to cocoa[71], is funded by the Government of Ghana, donors, and self-funding by the respective agencies. The World Bank has provided loans to agricultural research in Ghana under two consecutive projects, which are co-funded by the government and other international donors. Under the second project, producers and exporters of crops such as oil palm and palm oil, fruits and vegetables, cotton, coffee, yams, and sheanut butter, along with agribusiness, will fund a growing share of the research costs for these commodities. However, only one CSIR agency has met this target to date, and consequently the government has not reduced its funding to CSIR agencies as was scheduled to occur in 2001. The project includes the establishment of a competitive agricultural research grant scheme (CARGS) that provides research funding based on the quality of research proposals. Agricultural research at higher education agencies is financed primarily by the government, although other donors including FAO, nongovernmental organizations, and foreign universities contribute.

Agricultural research expenditures and funding increased marginally in Ghana throughout the 1990s and remained highly dependent on government and donor funding, with the World Bank's two projects contributing greatly to the rehabilitation of Ghana's weakened agricultural research infrastructure. However, in 2009, Ghana invested 0.9 of its agricultural GDP increasing from a 0.57 in 2000 (Figure1).

Research in cotton is conducted by the Savanna Agricultural Research Institute (SARI) at Tamale which was an experimental station known as the Nyankpala Experimental station (NAES) and operated as an outpost of Crop Research Institute (CRI) of Kumasi until it was upgraded to autonomy in 1994. Other institutions involved in cotton research are the

[71] For cocoa, producers apply a levy on the Freight on Board (FOB) price.

University for Development Studies (UDS) at Tamale, which conducts socio-economics research, the University of Ghana (Soil Science Department and Department of Geography and Development studies) at Legon, the Environmental Protection Agency at Accra, the Soil Research Institute (Council for Scientific and Industrial Research) at Kumasi and the University of Science and Technology (Department of Crop Science), also at Kumasi, which contribute through studies to an improved understanding of the cotton region's environment or conduct experiments for soil conservation or into innovative cropping systems (direct sowing).

SARI instead, conducts research into all aspects of cotton production - along with different plant programmes - with the overall goal of finding answers to the needs of farmers and to increase their production and incomes. Testing stations are distributed over all the agro-ecological zones of the three northern regions: Manga, Damogo, Yendi, Salaga and Wa. It also coordinates the activities of the Research-Extension Linkage Committees in the northern regions. The cotton programme has scientists working in the fields of genetics, agriculture, entomology and socio-economics. According to the Ministry of Food and Agriculture (MoFA) the only programme which has shown continuity and has come to tangible results is the varietal programme. The Ghanaian cotton sector is particularly sensitive to the varietal problem which makes the programme relevant. Actually, a matter of concern is that Ghana does not have its own system of seed multiplication. Consequently third or fourth generation seeds are purchaised from neighbouring Burkina Faso, Cote d'Ivoire and Togo. Such seeds are not guaranteed and thus unreliable, not to mention the transport conditions they undergo with consequences on their quality. All of this contributes to low yield due to very low viability and vigour in the cotton seed. Poor seed leads to a poor germination rate. Consequently cotton companies have requested the Savanna Agricultural Research Institute (SARI) to develop appropriate genetic materials for growing cotton in Ghana. SARI has released 3 varieties: SARCOT 1, 3 and 5, but a national multiplication

scheme that can guarantee the distribution of the adapted high yield variety is still missing. A research project in this direction was interrupted in 2008 (MoFA, 2010).

While the Cotton development Board was responsible for the financing of research in the Ghanaian cotton sector and thus a public expenditure, with privatisation and later liberalization, the Savanna Agricultural Research Institute was intended to be financed by the newly formed private cotton companies through contributions for their use of research findings. However, SARI never received any contribution from cotton companies and these often prefer importing seeds from neighbouring countries with the afore mentioned consequences on seed quality. In fact, the institute is to date only financed through the government budget.

ASTI figures show that public expenditure in Ghana for research in the cotton sector is low in 2001 and has even more decreased in 2008 with only 4.57 full time equivalent researchers. Another major problem which is common in SSA research stations is the low wage level which results in a human resources problem that undermines the continuity of research programmes, not to mention the motivation of scientists. Also SARI has been affected by low salaries (MoFA report 2012).

The three "Northern regions" of Ghana are the poorest in the country and food crop farmers have the lowest income. Cotton is by far a more suited cash crop for the climatic conditions of the northern region as it is drought resistant. Thus, the MoFA advocates that developing cotton as a major cash crop in northern Ghana has a better potential of reducing poverty in the region in comparison to other crops; and asserts this should be done adressing cotton R&D first.

Guinea

The area where the cotton project was first introduced (Kankan) is also the area where the

first food and crop research station was created in 1930, under the French colonisation. Following independence (1958) and the cessation of relations with France, the research centre was nationalised, and a national agricultural research institute was created. In 1969 the Government introduced a network of 300 regional crops and livestock farms along with thirty crop and animal science faculties. However, during the first Guinean republic, the country was governed by a totalitarian socialist regime (1958–84), which had a negative economic impact on the agricultural sector as a whole (Stads, Béavogoui, 2009): research resources were limited and the country was cut out from possible foreign investment until the 1980s. At that time economic liberalization resulted also in a renewed interest in agriculture, and numerous old agricultural research stations were rehabilitated and reopened.

In 1989, what is presently considered the country's most important agricultural agency -the Agricultural Research Institute of Guinea (IRAG)-, was established by incorporating numerous agricultural R&D centers and stations from across the country's various agroecological zones. In 2008 it accounted for approximately two thirds of all agricultural researchers and public expenditures (ASTI). IRAG carries out all kinds of agricultural R&D, including livestock, forestry, and socioeconomic research, but crop research is particularly important. In 2001 and 2008, close to half of agricultural fte researchers for whom data were available conducted crop research (ASTI).

There seem to be no private-sector companies, profit or non-profit, that conducted their own agricultural R&D in Guinea. IRAG, however, works in close cooperation with a number of producer organizations, non-governmental organizations (NGOs), and private-for-profit enterprises.

Financing from the government has from the foundation of IRAG only been part of the necessary funding for its operating, the rest coming from donor contributions. Main donors were the World Bank and the French Government, especially during the 1990s and 2000s.

This has made research programmes particularly sensitive to the completion of the donor funding projects. Between 1991 and 2002, for example, World Bank loans accounted for fiftty-six percent of IRAG's total funding, the government provided the remaining forty-four percent together with other donors (France and the European Union). Following the completion of the donor projects there was a sharp fall in research expenditure and when the World Bank funding ceased in December 2000, more than half of IRAG's research programs were affected. From then on, the French Government became IRAG's primary donor after the Guinean government; but in 2008 the French funding project was also terminated.

The decline in the country's overall agricultural R&D, however, is not only due to reduced donor support, but also to a decreasing trend in government funding. In 2008, only 0.16 percent of Guinea's AgGDP was invested in agricultural R&D compared to 1.17 in 1991 (figure 1), becoming among the lowest levels recorded in Africa and leaving IRAG in a bleak financial situation.

Cotton is among crops considered important but it only comes after rice, the principle staple crop, and after coffee, the second main crop. Research on cotton accounted for four to eight percent of total crops research (ASTI). In 2001 fte researchers on cotton were 5,70 and 4,56 in 2008, showing a decreasing trend in line with total public expenditures in agricultural R&D. The cotton programme is run in the regional centre of Bordo in Upper Guinea along with other crop programmes. In general crop research focus is mainly on crop genetic improvement on which forty-seven percent of IRAG's researchers focused on, followed by postharvest research and crop pest and disease control.

Mali

Research in agriculture prior to Mali's independence (1960) was conducted by the Bambey

(Senegal) Federal Center for Agronomic Research and the Niger Office. Immediately upon independence Mali was one of the few French African colonies to create a national agricultural research structure with the objective to control and coordinate agricultural research activities in the country. In 1960, the Rural Economy Institute (IER) was established as an agency within the Ministry of Agriculture with the mandate to coordinate the different research organizations as well as all the agencies implementing development projects. Although independent, an agreement was made with the former colony so as to enable collaboration among IER and the existing French research institutions most of which continued to conduct research in the country.

Mali has an extremely centralized agricultural research system which distinguishes it from other African countries. The Rural Economy Institute (IER), Mali's principal agricultural research agency, is responsible for eighty-five percent of the country's total agricultural researchers and expenditures. The institute oversees six additional regional centres -each in a different agroclimatological zone (Kayes, Sotuba, Sikasso, Niono, Mopti, and Gao)-, three central laboratories, and one genetic resources unit. Each centre operates within a network of research stations. IER's runs research programs over five themes: crops, livestock, forestry and fisheries, production systems and natural resource management, and economics of agricultural networks. National partners are the Center of International Agricultural Research Cooperation for Development (CIRAD), and the Institute of Research for Development (IRD), the latter two from France. IER is also a member of various regional networks.

Two higher-education agencies employ another ten percent of the country's total agricultural research staff: the Rural Polytechnic Institute for Training and Applied Research (IPR/IFRA) and the Higher Institute of Training and Applied Research (ISFRA); both are under the University of Bamako. The former is the country's main agricultural training institute and has trained the grand part of researchers employed in the IER. However, the institute also works on agricultural R&D, including crops biotechnology, crop pest and

disease control, and soil fertility improvement (Stads 2009 citing Samaké 2002). The occupation in ISFRA is solely training.

There are no private for profit companies known to conduct agricultural research in Mali. However, the IER works closely with various producer organizations and private companies, in particular with the Malian Cotton Company (CMDT). IER conducts applied cotton research on a contractual basis on behalf of the CMDT and the two agencies work together on technology transfer to cotton producers.

Cotton is particularly imortant in Mali and research in cotton was adressed separately as early as in 1948. At that time the N'Tarla experiment station and farm school were created by the Institut de Recherche Cotonnière et des Fibres Textiles exotiques (IRCT) created by the French governement in 1946. The purpose was to carry out applied research, breed new varieties and train extension agents. Initially, varietal research focused especially on yield objectives with quality features being trivial at that time. From independence cotton research activities have been managed by the IER in collaboration with French agricultural research institutes (CIRAD, IRCT) and regional WCA institutions and cotton companies (CFDT/Dagris, CMDT)[72]. All research activities form part of a national strategic plan submitted by the IER to the National Committee for Agricultural Research (NARC) that coordinates the entire portfolio and allocates national science funding after a Scientific Committee has judged the relevance of projects. When a new variety is created, experiments are made, including extensive testing in rural areas with extension staff, resulting in a performance report on a particular variety which is used by CMDT to decide whether or not

[72] When the *Compagnie Malienne pour le Developpement des Textiles* (CMDT) was created in 1974, the CFDT retained a forty percent stake in the new company, allowing the sector to benefit financially and technically from the cooperation with the French company and government and to access external capital for rural development programs in the CMDT zone (Tefft citing Bingen et al. 1995 and Dione 1989). Between 1976 and 1988, the CMDT carried out two successive projects (Mali-Sud I and II) co-financed by the World Bank, IFAD and French development agency funds (FAC and AFDviii). Under these projects, the CMDT began to provide key public services that were viewed as a complement to their cotton-specific actions. These public development interventions included both new and accelerated initiatives in the area of animal traction support, training and equipping blacksmiths, animal health, cotton research

to adopt the new variety. If approved, CMDT multiplies the variety in its seed-farms and supplies seed to cotton growers. The cooperation among the mentioned institutes, resulted in the production, multiplication and successful adoption of six new seed varieties with progressively higher agronomic and ginning yields[73] and improved fiber quality characteristics (length, fineness, color, strength, maturity and impurity content).

As of ASTI data, in 2008 twelve percent of researchers were involved in reserach in cotton. In terms of fte researchers, cotton in 2008 had 19.0 researchers at IER and 4.2 researchers at IPR-IFRA, totally 23.3, i.e. a 11.5 percent on the total of fte researchers.

Agricultural research in Mali is primarily financed by the national government and in varying proportion by the World Bank[74] (ASTI). Among other foreign donors are the Food and Agriculture Organization of the United Nations (FAO), USAID, IAEA, the Swiss government, and the European Union (during 1991–2001, ASTI). Conequently also the IER heavily relies on foreign donor funding with two thirds of its budget coming from donors between 1994 and 2001 (ASTI), of which one third from the WB and the rest from other foreign donors as USAID, CMDT and Novartis Foundation. However, the national government covers one third of the budget and has delivered ninety-nine pecent of its share of counterpart funding (ASTI). CMDT provides funding for research in cotton while the government finances the salaries of researchers, and operating budgets of infrastructures. The budget allocated to cotton by the CMDT for over five years is now 170 million CFA Francs (US$315,000). The budget allocated for inputs, operation of vehicles, etc., is managed by the CMDT itself. Since 2009, the cotton program has received, as part of a project Draft Sector Support Cotton Textile-PAFICOT (Projet d'Appui à la Filière Coton Textile) between

[73] Improved yields objective has been reached also through the widespread adoption of ultra low volume pesticide equipment (ULV)[73] and the introduction and use of pyrethroid pesticides in the nineteen seventies. By the late 1980s, average seed cotton yields averaged over 1,300 kg/ha, (546 Kg/ha of cotton lint), a cumulative increase of over 600% since independence.

[74] The World Bank has assisted the Malian government in the development of the country's agricultural sector since 1971. During the period 1991–2003, two consecutive World Bank projects have targeted Mali's agricultural research sector. Both largely cofinanced by the Government of Mali.

the C4[75] countries and the ADB (African Development Bank) of an extra budget of 110 million CFA (US$203,000) per year which should run to 2013/14.

Mali's total number of agricultural researchers increased by 2.3 percent per year on average during 1976–2001 (ASTI). There has been a slow decline in fte during the last decade although agricultural spending has remained stable, actually since the beginning of the 1990s, agricultural researcher numbers have first gradually fallen from the peak reached in 1989[76] with 345 researchers. However, from 2001 to 2008 the trend in ASTI data shows to be positive, passing from 247,25 in 2001 to 312,65 fte in 2008. Researchers dedicated to cotton have followed this fashion and the proportion on total fte researchers has slightly grown: from 7.6 on the total in 2001 to 7.8 in 2008.

Average expenditures per researcher in Mali are higher than in most West African countries.

In general Mali has shown serious commitment to research in agriculture investing a share well above that of Africa and the developing world in general (ASTI). Nevertheless, expenditure as a share of agricultural Gdp has fallen from 1.04 in 2001 to 0.64 in 2008 (ASTI).

Nigeria

Agricultural research in Nigeria was initiated with the establishment of a botanical garden in Lagos during the late 19th century as part of a network of gardens established under British rule, focusing on the introduction of new crops. In 1914, a new Department of Agriculture was formed from the merger of the former Agricultural Department for southern Nigeria and of the Agricultural Department for northern Nigeria. Research focus was on export

[75] Four major SSA cotton producing countries: Benin, Burkina Faso, Chad and Mali
[76] Between 1976 and 1989, researcher totals increased steadily by 7 percent annually, reaching a peak of 345 fte researchers in 1989. (ASTI)

crops like cotton and cocoa. After Nigeria achieved independence in 1960, research activities were regionalized, eliminating federal government involvement, but regional efforts did not yield the expected results and the federal government intervened in the 1960s resulting in the current structure.

Agricultural research in Nigeria is mostly public. ASTI identified eighty-one government and higher-education agencies engaged in agricultural research in Nigeria in 2000. Of these, twenty-two were government agencies the grand part of which under the responsibility of the Agricultural Sciences Department (ASD) within the Federal Ministry of Agriculture and Rural Development (FMARD), which is responsible for the coordination, planning, and evaluation of the activities of these, the rest falling under the responsibility of the Federal Ministry of Science and Technology (FMST).

The rest are higher-education agencies conducting agricultural or agriculture-related research. The primary higher-education agencies involved in agricultural research are the four older universities—Ahmadu Bello University, the University of Ibadan, the University of Nigeria, and Obafemi Awolowo University. Important role in Nigeria's agricultural research is also played by the three universities of agriculture in Makurdi, Umudike, and Abeokuta. As of ASTI data, in 2008, thirty-eight percent of fte researchers in agriculture focused on crop research.

Private-sector involvement in Nigerian agricultural research is considered negligible (ASTI). The low private-sector involvement results from a number of disincentivating circcumstances: lack of incentives in terms of returns on investments because public research agencies share their research results at no charge (Stads citing Voh 1999), political instability, and lengthy bureaucracy for approval of new varieties. However, some seed companies with small research activities focusing on varietal testing have been spotted as well as a few agro-industrial companies which fund adaptive research activities in public-sector agencies in areas

of their interest (Stads citing Okunmadewa and Olayemi 2002).

Research on cotton is conveyed by the Institute for Agricultural Research of the Ahmadu Bello University in Zaria. A Technical Sub-committee critically reviews data from on-station, multi-location and on-farm trials before recommending suitable varieties for registration and release. New varieties recommended by the Technical Sub-committee need to be approved by the National Committee of Crop Varieties, Livestock and Fisheries Registration and Release before they are released. The Institute for Agricultural Research then provide seeds to ginneries for further multiplication by supervised out growers. The Research Institute also develops production technologies, which are first tested on farmers' fields under supervision of researchers. New technologies are promoted by the Institute's Extension Department, National Agricultural Extension Research Liaison Services and the State Agricultural Development Programmes-ADPs through monthly review meetings, Small Plot Adaptive Techniques, etc.

Agricultural research in Nigeria is largely funded by the government, although during the 1990s, funding from the World Bank was considerable. For the first two decades after independence in 1960, Nigeria's agricultural research performance was strong, but since the early 1980s—in part due to falling oil prices—it has weakened significantly. Funding dropped sharply and became insecure affecting infrastructure and resources. In general, total agricultural R&D spending exhibited a slight average growth after 1998, after total spending had decreased considerably during the first half of the 1990s given sharply declining government contributions. Although fte researchers have increased in number, fte researchers dedicated to cotton have decreased slightly from 2001. In 2008, public agricultural R&D expenditure was higher (0.42) than in 2001 (0.27) and back to what it was in 1980 (ASTI).

Ethiopia

Agricultural research in Ethiopia only began in 1947 when the Ambo and Jima Junior Colleges of Agriculture were established. However, what was to be the primary Ethiopian agricultural research unit until 1966, the Debre Zeit Agricultural Research Center (DZARC) of the Imperial College of Agriculture and Mechanical Arts (now AU), was only created in 1953. Following came the Ethiopia Institute of Agricultural Research (EIAR) as the first nationally coordinated agricultural research system in the country; absorbing the scattered research activities of the Ministry of Agriculture. EIAR became responsible for the national agricultural research policy and conducted research on crops, livestock, and natural resources. The Institute underwent several restructurings in the 1970s and 1980s but only in the early 1990s was it reformed substantially and decentralized with a number of EIAR centres being transferred to the respective regional governments, thus becoming independent research centers. Finally, in 1997, the Debre Zeit Agricultural Research Center and other remaining federal IAR research centres were merged into the newly created Ethiopian Agricultural Research Organization (EARO) which had the purpose of coordinating the agricultural research activities of the federal and regional research centers and the higher-education agencies. EARO falls under the administrative responsibility of the Ministry of Rural Development.

EARO is still the main agricultural research entity accounting for about two-thirds of total agricultural spending. The Ethiopian agricultural research system consists of EIAR, Regional Agricultural Research Institutes-RARIs, and Higher Learning Institutions-HLIs. EARO comprises all institutions undertaking agricultural research. EARO directly manages a network of fifteen federal research centres inherited from the EIAR, which are partly autonomous in setting financial and human resource policy. EARO funds the budget requirement of research projects that have national implications and are approved by a

national review forum; regional governments fund the remainder of research projects that focus on the specific agricultural problems of the regional agroecological zones. EARO also collaborates with neighboring countries and is engaged in collaborative projects with various international agricultural research centers. In 2003 Regional Agricultural Research Institutes (RARIs) have been established in the six regions of the country funded by the regional state governments, with the objective of solving inherent agricultural problems. EIAR programs are organized under five directorates and five departments. The directorates include crop research, livestock research, soil and water research and farm mechanization.

There are seven higher-education agencies (ASTI). The Alemaya University (AU) was responsible for about half of research activities conducted in higher education agencies. Research activities are managed at the Alemaya University Agricultural Research Center (AUARC) and focus on crops, livestock, dryland agriculture, forestry, fisheries and aquatic resources, socioeconomics, and postharvest issues. Other institutions forming the higher-education sector in Ethiopia are the University of Addis Ababa's Faculty of Veterinary Science, Mekele University's Faculty of Dryland Agriculture and Natural Resources, and three colleges—Awassa College of Agriculture, Jimma College of Agriculture, and Wondo Genet College of Forestry.

Agricultural R&D performed by the private sector in Ethiopia is limited and only two private companies have been identified, employing only one fte researcher each in 2000, and together accounting for less than half of one percent of total agricultural R&D investments. Many of the private companies do not employ their own research staff but instead contract EARO and other agencies to conduct research on specific issues. One of these is the Birale Agricultural Development Corporation (1991), which predominantly focuses on cotton research.

Research in cotton is coordinated by EIAR under one of its five directorates and

departments, particularly in the Werer Agricultural Research Centre. The crops research directorate has five teams of which cotton is covered under pulse, oil and fiber crops research group. Cotton research is implemented under two projects "Adoption, Development and Promotion of Improved Cotton Production Technologies for Irrigated Areas in Ethiopia" and "Adoption, Development and Promotion of Improved Cotton Production Technologies for Rainfed Areas in Ethiopia" which are both coordinated from the Werer Agricultural Research Centre, a unit of excellence for cotton research in the country. Testing and registartion of any newly developed variety or hybrid is conveyed by the National Variety Release Committee (NVRC). There is no public or private seed company involved in cotton seed multiplication and distribution in the country which are conveyed by large private commercial cotton growers who have the capacity to multiply and prepare delinted cotton seed for further distribution. As a short-term solution, the cotton breeding section started a participatory seed multiplication scheme on farmers' fields with the aim of training them on how to maintain varietal genetic purity. EIAR has substantial and continued funding from the government and cotton research projects receive their share annually from the budget allocated to EIAR by the government.

Agricultural research in Ethiopia is mainly funded by the government; during 1993–2000, government contributions accounted for about eighty percent of funding for research at the federal level and ninety percent for regional research centers. The rest comes from bilateral and multilateral donors as the World Bank and the International Fund for Agricultural Development (IFAD).

Investments in Ethiopian public agricultural R&D have been growing at a steady pace since the early 1990s and the total number of public agricultural researchers increased at EARO as well as at the regional research centers. Agricultural research spending doubled between 1993 and 2000, and then doubled again during 2000–01 (ASTI). The increased expenditures were driven by considerable growth in both government and donor funding, and in particular the

World Bank. Data on fte researchers dedicated to cotton are in line with the increasing trend in total expenditure in human resources, although the relative proportion on total researchers slightly diminished (Figures 1, 2).

Tanzania

Agricultural research in Tanzania was introduced by German colonisers as early as in the late nineteenth century. Laboratory facilities were established within the botanical garden and trial farms across the region to study crop plants and husbandry. In the 1920s, with British rule agricultural R&D was suspended and only a few decades later were research stations established as part of the Departments of Agriculture and Veterinary Sciences. Until World War II agricultural research was largely the domain of the local colonial government but later the British government decided to increase its participation and created two institutes (the East African Marine Fisheries Research Organization and the Tropical Pesticides Research Institute of East Africa). In 1961 independent Tanzania inherited the research infrastructure created under British rule which mainly focused on export commodities such as cotton, coffee, and sisal, over food crops. With the establishment of new research stations, food crops and natural resources were included. From the late 1970s agricultural R&D in Tanzania has undergone various reorganizations, in particular in 1984 a new Directorate of Research and Training (DRT) was created which later absorbed the Tanzania Agricultural Research Organization (TARO), and the Tanzania Agricultural Livestock Research Organization (TALIRO). After a World Bank led re-organization in 1997, DRT was renamed Department of Research and Development (DRD).

The Department of Research and Development (DRD) is under the Ministry of Agriculture and Food Security (MAFS) and is the principal agricultural research agency accounting for close to two-thirds of total research spending and fte researchers. The Department has

twenty-two agricultural research institutes and livestock centers led by a central institute in each of the seven agroecological zones. Research focus is on crops with two thirds of the DRD researchers involved (ASTI). Other significant crops in 2008 (ASTI) were soybeans, cotton, sorghum, vegetables, and wheat (recording shares of 5 percent each).

In addition to DRD, five other government institutes are involved in agricultural research. They have semi-autonomous status which enables them to set their own research programs and seek funding other than from the government, at the same time maintaining secure government funding for staffing and basic facilities.

There are a few private companies and non-governmental organizations which conduct adaptive research albeit using the government's research facilities and in collaboration with the DRD. There also are two non-profit research institutions established through the privatization of research activities that had previously been responsibility of DRD - the Tanzania Coffee Research Institute (TACRI) and the Tea Research Institute of Tanzania (TRIT) which are both are funded by a cess on tea and coffee production as well as government and donor contributions.

Agricultural research in Tanzania is mainly funded by the Tanzanian government, loans from the World Bank, and African Development Bank (ADB) and contributions from other donors. Prior to 2005 spending was highly dependent on donor funding but thereafter funding to agricultural R&D from the government started increasing with a particular raise in 2008 showing the government's committment to develop the country's agricultural sector. Funding through commodity levies is also relatively high in Tanzania since agencies are allowed to retain internally generated revenues, through the sales of produce and other.

Tanzania expenditure on agricultural R&D as a percentage of agricultural Gdp has increased in time. However, agricultural research investments per researcher and as a share of AgGDP remain very low, in part because government employees earn very low salaries relative to

their colleagues at nongovernmental organizations or in other countries.

Research in cotton is conducted in the two areas where cotton is grown: at the Lake Zone Agricultural Research Development Institute (LZARDI) particularly at the Agriculture Research Institute Ukiriguru, in the Western Cotton Growing Area (WCGA); and at the Ilonga Agricultural Research Institute (IARI) in the Eastern Cotton Growing Area (ECGA). Both institutes are government owned. The mandate of the Ukiriguru ARI is to carry out research -relatively to cotton- on breeding, entomology, agronomy, pathology, fibre technology and soil. The Ilonga Agricultural Research institute is located in Morogoro Region and also deals with breeding, entomology, agronomy and social economics however not exclusively relatively to cotton. Other research includes soil fertility.

Other government institutions which play a critical public role in the cotton sector, include the Tanzania Official Seed Certification Institute (TOSCI), Tropical Pesticides Research Institute (TPRI), the National Environment Management Council (NEMC) and the Tanzania Bureau of Standards (TBS). The Tanzania Official Seed Certification Institute (TOSCI) takes care of National Performance Trials (one year) and Distinct Uniformity and Stability-DUS tests when a new variety is breeded. Further, the Seed Release Committee analyses results. In case of approval, the variety is registered for use in Tanzania according to the identified ecological areas.

Seed multiplication is conveyed by the Tanzania Cotton Board (TCB). Before the seed can be distributed to farmers TCB agrees with the ginners to treat and pack the quality seed. It is expected that in the near future there will be a company, which will multiply, treat and pack the seed for farmers as is happening already in the Western Cotton Growing Area where the Quton of Zimbabwe company won the tender.

Technology transfer takes place through the Zonal Information and Extension Liaison Unit. The Tanzania Cotton Board and other stakeholders disseminate new technologies through

field days, extension forums, training of extension workers, agricultural shows and printed material. Local governments at district level also train farmers particularly in the WCGA.

Cotton specific funding comes from the Government of Tanzania, the Cotton Development Trust Fund, the Tanzania Gatsby Trust and occasionally chemical companies. Among the various commodity levies set up by the government, the Cotton Development Fund was established in 1999, and collects a levy of three percent on the production value of cotton lint (ASTI). Half of this levy officially funds cotton research activities, mainly at DRD's agricultural research institutes at Ukiriguru and Ilonga.

Fte researchers in cotton have shown to slightly decrease from 2001 to 2008, thus not in line with the increased expenditure on agricultural R&D and increased capacity.

Zambia

Agricultural research in Zambia began in 1922 with research focus on cash crops (cotton and tobacco). Later, other crops were gradually introduced. In 1953, the Department of Agriculture was re-organized and its research activities were from then on to be conveyed by the ad hoc created Research Branch. In the same year, the Central Research Station in Mount Makulu and three substations were established. During the early 1960s, several other regional research stations were established.

Following independence in 1964, the focus of the Research Branch shifted slowly from commercial crops towards the problems of small-scale subsistence farmers. However, until the 1970s, the Research Branch was organized by discipline and research remained heavily focused on the problems of large-scale commercial farmers. During the early 1980s, the Research Branch was re-organized with the objective of a greater sensitivity towards the problems of smallholders, who dominate the country's agricultural sector.

Nowadays the main agricultural research agency is the Zambia Agriculture Research Institute (ZARI) from a transformation of the Soils and Crops Research Branch (SCRB) of the Department of Research and Specialist Services (DRSS), under the Ministry of Agriculture, Food, and Fisheries (MAFF). In 2008 eighty-two percent of researchers were employed at the ZARI (ASTI). Its mandate is to generate and adapt soil and crop technologies to increase the sustainability of agricultural production and serve the needs of poor farmers. Research focus is on crops; in 2008, more than half fte researchers focused on crop research (ASTI) among which is cotton although it only comes after maize.

Higher education agencies in Zambia also conduct agricultural research. Four units under the University of Zambia (UNZA), together accounted for eleven percent of the country's agricultural research staff in 2000.

The private-sector research is active in the country, in 2000 it represented fourteen percent of agricultural research spending (ASTI). There are three private enterprises are involved in agricultural research in Zambia: ZamSeed and the Maize Research Institute (MRI) - maize research- and Dunavant which focuses on cotton research. Dunavant and ZamSeed[77] are controlled by foreign capital, while MRI is a Zambian- owned enterprise. Since the late 1990s, the role of the private sector in agricultural research has increased the Government of Zambia being particularly active in developing public–private partnerships. In this view, four research trusts were created: the Golden Valley Agricultural Research Trust (1997), the Cotton Development Trust (CDT, 1999), the Livestock Development Trust (2002), and the Lyambai Agricultural Development Trust (2002).

Cotton research in Zambia is conducted on a public-private basis. The Cotton Development Trust is the main cotton research institute in Zambia. It was created in 1999 as an initiative

[77] ZamSeed was established in 1980 as a private company, though the Government of Zambia maintained an initial forty percent shareholding, which was later reduced to 37.5 percent. ZamSeed remained the country's primary seed company until 1991, when the seed market was liberalized and several other seed companies were established, including Dunavant.

of the Ministry of Agriculture and Cooperatives (MACO) and the private sector driven cotton industry. The objetive of the CDT is to improve low yields and poor fibre quality through research, seed production and maintenance, extension and training programmes. The CDT carries out research at the Magoye station but research trials are also replicated at the ZARI research stations. It has been succesful in releasing four commercial varieties with superior yields and ginning out-turn ratio. In 2007/08 an integrated pest management (IPM) department was set up with assistance from the WB. The CDT also is responsible for testing all available foliar fertilizers on the market in Zambia and thus convey recommendations to the private sector. The technologies finalized by the CDT are passed on to the private sector and the Cotton Association of Zambia for dissemination to cotton farmers. The main source of funding for the Trust is a yearly government grant and contributions from the private sector. CDT works in collaboration with other research organizations such as the ZARI, the Golden Valley Agricultural Research Trust, the Conservation Farming Unit and fertilizer and chemical companies.

Other research on cotton is implemented by the private cotton company Dunavant which established a R&D unit in 1995 which focuses entirely on cotton including breeding, agronomy, and entomology. However, after the CDT was established the company is doing very little research.

Seed multiplication is done by ginners on behalf of the CDT which provides pre-basic and basic seed to companies (ginners) to produce certified seed, then supplied to farmers by the ginning companies.

Agricultural research in Zambia is funded by the government, numerous international donors, and loans from the World Bank. The first World Bank supported project began in 1987 with counterpart funding from the government and contributions from the African Development Bank (AfDB) and the Norwegian Agency for Development (NORAD). The

Swedish International Development Agency (Sida) has been a major contributor to Zambia's agricultural research. A second World Bank-supported project, ran from 1995 until 1999 with the objective to liberalize markets, privatize state-owned industries, diversify production etc. with the consequent establishment of four research trusts in the late 1990s - among which the CDT -which has proven successful in encouraging public–private partnerships, improving the cost-effectiveness and efficiency of research, and developing opportunities for non-government funding.

Long-term trends indicate a serious decline in investment in agricultural R&D in Zambia: public agricultural R&D spending has more than halved in 2005 compared with the average investments during the 1990s. Although there was a slight recovery in expenditures, spending was still low in 2008. However, there has been a rise in the number of agricultural researchers (ASTI). The number of fte researchers dedicated to cotton seems to follow the overall trend of investments the proportion on total fte researchers falling from 1.42 to 0.64 (ASTI).

Togo

Agricultural research began in Togo in the 1940s through French agricultural research institutes. After independence in 1960, the institutes were not nationalised because of a lack in national agricultural researchers, and two additional French research institutes were founded in 1967. The system resulted in a fragmented organisation of agricultural R&D across a number of stations and four ministries. In 1991, under recommendation of the World Bank, the National Agricultural Research Directorate (DNRA) was established to coordinate the country's agricultural R&D activities in an effort to reform its fragmented organisation. In 1994, DNRA also took over the administration of the Cotton and Exotic Textiles Research Institute (IRCT). By 1997 all units of DNRA were merged into the

Togolese Agricultural Research Institute (ITRA): the National Food Crops Institute (INCV), the National Nutrition and Food Technology Institute (INTA), the National Soil Institute (INS), the Cotton and Exotic Textiles Research Institute (IRCT).

ITRA is the country's principal agricultural R&D agency. In 2008, it accounted for close to two-thirds of Togo's agricultural R&D expenditures and capacity. It is the country's only government agency involved in agricultural R&D. It is responsible for research in agricultural systems, crops, livestock, fisheries, natural resource management, and food technology. ITRA is placed under the Ministry of Agriculture, Livestock and Fisheries (MAEP). It runs several agricultural research centers (CRAs) located in each of the country's four agroecological zones: coast, forest, humid savannah, and dry savannah. The institute is governed by a board consisting of two representatives from the government, one from the Technical Advice and Support Institute (ICAT), one each from the coffee/cocoa and cotton commodity organizations, one from the organization of agricultural input importers, and five from various producer organizations (World Bank 2003).

The higher-education sector also plays an important role in Togo's agricultural research, accounting for one-third of its agricultural R&D capacity and investments (ASTI). The higher- education agencies involved in agricultural R&D fall under the University of Lomé. Among them the Advanced School of Agronomics (ESA) is involved in research on cotton and carries out research in two laboratories: LVBV (research on plant virology and biotechnology) and LARPSAD (research on poverty and sustainable food security). Other research activities are soil fertility management, farm mechanization, and post-harvest conservation. The Faculty of Science's R&D program primarily deals with the conservation of plant genetic resources, entomology, and vegetal biotechnology.

Research in ITRA is especially oriented to crop research. More than half of full time equivalent researchers in the ASTI agency sample in 2001, conducted crop research and in

2008, sixty-one percent of ITRA's researchers focused on crop research. The most researched crops are maize and cotton. The higher education sector and particularly the ESA has cotton lower down in its preference scale being at the fifth place after other food crops, with 6.3 percent of fte researchers dedicated to its research in 2008.

As far as the private R&D sector goes, no private company results to be conducting agricultural R&D work and private companies tend to purchase services from ITRA which also carries out research on behalf of the New Togo Cotton Company (NSCT).

Research on cotton is conveyed by the Center for Agronomic Research of Humid Savanna (Centre de Recherche Agronomique de la Savane Wet-CRA-SH) which is under the ITRA. Here new varieties are developed through mass selection and pedigree method. They are evaluated with respect to production, ginning performance and fiber quality characters like length, strength and fineness of fiber. The research institute then passes on the breeder seed to the New Cotton Company of Togo (Nouvelle Societe Cotonniere du Togo) receives breeder seed from the research institute for multiplication and distribution to cotton growers of the country and distributes it to specialized farmers' groups.

In Togo agricultural R&D, be it ITRA or higher-education agencies, is mainly financed by the national Government, (foreign) donors, and to a smaller extent by producer organisations and self-generated resources. ITRA's budget is primarily derived from government subsidies, regional projects administered by networks or international agricultural research organizations, and other partners under various research conventions. However, the amounts by the different funding sources has shown to be significantly fluctuating. In 2008 the Togolese Government met more than half of the institute's expenses (ASTI), donor funding accounted for twenty-nine percent, and internally generated resources represented fifteen percent. When ITRA was created it was largely dependent on World Bank loans through a project launched to create the research institute, but the World Bank's

loans finished when the project was concluded in 2003 and no new significant donor projects have taken place until 2011[78] and ITRA was forced to generate income from other sources such as selling services and research products -as for the cotton company-, but to date it has only had partial success (ASTI). Funding in general has proved to be very unstable with negative consequences on ITRA's research activities. In any case in 2004 the Government of Togo has moved the institute's budget under the State budget which remains ITRA's main source of funding along with the resources it generates internally. Producer organisations finance a share of ITRA's budget (an average of eleven percent during 1998–2001- ASTI).

Total agricultural R&D expenditures exhibited a downward trend during 1971–2008 (ASTI). Although expenditure for higher education agencies has grown, these have been more than offset by the declining trend of the national government expenditure in funding of government agencies. Donor funding has been volatile depending on timely suspensions of the main donor programme from the WB, and has definitely fallen in 2003 with the completion of the project. Public expenditure for agricultural R&D calculated as a share of AgGDP also shows a declining trend and has fallen from 1.97% in 1981 to 0.47% in 2008; although agricultural gross domestic product (AgGDP) has grown during the same period (ASTI).

The negative trends seen in financing of agricultural R&D are reflected in the overall declining trend of agricultural research capacity from year 2000. The negative trend is due to the heavy capacity losses in ITRA which has seen its number of researchers decrease by one third during 2001-2008. Higher education instead, has revealed a positive trend though not in terms to offset ITRA's losses. Researchers dedicated to cotton have followed ITRA's negative trend going from 6,20 fte in 2001 to 5,35 fte in 2008.

[78] when the West Africa Agricultural Productivity Program (WAAPP), a new programme funded on a World Bank loan, was on the way

Kenya

Formal agricultural research in Kenya was initiated in 1903 with the establishment of the Department of Agriculture under the British colonial government, which set up an experiment station at a government farm in Kabete. In the following years research capacity slowly developed and a number of other agricultural research stations were established throughout the country. Agricultural research was the domain of the local colonial government until WWII, during which time the British government sought a more active role in the promotion of science and technology in its colonies. With independence in 1963, all national agricultural research agencies were transferred, to the newly independent government. In the first two decades agricultural research was reorganized into a number of semi-autonomous parastatal institutes, and this led to the creation of the Kenyan Agricultural Research Institute (KARI), Kenya's major research agency, as well as other four institutes that also conduct agricultural research. Reforms were financially supported by a World Bank loan and various contributions by other donors as part of the National Agricultural Research Project (NARP).

In 2000 KARI accounted for more than half of both total agricultural research spending and staff. Its mandate covers a broad spectrum of agricultural research but excludes forestry and fisheries. KARI's research activities are organized into programs by commodities and factors (meaning issues that cut across commodities). Research focus is mainly on crops, major crops being vegetables, maize, coffee, and fruits. In 2008, crop research involved thirty-eight percent of total fte agricultural researchers in Kenya.

There is also a large number of higher- education agencies involved in agricultural research. About half of higher education research activities fall under the University of Nairobi's Faculty of Agriculture and Faculty of Veterinary Medicine.

Private agricultural R&D in Kenya is small. ASTI surveys identified three companies involved in agricultural research: two national companies—the Oserian Development Company and the Kenya Seed Company— and one multinational company, Del Monte.

In Kenya research on cotton followed a similar path to agricultural research in general, with variety evaluation research activities taking place as early as in 1912 in compliance with early attempts to establish the cotton crop in the country between 1912 and 1923. However, it was not until the 1950s that proper and systematic cotton variety evaluation trials were started. Actually, cotton research in Kenya was started around 1950 under the direction of the Cotton Research Corporation (CRC), then called the Imperial Cotton Growing Corporation. Over the four and a half decades of cotton research in the country, a considerable amount of research activity has been conducted in the areas of breeding and variety evaluation, agronomy, and crop protection (Ikitoo). Variety evaluation work conducted during the 1950s especially concentrated on selecting varieties that were better than the commercial varieties in terms of yield and resistance to pests and diseases while fibre quality characteristics were not much considered. In 1975, the CRC was transferred to the Ministry of Agriculture's Scientific Research Division, and in 1988 was moved to the newly established Kenyan Agricultural Research Institute (KARI). The KARI carries out agricultural research and technology transfer of cotton among other agricultural crops and livestock. In particular, cotton falls under the Horticulture and Industrial Crops Division. There are two centres responsible for cotton research: KARI Mwea, in charge of cotton research and program coordination east of the Rift Valley; and KARI Kibos, in charge of cotton research west of the Rift Valley.

Cotton planting seed production, importation or export is guaranteed by the Kenya Plant Health Inspectorate Service (KEPHIS). Seed multiplication is conveyed by KARI in collaboration with the Cotton Development Authority and under the supervision of KEPHIS. The country is in the initial stages of establishing public and private seed

companies (ICAC, 2012).

Technologies developed by research scientists are disseminated to farmers through on-farm trials, demonstration plots, farmer field schools, farmer group or individual visits to research centers, printed and electronic media, pamphlets, posters, leaflets, quarterly and annual reports and agricultural books printed by the Agricultural Information Resource Centre.

Agricultural research in Kenya is funded by the government, and a number of donors. Donors are primarily the World Bank, followed by donor contributions from the United States Agency for International Development (USAID), the United Kingdom's Department for International Development (DFID), and others. During the 1990s, government contributions accounted for about half of KARI's total funding, while the combined World Bank loan and donor contributions accounted, on average, for slightly less than half during the 1990s (ASTI). From 2001 to 2008 KARI's main source of funding was the government, accounting for fifty-five percent of total funding; donors and development banks provided thirty-six percent of funding, while the sale of goods and services provided a nine percent share (ASTI). Sources for agricultural R&D funding in Kenya also include proceeds from the sale of goods and services, and commodity levies.

As of ASTI, the overall trend for 2001–08 for KARI appears to be an increasing reliance on government support rather than donor funding. This shift is in contrast with the 1994–2000 period, when donor funding exceeded government funding in some years. However, although the support of donor support fluctuated year-to-year, agricultural research continues to rely heavily on external donor funding (ASTI).

In terms of capacity, while KARI's total number of researchers diminished during 1991–2000, total public agricultural R&D research capacity has shown a gradual increase since 2000. FTE researchers dedicated to research in cotton reflect this trend going from 4 fte researchers in 2001 to 5.78 fte researchers in 2008 (ASTI). Total fte researcher numbers in

the higher-education sector increased considerably over the past three decades.

Overall, Kenya has among the highest research intensity ratios in the region and continues to attract large sums of donor funding (ASTI); Kenyan agricultural research is relatively well funded compared with many other African countries. Its intensity of research is close to the average for the developed world. However, fte researchers dedicated to research on cotton do not outperform in number other cotton producing countries in SSA.

Uganda

Agricultural research in Uganda began in the early colonial era in the 1920s with research stations established under the Department of Agriculture and the Department of Veterinary Services. Makerere University initiated its agricultural training in the 1920s and its agricultural research in the late 1950s. Until after World War II, the responsibility for agricultural research was mainly with the local colonial government. Following the years after independence in 1962, all the national agricultural research agencies were transferred to the national government, and no major organizational change occurred until the 1980s. The regional research organizations remained—with little changes in their operational structure—until the collapse of the East African Community[79] in 1977 and the Ugandan government inherited two major agencies of the East African region. Research continued to be heavily focused on the principal export commodities - cotton, tea, and coffee - although the mandate gradually broadened to include food crop research. After independence, the Ugandan research agencies continued to be highly dependent on British researchers but these were replaced completely by late 1970s, as more Ugandans graduated in the agricultural sciences

[79] The East African Community is an inter-governmental organisation comprising five countries in East Africa: Burundi, Kenya,Rwanda, Tanzania and Uganda founded in 1967. It collapsed in 1977, but was officially revived in 2000. In 2010, the EAC launched its own common market for goods, labour and capital within the region, with the goal of a common currency by 2012 and full political federation in 2015.

from the Makerere University and universities abroad. Agricultural research budgets decreased dramatically over this period. Furthermore, research infrastructure was severely damaged as a result of the 1979 liberation war. During the 1980s, the government strived to revamp Uganda's agricultural research infrastructure as part of a national plan to rebuild the country and its economy, but attempts failed because of continued guerilla warfare occurring in the countryside.

In 1992, the National Agricultural Research Organisation (NARO) inherited the six existing research institutes from the Ministries of Agriculture, Animal Industry and Fisheries, and Cooperation, which focused on crops, livestock, fisheries, and forestry research with the mandate to guide and coordinate all agricultural research activities. Since its establishment, NARO has directed its efforts toward building its institutional infrastructure and training staff, moving away from a scientist-driven research agenda toward an approach focusing on farmer needs. NARO comprises fifteen public agricultural research institutes (PARIs), which fall into two categories: National Agricultural Research Institutes (NARIs) and Zonal Agricultural Research and Development Institutes (ZARDIs).

Research in cotton started formally in 1949 when of the Namulonge Agricultural and Animal Production Research Institute (now The National Crops Resources Research Institute - NACRRI) was created by the Empire Cotton Growing Corporation of Britain. It is one of the research institutes under the guidance of the National Agricultural Research Organisation (NARO). It was established to solely investigate problems related to cotton production within the countries of the British Empire. It served the Sudan, Kenya, Tanzania, Zambia, Malawi, Swaziland, Nigeria, Uganda and to some extent the Gambia and Yemen. Uganda was chosen to be the regional centre because it was centrally placed and with the exception of India, Uganda was at the time the largest producer of cotton in the Commonwealth. The Cotton Research Corporation handed over Namulonge to the government of Uganda in 1972. The Institute continued as a cotton research station under tha name National Semi-

Arid Resources Research Institute-NaSARRI until the 1980s when research on other commodity crops, animal production, agroforestry, and weather data collection was introduced in addition to cotton. The present mandate is to increase productivity of crop and livestock production. Specific objectives are genetic improvement, pest and disease control and management of mandate crops and feed resource development and management for livestock. Release of new varieties and seed multiplication permission are responsibility of the National Variety Release Committee established in 2006. The National Seed Certification Services under the MAAIF's provides for genetic purity and the Cotton Development Organisation (CDO) provides seed to growers. The Source of funding for Cotton Research in NARO include the Government, the Cotton Development Organisation (CDO), Competitive Grants from pooled "basket" funding by the Government and Development Partners accessed through competitive research proposals developed by scientists on Cotton; and loans from development partners as the World-Bank and others.

Producer organizations exist for various crops including cotton. However, these organizations, neither conduct nor fund research since they have been reluctant to commit funds to research. They convey extension services instead. The coffee and cotton organizations are public institutions and receive most of their funding through taxes levied on export proceeds.

Agricultural R&D performed by the private sector in Uganda is very small; accounting for only two percent of total agricultural R&D investments in 2000 (ASTI). Many of the larger private companies do not employ own research staff, but contract research out to NARO and other researchers, often through short-term informal personal contracts.

The primary funding sources for agricultural R&D in Uganda are the national government, a large number of multilateral and bilateral donors, and development bank loans. In 2008, NARO accounted for seventy-three percent of Uganda's public and private research

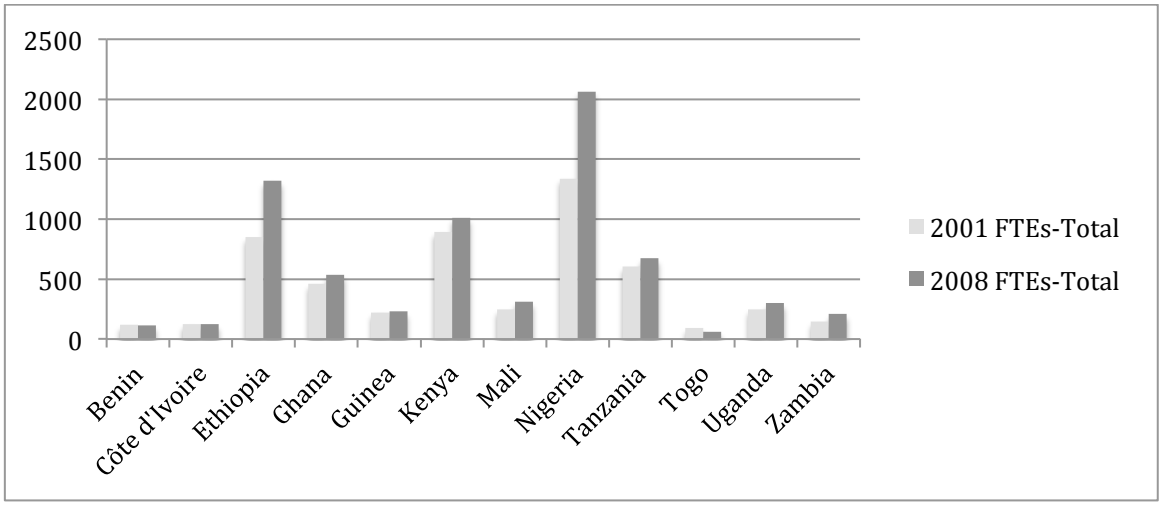
spending and sixty-three percent of its fte research staffing. In recent years government contributions to NARO have increased substantially, as the main source of funding for NARO shifted from primarily donors before 2007 to the government in 2008 when donors provided forty-six percent of NARO's total funding, and the national government provided fifty-two percent instead (ASTI). The World Bank has been the main source of funding for agricultural research in Uganda. World Bank support will continue with the new Agricultural Technology and Agribusiness Advisory Services (ATAAS) project, which began in June 2010 (World Bank 2010). A small amount of funding is derived from the proceeds of the sale of goods and services or from commodity levies which are currently being collected on coffee, tea, cotton, oilseeds, horticultural, livestock, and fisheries exports, but almost all of these revenues are being used for non research purposes, such as marketing, extension, and administration.

Total research capacity at Uganda's main higher education agency, Makerere University, also grew in recent years, strengthening the role of this sector in the performance of agricultural R&D.

Public R&D spending data were only available for the period 1995−2000 during which it increased seventy-five percent from 1995. This increase was mainly the result of World Bank funding to NARO through the first Agricultural Research and Training project (ARTP-I) and increased research activities at the higher education agencies. However, ASTI data on cotton fte researchers seem to withstand the positive trend since the proportion over total fte researchers has diminished instead.

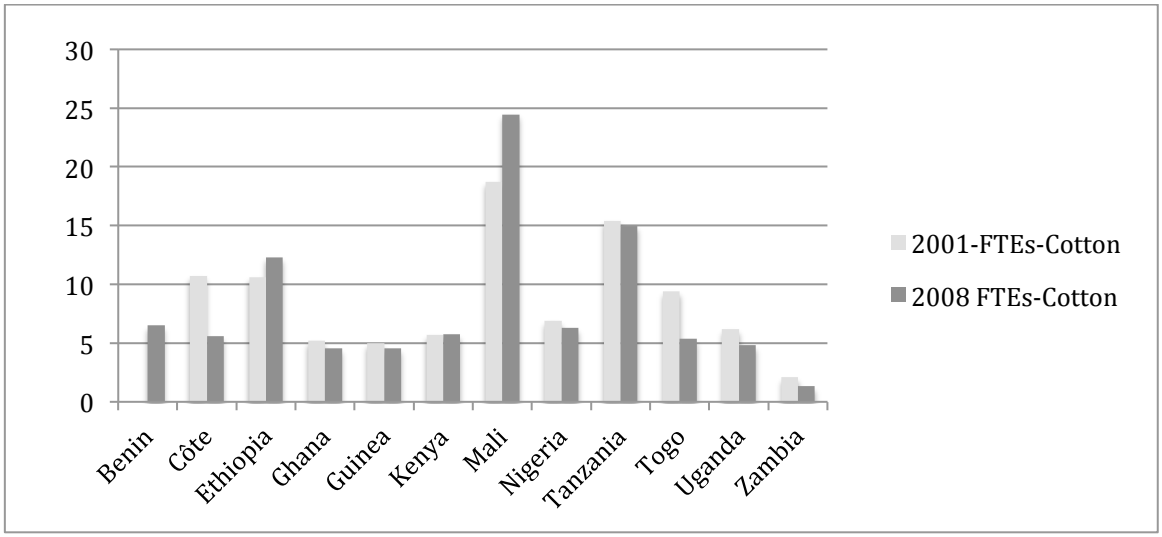
In 2008, Uganda invested $1.40 in agricultural R&D for every $100 in agricultural output. The intensity ratio fluctuated from year to year during the 1995–2008 period, following varied trends in agricultural R&D spending combined with relatively static AgGDP levels.

Figure 1. Full time equivalent researchers in 2001 and 2008.



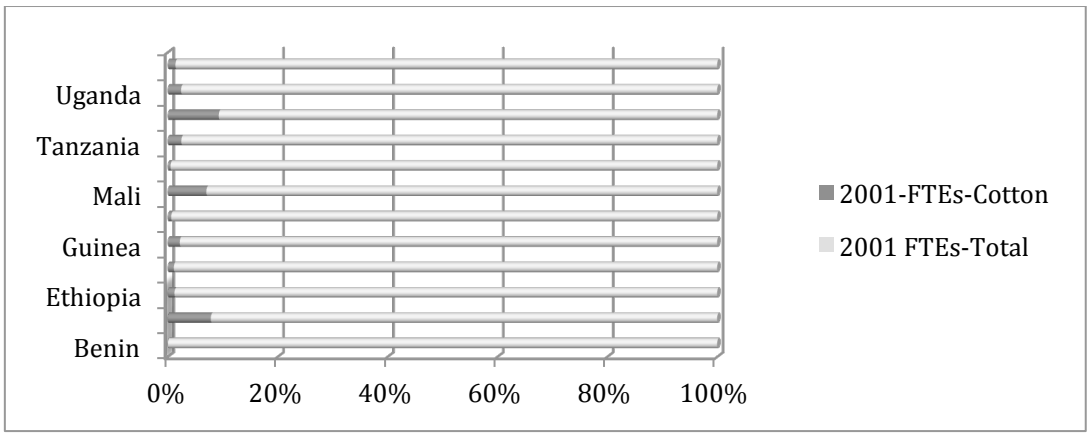
Source: ASTI

Figure 2. Fte researchers in cotton in selected SSA cotton producing countries



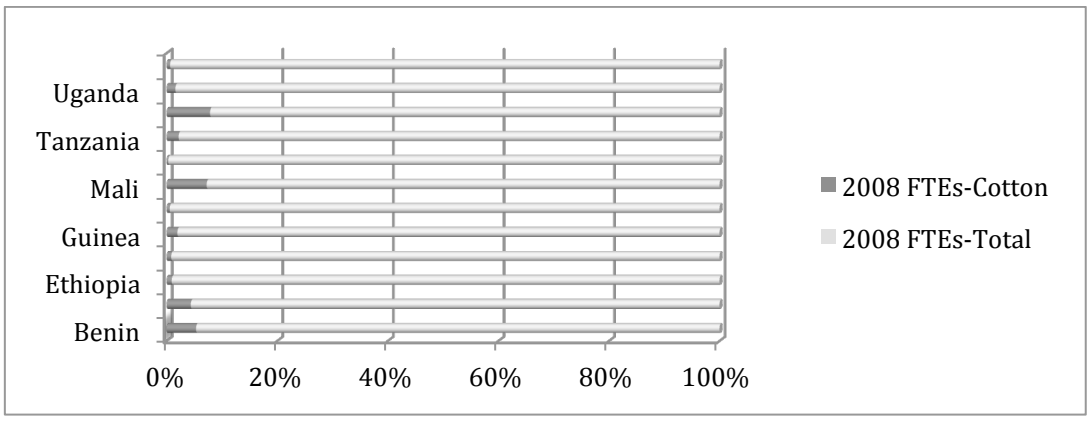
Source: ASTI

Figure 3. Cotton fte (fuul-time equivalent) researchers percentage over total fte researchers in agriculture in selected SSA cotton-producing countries, 2001



Source: ASTI

Figure 4. Cotton fte (full time equivalent) researchers percentage over total fte researchers in agriculture in selected SSA cotton-producing countries, 2008



Source: ASTI

6 Conclusions

6.1 Financing SSA R&D in agriculture

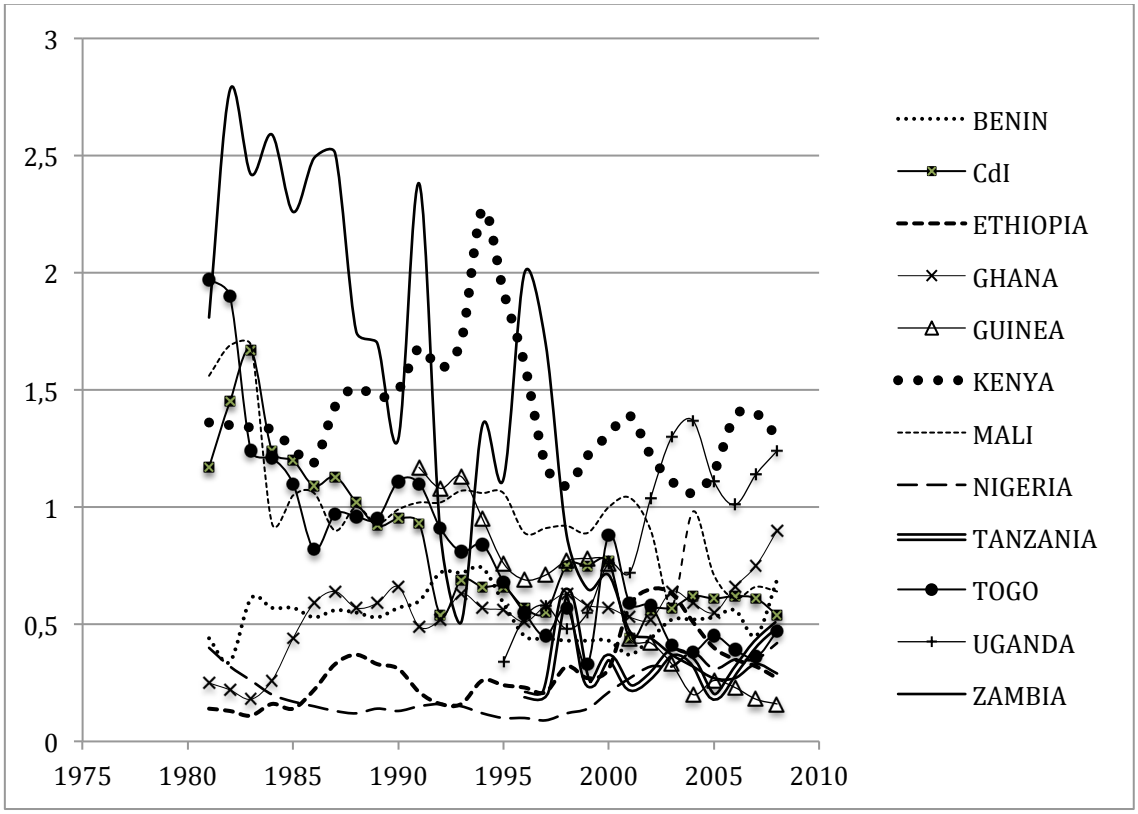
Agricultural R&D in SSA, including R&D in cotton, is primarily public. However, the governments in the region are heavily dependent on external international donors. ASTI show falling investments in agricultural R&D in SSA although there is much variation among countries, but especially those countries which are more dependent on donor funding have

shown a decreasing pattern in investments. Infact, this decreasing pattern is found to be due to the general decrease in contributions from donors especially due to the completion of large donor-funded programmes and the general decline in World Bank loans since the late 1990s-early 2000s (Beintema and Stads, 2009).

The World Bank was an extremely important contributor to agricultural research activities in Africa through loan-supported projects in the 1990s. After peaking at US$120 million in 1991, total World Bank funding in support of African agricultural research declined precipitously during 1991–2002, reaching US$8 million in 2002 (in 1993 prices). Total funding by USAID similarly declined from a high of US$80 million in 1982 to just US$4 million in 1999 (IAC 2004). R&D needs long term stable funding.

Agricultural R&D is particularly susceptible to fluctuations in funding due to the long lags between investments and results that characterize it. Thus, uncostancy in funding has negative effects and can determine the loss of gains achieved. The decreasing pattern in public expenditure for agricultural R&D, the fluctuations in government funding, the highly instable inflow of donor and development bank funding and their short term characteristics, mine the system stability, the financial and institutional efficiency and the overall quality of research outputs. Such general instability also results in difficulties for agencies to retain senior staff, train new staff, coordinate with other agencies and sustain research programs (Beintema and Stads).

Figure 5. Public agricultural R&D expenditures as a percentage of agricultural GDP in selected SSA cotton-producing countries, 1980-2008



Source: ASTI

6.2 R&D in Cotton

Among strategic critical factors of the cotton sector is certainly also investment in research. Research on cotton in SSA is implemented in agencies which generally combine research on a number of other crops. Thus, extrapolating public expenses dedicated solely to cotton research is quite difficult, the only way being to consider the number of hours per researchers per year dedicated to the topic. This data is available only for a number of countries and it is difficult to single out a general trend complementary to the application of the liberalisation strategy. Considering R&D in cotton in a number of SSA countries it appears that it has not been clearly affected by the liberalization strategy. Even the countries which have experienced a complete liberalisation of the cotton sector have remained with agricultural R&D under public expenditure with private cotton companies generally

purchasing research products from government R&D agencies.

From ASTI data on fte cotton researchers in 2001 and in 2008 no particular trend can be identified. However, data in absolute terms and in relative (to the total of fte researchers in agriculture) terms are mostly in line with the importance the cotton sector is given in each country here considered.

In confirmation of this Mali and Tanzania have in absolute terms the most cotton fte researchers both in 2001 and 2008. However, looking at the proportion of cotton fte researchers on total fte researchers in agriculture it is Togo, Côte d'Ivoire and Mali that stand out dedicating respectively 10.2; 8.5 and 7.5 percent of their total agricultural R&D capacity to R&D in cotton in 2001(Figure 4). Except for Côte d'Ivoire things don't change much in 2008 although Mali is among all the observed countries, the only one which increased fte cotton researchers both in absolute and relative terms showing committment of the government to the sector. Nevertheless, Togo remains the country with the higher relative number of cotton fte researchers also in 2008. Notably, Côte d'Ivoire shows a fall in cotton fte researchers both in absolute and relative terms passing from 8.5 to 4.6 percent of total fte researchers in agriculture in 2008. This can be explained by the break out of civil war in 2002 the country has witnessed during which particularly the cotton research station in Bouaké has been affected, leaving cotton researchers completely without facilities. The effects of the war can also be seen on production which has been significantly affected plummeting from 700,000 bales[80] in 2002 to 225,000 bales in 2008.

All countries in the sample except Côte d'Ivoire, have seen the absolute number of agricultural fte researchers increase. However only Ethiopia, Kenya and Mali have also increased the number of cotton fte researchers in absolute terms and none except Mali have increased the relative number of cotton fte researchers which have decreased instead.

[80] 1 bale = 480 lb

Chapter IV

The Quality Issue in Cotton

Introduction

In literature the failure of reforms of the cotton sector in SSA is generally primarily ascribed to the falling apart of the input provision system consequent to the impossibility of coordination in competitive systems. As mentioned in chapter II, cotton is an input intensive crop and the failure in the SSA financial market makes it necessary for the farmers to be provided with input credit before the growing season. While vertically integrated systems solved the issue with ginners providing the necessary inputs on credit knowing they would be paid back at harvest; it is by now acknowledged that this does not work in a competitive organisation of the sector where the numerous ginners scramble for cotton and farmers can free-ride avoiding to pay for their debt thus making the input credit system impossible to work.

It is acknowledged that another problem ememerged with liberalisation is a decline in export quality as also seen in other SSA liberalised sectors as coffee, cocoa and tea. However, the subject is not often tackled in literature if not just mentioned as a secondary side-effect of reforms. In my view, the plummeting of quality is just as serious a consequence to liberalization since in the cotton sector it has both short term and long term lasting negative consequences on the sector. The purpose of this chapter is to explain the origin and importance of quality in the cotton sector and to analyze the contingent effects a liberalization of the sector has had on such feature.

The chapter is organised as follows: Section 1 considers where the demand of quality is originated; section 2 gives an exhaustive primer on the features of cotton that "make" the quality of cotton; section 3 analyses where in the value chain quality is "built"; section 4 explains how cotton is priced and how quality impacts prices; section 5 purpose is to analyze

with econometric analysis the impact of liberalisation on the SSA cotton sector.

1 The origin of Demand for Quality

Cotton is a natural and seasonal product. Cottons are not all equal and characteristics can vary considerably. There are many different types of cottons, referred to as growths or varieties, and many other varying characteristics determine its use. Like all commodities, cotton is differentiated by quality parameters for the purpose of trade.

The quality parameters by which cotton is differentiated and that consequently determine its value are determined by the consumer of cotton lint i.e. the spinner and the textile manufacturer, who transform the raw material into yarn and then into fabric (Estur). Cotton quality requirements can vary substantially depending on the final product, and the quality differences affect the value that spinners can get from the cotton lint and thus the price that manufacturers are prepared to pay. In general, manufacturers are interested in the performance of cotton in the manufacturing of textile: better fiber quality translates into better yarn quality as well as in higher processing efficiency.

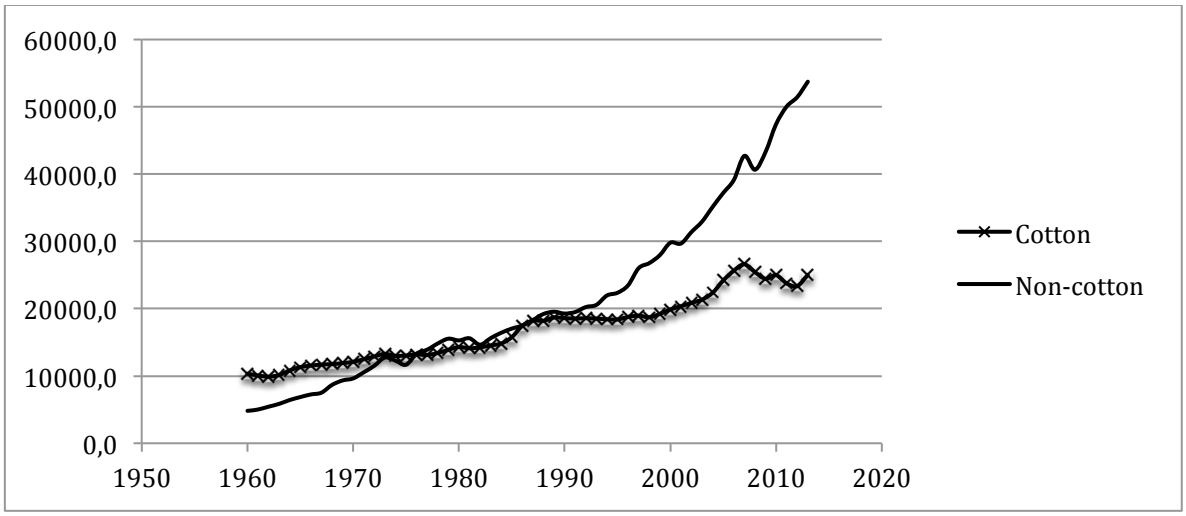
Resisting the apparent descending trend in quality demand as seen in the processing industries of other commodities, i.e. in the coffee, cocoa and tea sectors; the spinning industry has instead been demanding growing lint quality from ginners. The reasons for this are to be ascribed to the increasing market pressure that is being placed on the textile supply chain on the one hand; and to the innovation in the spinning technology on the other.

Growing competition in the textile industry results from the combined effect of cotton market saturation due to the plentiful production (mainly from China and the US) and of the growing pressure from manmade fibres. Within the sector, cotton competes with various international growths with spinners searching to attein particular blends giving scope for differentiation rather than standardization. In the fibre market cotton strives to compete with the advantages of artificial fibres (notably polyester). Manmade fibres have the advantage of

being homogeneous, verstaile, clean (e.g. all synthetic fibers within a given lot are identical and totally free of contamination) and stronger than a natural fibre; they are easier and hence less costly to process. Thanks to these features and to the relatively lower prices, manmade fibres have gained a growing share in the textile market as confirmed by the loss in market share of cotton to the advantage of chemical fibres (figure 1).

Contrarily, cotton is a natural product and varies widely in its fibre characteristics, both physical and chemical (mainly physical), because of genetic, environmental, and processing factors. This variability in the fibre impacts its processing performance, costs, and quality. The increasing quality and performance demands placed on the textile value chain has made chemical fibre performance become the benchmark by which spinners judge cotton, requiring the same characteristics of cleanliness and homogeneity as offered by artificial fibres.

Figure 1 - Cotton and non-Cotton World Consumption, 1960 - 2013



Source: ICAC

The other reason for quality demand in cotton comes from innovation in the spinning industry. Since the late nineteen-seventies spinning machines have seen processing speed intensify with a consequent forty percent increase also in productivity. This has resulted in a

raise in minimum quality requirements in cotton being that the physical, chemical and related characteristics of cotton lint, including the type and amount of contamining non-fibrous matter and 'fibre configuration' (preparation, neps etc.), determine its textile processing performance and behaviour, in terms of processing waste and yarn and fabric quality. Additionally, machine stoppages and spinning breaks - which can partly be ascribed to yarn defects, as in the case of weaving end-breaks- have become increasingly costly making the undesirable properties of cotton further burden on the determination of its price[81].

Cotton fibre represents fifty to seventy percent of manufacturing costs of yarn and as a result of competition and innovation, alongs conventional parameters, new quality attributes have assumed increasing importance in the determining of the price of cotton. Among fiber properties, staple length has the greatest influence on spinning performance. According to the International Cotton Advisory Committee (ICAC), the world cotton supply can be divided into six categories based on commonly perceived competitive relationships between cottons of differing quality, variety, and geographic origins: extra-fine, fine, high-medium, medium, coarse count, and waste/padding. The categories are roughly parallel to staple length categories but are designed to incorporate more than just staple length information because two cottons of equal length might actually have significantly different spinning characteristics.

2 Features of Cotton that Determine Quality for Spinners

The most commonly produced and traded cotton lint variety in the world belongs to the species *Gossypium hirsutum,* which is also known as upland cotton. Extra Long Staple (ELS) cotton used for producing very fine yarns comes from another species and accounts for less than 5 percent of world cotton trade.

[81] Some twenty to thirty percent of weaving machine stops are attributed to yarn defects, the repair of each end-break costs about seventy US cents.

Following is a review of cotton features taken into account by spinners because they affect processing, performance, utilization and value. Together they determine the quality of cotton.

Leaf Grade- Leaf refers to small particles of the cotton plant's leaf which remain in the lint after the ginning process. Upland leaf grades are identified as numbers 1 through 7, all represented by physical standards. Upland leaf grade 8 (Below Grade) is used to identify samples having more leaf than leaf grade 7. Leaf is determined by plant condition, harvest preparation, weather conditions at harvest, and weeds present in the field at harvest. Use of hairy leaf varieties, poor defoliation prior to harvest, hard freezes on rapidly growing plants, and harvesting damp cotton can also be causes of high leaf grade.

Regardless of the cause, high leaf grades can result in significant price discounts.

Upland leaf grades are determined by human classers who compare a lint sample to Universal standards for the grades and cannot as yet be measured instrumentally.

Fiber length - is the average of the longest half of a fiber bundle and is reported in hundredths of an inch and 32nds of an inch. The official standards for fiber or staple length range from 26/32 inches upward, generally in graduations of one thirty-seconds of an inch. A length above 28 mm is desirable in most cases, although this depends upon the spinning system and yarn count (desired for ring spinning and weaving). The mean length (ML) or 50% span length is generally regarded as providing a better measure of spinning performance and yarn quality.

Fiber length is primarily determined by cotton variety, but growing conditions as optimum temperatures[82] and fertility (adequate levels of Potassium and nitrogen) can affect length as well. Deficit or excess soil moisture levels can also cause reduced fibre length. The first 16-20

days following flowering determine fiber length.

Fibre length characteristics can be deteriorated by ginning and textile processing conditions in terms of fibre breakage.

The upper half mean length of fiber can be measured instrumentally in hundredths of an inch and length is converted to thirty-seconds of an inch.

Length uniformity - is a measure (uniformity index) of the degree of uniformity of the fibers in a sample. It is the ratio between the mean length of fiber and the upper half mean length expressed as a percentage.

Low uniformity values are related to fibers that are more easily broken. Among causes of low uniformity are weathering of cotton, ginning at improper moisture levels (less than 6%), or excessive lint cleaning. Excessive fibre length variation tends to increase manufacturing waste and to adversely affect processing performance, including spinning performance and yarn quality.

Related to length uniformity is the short fibre content (SFC) defined as the percentage, by weight, of fibres shorter than ½" (12.7 mm). The SFC level is generally a function of the staple length (UHML).

An increase in SFC increases spinning end breaks, processing waste and causes deterioration in yarn and fabric properties, notably yarn strength and evenness.

Fabric strength and abrasion resistance also tend to deteriorate with an increase in SFC. An SFC below 8% (by weight) is desirable.

Length, length uniformity and length distribution, including short fibre content, are probably the most important cotton fibre properties, being the best criterion for ring spinning performance and spinning limits; and often also of yarn strength.

Strength – It is important to draw a distinction between absolute fibre strength (uncorrected

for cross section or fineness) and fibre tenacity (corrected for cross section or fineness). The strength of individual cotton fibres is determined by the fineness of the fibres.

Cotton fibre tenacity, is generally measured on fibre bundles, by clamping and breaking the bundle of fibers with a 1/8-inch spacing between the clamp jaws. Results are reported in terms of grams per tex (g/Tex) to the nearest tenth. A tex unit is equal to the weight in grams of 1,000 meters of fiber. Therefore, the strength reported is the force in grams required to break a bundle of fibers one tex unit in size.

In terms of spinning performance, the effect of fibre strength is small, whereas fibre tenacity is virtually linearly related to yarn and fabric strength, all other factors being constant. Fibre tenacity is particularly important for rotor spinning.

Elongation- means extension at break and is measured at the same time as fibre strength. It is determined by genetic and environmental factors.

An increase in elongation is associated with an increase in yarn and greige fabric elongation and nep formation which significantly affects weaving efficiency. The relationship between yarn elongation and fibre elongation is a function of fibre length and yarn twist and linear density. Yarn elongation. An increase in fibre elongation can sometimes reduce spinning end-breakage but also yarn strength.
A level above 7% is desirable.

Micronaire (also called mike) - is a function of both maturity and fineness and is generally used as a measure of the latter. Although it is usually important to measure maturity and fineness separately particularly when different cotton varieties and growing regions are involved; for Upland cottons, micronaire is considered as good as, if not better than, maturity measures.

Micronaire is determined both by variety and environmental conditions, although environmental conditions play a greater role. Micronaire develops after the full fiber length is obtained that is from 16-20 days to 40-45 days following flowering and is negatively affected (low mike) by cool and/or dry weather and low fertilizer use.

Micronaire affects processing waste (lower micronaire fibres break more easily during mechanical action), creation of neps (lower micronaire fibres are generally more flexible and entangle more easily to form neps), short fibre content, spinning performance, yarn and fabric quality, dyability and neppiness in particular.

Micronaire is important to spinners because it predicts yarn quality and dyeability. Low micronaire refers to fine fibers and is usually a predictor of low dye uptake and possible end-breakages during spinning; while high micronaire refers to coarse fibers and is a sign of good dye uptake. However, very high micronaire also causes reduced yarn strength.

The ideal micronaire range is between about 3.8 and 4.2; or below 3.8 provided the cotton is mature. It is generally considered that both too-low and too-high cottons should be avoided consequently values below 3.5 and above 4.9 are discounted, while premiums are paid for the most desirable mike readings.

Maturity- Fiber maturity is related to the amount of cellulose deposited during boll development, the relative wall thickness of the fibre, ratio of the cell wall thickness to the overall 'diameter' of the fibre. It is primarily a function of variety, culture, and weather.

Cellulose is the element of the fiber that is dyed in the textile process and the more cellulose present, the better dye uptake. In general maturity affects fabric appearance and defects more than any other fibre property. It particularly affects nep formation, dye uptake, dyed appearance and lustre. Maturity should be considered not only in its average but also in its distribution being that variations in maturity can lead to differences in dyed appearance and

even a small percentage of immature fibres which may not significantly affect the average maturity, can significantly affect the yarn and fabric appearance in terms of neppiness and white flecks. Immature cottons also have greater scouring and finishing losses because their non-cellulosic contents are higher; and can also be associated with stickiness and roller lapping because of excessive plant sugars.

Maturity is commonly measured by the double compression airflow test. The most popular means of expressing maturity are percentage maturity (Pm) and maturity ratio (M), a level of at least 0.9 (preferably 0.95) for M and 80% for Pm being desirable.

However, relatively immature and fine fibres can be removed with combing.

Neps - are generally defined as hopelessly entangled masses of fibres. Neps can be distinguished either in 'seedcoat neps' – which have a piece of the seedcoat attached to the fibres– or 'shiny neps' – which consist of dead fibres, with insufficient cellulose to even absorb dye.

Neps may exist in unprocessed cotton, being related to certain fibre properties, but the vast majority of neps are caused by handling and processing. Almost any mechanical process can cause the formation of neps, especially harvesting (meaning machine harvesting; while cotton carefully removed by hand fom the seed contains very few neps), ginning, and mechanical treatment conditions in the spinning mill.

However, some cotton fibres are more susceptible to nep formation than others. Susceptibility tending to increase when maturity decreases, length increases, and with either very high or very low moisture content. Nep formation is also directly proportional to trash content due to the consequent necessary over cleaning which causes more neps to be formed.

Nep testing should be separated, i.e. before and after processing but also to be able to measure the different types of neps, e.g. seed coat neps and fibrous neps.

Neps are responsible for up to fifty percent of yarn defects. If neps are incorporated into the yarn, it is quite likely they will survive into the fabric causing imperfections and unevenness, and if neps exceed a fairly low threshold (20 neps/gram) the resulting fabric is not suitable for high-quality textile products. Neps also cause spinning end-breakages. Seed coat fragments are particularly problematic.

However, neps can be removed from the cotton fibres by the carding machine and the combing machine. A well-adjusted carding machine can remove about ninety percent of the neps.

Short fibres- fibres less than 1/2" long. Shorter fibres are negatively correlated with good yarn properties (e.g. strength and elongation) and positively correlated with bad yarn properties (e.g. thin and thick places and hairiness). Even a slight elevation of very short fibres (say, less than 1/4") is likely to disproportionately damage spinning performance and yarn quality. Short fibres are one of the causes for an increased tendency toward nep formation.

Contamination- is a measurement of non-lint material. It commonly comprises plant and non-plant matter as fragments of leaves, bark and grass, as well as particles of sand and dust. It includes stickiness and synthetic fibers. Stickiness is caused by insect sugars on the fiber forming sticky deposits on the surfaces of mill machinery with which cotton comes into contact. They can make ginning very difficult, but also carding, drawing and spinning difficult for mills. Stickiness mostly comes from late harvest, incentives for early picking were offered to farmers which have led to stickiness virtually disappearing.

Once this material gets into the gin or the mill, it is distributed throughout the fibers and is difficult to remove because when this material gets ground up, it can resemble fibers and is difficult to separate from the cotton. It is very difficult to detect until the fabric has been

dyed. Fibre contamination is a serious and expensive problem for the mills.

Growing, harvesting, storage (field), and ginning conditions determine levels of contamination since foreign matter can during these stages enter into the cotton. Seed coat fragments, with tenaciously clinging fibres, are an important cause of yarn faults, also adversely affecting spinning and yarn performance. In particular plastic materials represent a serious source of contamination being undetectable before the fabric has been dyed - picking polypropylene (ppp) bags and tie downs have been major source of fiber contamination.

Most foreign matter can be removed, but cleaning is associated with fibre breakage and consequent nep formation.

Classers look for grass and bark while grading or the measurement is made by the instrumental video trashmeter which measures the percentage area and particle count of trash on the sample surface. This measurement provides an estimate of the total amount of trash in the bale.

Colour - colour measurements are in terms of grayness and yellowness. Grayness (Color Rd) indicates how light or dark the lint sample is, and Yellowness (Color +b) indicates how much yellow colour is in the lint sample. Cotton is generally white when the boll opens, but continued exposure to weathering and micro-organisms can cause the cotton to lose its brightness and to become darker. Cotton may also become discoloured or spotted by the action of insects, fungi, plant diseases and soil stains, or when affected by frost or drought. Storage under high humidity conditions can cause yellowing and reduce brightness. color is usually not affected by variety (although it is known that WCA cotton is yellower than US Upland).

Colour has little effect on processing but affects dyeing and finishing of fabric. Bleaching is often able to reduce, or even eliminate, differences present in the raw cotton. Average

colour; colour variability; and spottedness can all affect processing and dyeing performance and fabric appearance.

Colour is generally measured by instrument, in terms of its greyness, reflectance or brightness (Rd) and yellowness (+b). Typically +b is about 9.0 and Rd 75%.

Table 1. Comparison for fibre properties

Fiber Property	**Cotlook A Index**	**Typical African upland cotton**	**Lint for finer yarns**
Grade	Middling-white	Strict low middling to Good middling	Strict Middling-white
Staple length	1-3/32" (27.8 mm)	1-1/6 to 1-3/16 inches (27-30.2mm)	≥1-1/8" (28.6mm)
Micronaire	3.5-4.9	3.5-4.5	3.8-4.2
Fiber strength	25-30 grams per tex	27-32 grams per tex	≥30 grams per tex

Source: Éstur (2008)

2.1 Where are the quality features created

Quality of cotton is achieved in almost every stage of the value chain. We may consider dividing the value chain into two parts, i.e. before and after the cotton boll opens. In this way we may consider pre-production stages and post-production stages in the value chain.

Variety determines grand part of lint quality parametres and actually the first stage that affects cotton quality is research and development where variety is originated. This stage takes care of a number of issues starting from researching varieties that better adapt to specific environment conditions. Follow seed breeding and multiplication which are implemented so that seed used is of good quality (use of old or stressed seed have detrimental consequences on cotton quality); soil fertility management (crop rotation, tillage,

animal draught, area specific fertilizers); pest management (integrated pest management practices, research of optimizing pesticides) and extension advice so as to maximize the varietal potential properties (chapter III considers research in cotton more in depth).

The next step that can affect quality of cotton is input provision. In order to maximize the potential properties of variety, inputs need to be of good quality (previous stage) and used in a timely fashion. Late sowing (which may be due to difficulties in obtaining seeds), like fertilizer and pesticide improper use (too little or too late) all have detrimental consequences on harvest quality.

Other than R&D and input timely provision, only production management practices are left that can affect the optimal expression of potential fibre properties before the cotton boll opens. Production management is affected by extension services the objective of which is teaching growers the production practices so as to optimize intrinsic fibre properties and harvest, i.e. timely sowing; soil fertility management; and pest management.

When the cotton boll opens it is at its best in terms of fibre properties and subsequent action can only change it to the worse.

After the boll opens, quality of cotton is mainly affected by post-production management, i.e. harvesting methods, storage, and ginning practices. Following is a description of each stage and how it can affect fibre quality.

Harvesting methods - Cotton can be either harvested by hand or mechanically. In terms of quality, seed cotton picked by hand is cleaner, and the fibre obtained has fewer neps and a lower short fiber content than cotton picked by machine which contains between six percent and thirty percent of plant parts depending on the type of harvester used[83]. Particularly

[83] Two types of mechanical harvesting equipment are used to harvest cotton: the spindle picker and the cotton stripper harvester. The spindle picker is a selective-type harvester; the cotton stripper is a nonselective harvester that removes not only the well-opened bolls but also the cracked and unopened bolls along with the burs and other plant parts.

bothersome in machine picked cotton is leaf material, one of the most difficult types of trash to remove. Machine picked cotton consequently needs to undergo more thorough cleaning procedures (which negatively affect quality as explained later) at the gin. However, handpicked seed cotton often gets contaminated during picking, storage, handling, or transport, and the presence of foreign matter in the fiber offsets the theoretical advantage conferred by manual picking. Particularly detrimental to quality is the use of polypropylene picking bags which can contamine cotton with own fibre which is detectable only at the dying stage thus affecting textile. As a result, handpicked cotton has lost its advantage over the past twenty-five years and now trades at a discount to machine picked cotton which is considerred more reliable in its outcome (Estur, 2008). Nevertheless, only three countries (United States, Australia and Israel) harvest 100% by machine.

Storage - Moisture content, length of storage, amount of high-moisture foreign matter, variation in moisture content throughout the stored mass, initial temperature of the seed cotton, temperature of the seed cotton during storage, weather factors during storage (temperature, relative humidity, rainfall), all affect fibre quality. Thus, adequate storage facilities are essential to keep cotton protected from weathering which reduces its quality. Seed cotton may be stored in piles on the ground, or in sheds, storage houses, trailers or modules so long as it is protected from environmental damage and from excessive ground moisture.

Cotton is then transported to the ginner. At the ginner a number of processes can significantly affect cotton quality in terms of fibre length, uniformity, seedcoat fragments content, trash, short fibres and neps. The two ginning practices that have the most impact on fibre properties are the regulation of fibre moisture during ginning and cleaning and the degree of saw-type lint cleaning used.

Cleaning involves the removal of both moisture and trash. While cotton contamined (over a certain threshold) with leaf is discounted, cleaning also means the loss of some marketable

fiber and thus a loss of profit since premiums consequent to the extra cleaning do not compensate for the loss of marketable weight (ginning out-turn ratio). Lint cleaning also adresses the problem of seed-coat fragments in the lint which can be caused by harvesters, by high-impact gin machinery or by worn gin saws and ribs; but the procedure results just in a reduced volume of SCF present in the cotton since their number tends to remain unchanged.

Other than marketable fibre, cleaning also negatively affects staple length: each lint cleaner reduces staple by up to 1/32 of an inch and this is worsened if excessive drying has weakened the fiber. It also causes the creation of short fiber and neps.

Over-cleaning is related to over-drying which additionally causes loss of marketable weight (water content). Furthermore, it causes loss of strength in the fibre and creation of short fibers which overvalue the benefits of trash removal.

The type of gin used is known to affect cotton fibre quality. Roller ginning, when compared to saw ginning, produces a superior fiber with excellent spinning potential because it is more gentle when separating the fiber from the seed. Roller ginning has better outturn (less waste thus less cotton is lost) and produces lint that is longer, has fewer short fibers, seed coat fragments and neps. However, saw ginning is much faster than roller ginning which is a slower and more expensive process that can only be used for ELS cottons and medium-long upland varieties. Roller ginned lint contains more trash as saw ginned lint is cleaner, but contains finer particles of trash that are more difficult to remove.

Mechanical processing in terms of roping and twisting of the fibre, and poor maintenance of the gin all affect fibre; the less mechanical processing that the fiber receives, the lower will be its nep content and roughness in preparation[84].

[84] Rough preparation refers to the appearance of cotton and causes increased waste to be produced during textile processing. Processing cotton while it is wet, transporting cotton in pipes with excessive air speeds, and

3. Grading

The afore seen intrinsic (in variety) and induced (by production management and post-production handling) quality features altogether determine the grade of cotton. Cotton grading is also significant in the quality performance of cotton. It plays a role in terms of information flow in the cotton value chain. Actually, classing and grading give producers the necessary feedback on the quality of their harvest which ideally acts as an incentive so as to implement all the necessary (labour intensive) operations to further improve the quality of cotton, particularly relative to care in hand harvesting. In SSA this happens when grading is implemented at the primary market stage; a practice that has died out after liberalization, being postponed to the export port to the detriment of the information flow to producers.

Grade is determined after classification (or grading) which is the application of official standards and standardized procedures developed for measuring the physical attributes of raw cotton that affect the quality of the finished product and the processing efficiency. This can take place in two ways: either through manual classification or instrumental classification.

The traditional method of cotton classification is through manual grading. This is based on appearance and feel, and includes determinations of color grade, leaf grade, staple length, preparation, and contamination; and is implemented by trained cotton classers based upon visual comparisons with physical and descriptive standards. A shortcoming in manual classing is that there are limits on the number of quality factors that can be measured by human sight and feel; and it depends on human perceptions of sight and touch, making results somewhat subjective. Furthermore, manual classing methods are not harmonized undermining reliability and precision of its outcomes. Nevertheless, it is still the actual base for trading cotton (Éstur, 2008).

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feeding too much air into air-fed cylinder cleaners can cause the twisting, knotting and roping that are recognized as poor preparation.

Instrumental classification is implemented through High Volume Instruments (HVI) which were introduced in 1980 in the US where they subsequently proliferated: in 1991 the entire US crop was classed with HVI systems. HVI classification increased the number of quality factors that can be measured and has also improved the measurements which were previously performed manually allowing for improvement in establishing absolute reference standards. The HVI yields seven major measurements- length, strength, uniformity index, micronaire, reflectance (Rd), yellowness (+b), and trash; and reports some qualities as length with far greater precision (to the 100th of an inch) compared with the human classer's staple length of 32nds of an inch). Furthermore it measures strength, uniformity index and micronaire, none of wich can be measured manually and are important to the textile industry. Rd and +b are combined to obtain an HVI color grade that replaced the human classer color grade in 2000. The only measurements still not performed by HVI are leaf grade and extraneous matter. Another deficiency in instrumental classing is that in most cases it tests samples so the outcome may not always be exhaustive of the overall quality. Furthermore test results have shown to be variable depending on different laboratories they are carried out in. Nevertheless, virtually every bale of cotton produced in the U.S. is subjected to mandatory HVI.

The outcome of the classing stage is the grade of cotton based on its quality. Cotton grading from coarse to premium is a critical economic issue for the mills; consequently based on its grade achievement, cotton fetches a higher or lower price over or below the world price expressed in the Cotlook A Index.

However, classing be it manual or instrumental seem to both have shortcomings such that spinners notably still rely on origin (of cotton) and thus country reputation for purchasing cotton (Éstur, 2008).

4. Pricing Cotton

4.1 The Cotlook A Index

The guiding light for prices of cotton is either the Cotlook A Index or the latest prices quoted for the nearby futures contract on ICE Futures U.S., Inc. in New York. However, while futures prices are not always good indicators of international price trends or prices of cotton from countries other than the United States; Cotlook[85] A Index has the purpose of being representative of the level of offering prices on the international raw cotton market on the basis of price information from both buyers and sellers of cotton from many origins, which makes it the unrivalled barometer of international cotton price movements as acknowledged by the trading fraternity, governments, and international organisations such as UNCTAD and ICAC.

Cotton Outlook, Cotlook Ltd, is a private company in Liverpool, United Kingdom which has been publishing representative prices for the principal growths of raw cotton from 1966. Prices are calculated from the prices at which cotton is offered to the final consumers, i.e. mills; as an average of the cheapest five quotations[86] from a selection (at present nineteen in which only two African Franc Zone countries are allowed) of the principal upland cottons traded internationally. This is a means of identifying those growths which are the most competitive, and which therefore are likely to be traded in most volume. The selection of cottons considered in the calculation can change solely to reflect shifts in the cottons most frequently traded. However, Cotlook quotations are intended to reflect the competitive level of offering prices, not the level at which business has been arranged.

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[85] In the attempt to provide a device that shows the potential influence of movements in futures on prospective offers to mills; Cotlook decided last year to introduce an 'intra-day' Index value, which adjusts the individual component values of the A Index by the extent of the movement in futures. The adjustments are based on the historic 12-month moving averages of the typical price relationship for each growth with the relevant NYBOT trading month, and the A is then re-calculated. This 'intra-day' value, which we have given the title 'Cotlook A Index Plus' (AIP), will therefore move in sympathy with futures.

[86] This practice is a proxy for weighting, which is impractical, owing to the absence of timely data by which it could be calculated.

The base quality of cotton considered in the A Index is Middling 1-3/32″ which allows for the widest possible selection of growths to be monitored. The terms quoted are Cost and Freight (CFR), Letter of Credit at sight, including one percent agent's commission and notional profit.

As of 2003 Cotlook has been calculating the A Index based on Far Eastern quotations, previuosly was the North European, as a consequence to the change in trade flows in cotton since China's accession to the WTO. The quality basis of the A Index FE is inaltered, namely Middling 1-3/32″. The Cotlook North European A and B[87] Indices were discontinued instead, from August 1, 2008.

Although the price of cotton, adjusted for inflation, is tending downward over the long run, a phenomenon common to many primary commodity industries; market for upland cottons with higher grades and finer cottons is growing and most profitable as a consequence to the fact that modern high-speed machinery requires better fibre characteristics to operate at maximum efficiency and spin high quality yarns. The importance of quality is reflected in the price cotton lint receives in the world market and is expressed by premiums or discounts over the Cotlook A Index. In general, prices for cotton that is finer, longer and stronger than the world average, but not as good as extra-fine, are above the Cotlook A Index by 10–15 percent; while cotton that is classified as coarse cotton (cotton that is shorter, rougher and weaker than average) has a discount from the Cotlook A Index of 3–10 percent. However, the specific premiums and discounts for each lot of cotton bales can vary due to a number of issues, as explained in the following paragraph.

[87] For coarser cotton

4.2 The "Making" of the Cotton Price

The price of cotton is detrmined by a number of factors.

On a general level, by world demand and supply. The world cotton market is particularly influenced by China which has for long been at the centre of the global cotton market it being the world's largest consumer and importer of cotton from 1994 (Faostat). Particular market influence derives from its cotton reserve policy since it is now expected that its cotton stocks are around half of total world stocks. Consequently, any decisions involving Chinese stocks is expected to impact the direction the world cotton price gets, as witnessed in the 2010 world cotton price surge[88]. Among other issues influencing world supply are subsidies most developed countries support their cotton sectors with (particularly the US[89] and the EU once).

On a specific level, by the quality features explained earlier. The benchmark for Upland cottons (the type of cotton grown throughout SSA) is currently California San Joaquin Valley Acala which is long (1.15 inch 1-1/8"), very strong (32-34 gpt), and has 4.2 micronaire; followed by Australian SM 1-1/8". These machine-picked cottons fetch premiums of about ten and nine cents respectively, over the Cotlook A Index. The market segment for upland cottons that is growing fastest and is most profitable is for higher grades and finer cottons, especially used in the production of ring spun combed yarns for the woven and knitted apparel sector. There is actually a global trend towards improving yarn quality, confirmed by the rising market share of medium and higher grades which account for an estimated seventy-five percent of world trade (Éstur, 2008); and the decline of shorter ("coarse count") upland cotton share. In addition to requiring longer, cleaner, whiter, brighter, stronger, and finer fibre, this higher segment of the market is demanding additional

[88] Consequent to droughts and floods, China's cotton production fell by as much as seventeen percent from 2008 to 2010 (USDA). In addition world cotton supply was also hit by droughts followed by floods in Australia and Pakistan. The combination with a growing demand of cotton world-wide and especially in China gives a rationale to the world cotton price surge.

[89] One example is given by the Brazil–United States cotton dispute was a World Trade Organization dispute settlement case (DS267) on the issue of unfair subsidies on cotton won by Brazil in 2004.

fibre properties, as elongation and neps; greater uniformity of length; and lower short fiber content. As explained in section 1, better fibre characteristics are required for the modern high-speed machinery to operate at maximum efficiency and spin high quality yarns. However, among the various quality features of cotton, staple length is ceteris paribus the most important; and SSA has been able to follow the market trend toward longer fibre as most African production now reaches the typical benchmark of 1-1/8" thus emphasizing its comparative advantage.

Qulaity is, as mentioned, expressed in grades and when these are truthful, mills pay for quality in the form of premiums (or discounts for lower quality) over (or below) the Cotlook A Index.

A number of other issues which are hardly measurable. The way cotton is marketed and shipped for example, has significant influence. The spinning industry is especially concerned about consistency in shipments: homogeneous and reliable year-round shipments, with consistent cotton characteristics, and standardized bales (same size and density) wrapped in cotton cloth are prefered. The homogeneity of deliveries also depends on seed cotton grading (HVI gives information per bale), and bale allotments. In this particular issue, SSA cotton suffers a disadvantage for various reasons. SSA shipments of upland cottons have longer transit times than those from their major competitors; in addition they are considered less reliable. The grand part of SSA cotton producing countries lack instrumental classing facilities, manual classing being implemented instead, which causes consequent homogeneity and consistency faults in terms of quality and packaging. The afore mentioned upland cotton benchmark, California Acala cotton, is for example shipped year-round, deliveries are very consistent, it is wrapped in cotton cloth, and has bale per bale HVI classification, short transit time and very reliable shipments.

Lastly, price is influenced also by reputation. In this particular issue, perception often shows

to be more important than fact. Trust and reputation matter in the cotton business and the market rewards origins and shippers that have a strong record of delivering certain quality characteristics with consistency, while respecting contract terms for quantity and other. Premiums and discounts attached to internationally traded cotton are acknowledged to derive partly from the reputation of national origins. This particularly works for discounts, which are usually applied indiscriminately to all cotton originating from an area or a country considered to be affected by contamination (real or perceived). In confirmation of reputation importance is also that cotton is sold on types (generally national types) and not on description, types being defined by each country based on its own criteria.

Following is a formalization of these points in the detrmination of the export cotton price:

$$P_{jt}^{x} = P_{w} + \omega_{jt}\alpha_{jt} + u_{jt}$$

Where P_{jt}^{x} is the export cotton price for country j at time t; P_{w} is the world cotton price; ω_{jt} is the share of premium quality cotton; α_{jt} is the quality premium; and u_{jt} is a measurment disturbance error.

5. Does Liberalization Affect the Quality of Cotton?

A generally accepted central concern about liberalization is that it can deteriorate quality. However, supporters of liberalization argue that this should not be influent a consideration since quality should not be undermined by sector design change unless it is a feature no longer interesting on the world market (Gilbert, 2009 for example) and as such consequently inifluent.

As explained, the quality of cotton ceteris paribus detrmines the obtainable price on the world market, thus the feature remains central when considering cotton. After having described the features that determine the quality of cotton, where they are created, and the

origin of quality demand; my purpose is to verify the assertion that a liberalization[90] of the SSA cotton sector has negatively affected its quality performance: the objective is to observe whether a change in sector organisation has affected the quality of cotton.

To pursue my purpose I need to consider some SSA cotton producing countries that have liberalized (not just privatized) their cotton sector and other countries that have not liberalized instead.

Drawing a comparison among SSA cotton producing countries is possible because SSA cotton has homogenoeus fiber characteristics across the region despite the fact that it is grown without irrigation and by small farmers. This homogeneity is mainly due to similar growing conditions and the low number of varieties[91] planted in most countries - it would be more difficult if for example among compared countries some produced LS or ELS and others Upland cotton.

Based on U.S. universal standards, classification of upland African cottons ranges from Strict Low Middling to Good Middling, and most production is classed as Middling or Strict Middling. Staple length ranges from medium to medium long (1-1/16 to 1-3/16 inches) and most production is classed 1-1/8 inches. Micronaire is within a rather narrow range (3.5 to 4.5) and fiber strength varies from resistant to very resistant (27 to 32 grams per tex) (Éstur, 2008).

I measure the quality performance of the cotton sector by the estimated average premium (or discount) over (or below) the Cotlook A Index (in US cents per pound of lint). This allows for comparison among performances in terms of premiums or discounts.

[90] by liberalization of the cotton sector, I mean the complete opening to competition and not just a privatization of the sector.

[91] As there are no major differences in basic fiber parameters between SSA cottons, price differentials between different origins primarily reflect their level of contamination.

5.1 The Data

My source of data is Cotlook Ltd., in the form of two bulletins with Index A average prices for cotton from 1970 to 2003 the first, and 2003 to 2012 the second. Both report average premiums or discounts for a number of SSA countries per type of cotton exported by the country (in general middling 1-1/32" and 1-1/8"). However, the data is not complete for all countries and considering my purpose, I could only take account of Tanzania among countries which have a liberalized cotton sector; and for countries that have not liberalized their cotton sector I grouped data for the African Franc Zone (AFZ), the time series for single AFZ countries being too short.

Nevertheless, both time series perfectly fit my purpose. Tanzania has a structural quality advantage deriving from its processing half of its cotton production by roller gins (the other half being saw ginned); and roller ginning cotton fetching a premium of one cent per pound over saw ginned cotton with the same grade and type. Furthermore, the cotton sector was liberalized in 1995 and had excellent production performance before that, fetching a premium price of 4 cents per pound (according to TCB). For the AFZ I consider grouped data on average premiums and discounts from Benin, Burkina Faso, Cameroon, Chad, Côte d'Ivoire and Mali that can be thought of as a representative country with non liberalized cotton sector.

5.2 Methodology and Econometric analysis

I rearranged data since as mentioned, the Cotlook bulletins distinguish data per type of cotton grown in each country, for example Bela 1-1/32" and Kaba 1-1/8" for Benin and similarily for other countries; thus, I calculated the average of type premiums so as to have one piece of data per country and year. For the AFZ I have done this grouping all data available, i.e. data on Benin, Burkina Faso, Cameroon, Chad, Côte d'Ivoire, Mali from 2003 to 2012 and data on the AFZ for previous years (already grouped by Cotlook). Subsequently, I have further arranged data calculating the difference between export value and Index A so

as to see clearly premiums or discounts (I call these "crude data" time series). In addition, considering there is an intrisic growth in Index A and country values, I have calculated the ratio between the premiums or discounts and the Index A obtaining to see the premiums or discounts in terms of percentages of Index A prices (I call these "percentage data" time series).

Thus for the Tanzania time series and the AFZ time series, I wish to determine:

- if there is a change in contingent trend in the Tanzania premiums
- if there is a trend in the AFZ premiums
- compare the AFZ and Tanzania trends if any

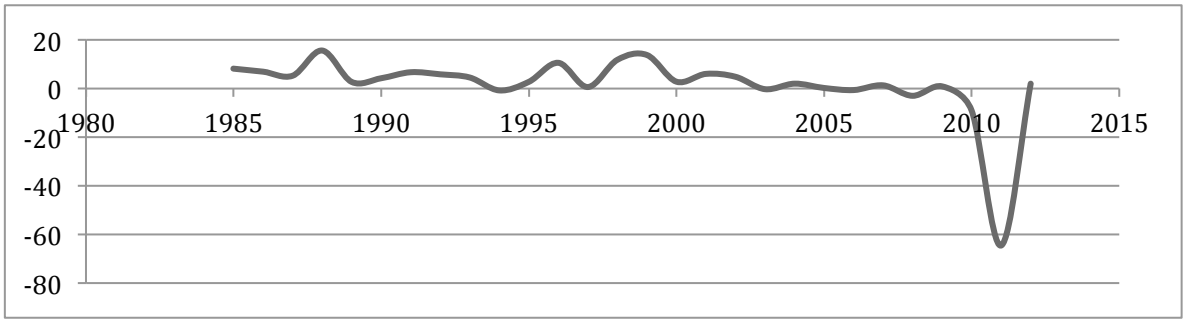
I will do this by running two regressions.

Tanzania premiums analysis

The objective is to highlihght whether the time series of cotton premiums for Tanzania, shows some trend or structural break that is attributable to the liberalization of the cotton sector of the country. In order to test the Tanzania premium time series I run an Ordinary Least Squares (OLS) regression.

However, an initial plot of the Tanzania "crude data" time series shows there is notably an outlying data point (a particularly low premium) in 2011 (Figure 3).

Figure 3: Cotton premium time series for Tanzania (calculated from an avrage of the two types of cotton SG1 and RG1 produced in the country)



The outlier is attributable to difficulties the sector suffered in the 2010/11 cotton campaign. Therefore, in order for results not to be biased by the outlying data, I introduce a dummy variable for 2011.

In order to test for a change in the contingent trend I introduce another dummy variable, i.e. DB_t which is zero for years before liberalization (i.e. before 1995) and 1 after liberalization of the sector has taken place (after 1995).

I thus tested

$$P\_\tan_t = \beta_0 + \beta_1 * year_t + \beta_2 * D2011_t + \beta_3 * DB_t + \beta_4 * DB_t * Year_t + u_t$$

where

P_tan_t is the premium for Tanzania cotton at time t, the explained (or dependent) variable

$Year$ is the explanatory (or independent) variable

$D2011_t = 1$ for t=2011 and 0 otherwise

$DB_t = 0$ for t<1995 and 1 for t≥1995 otherwise

u_t is the error term

The hypothesis I want to test is that liberalization has a significant effect on the Tanzania premium time series. The hypotheses are thus H_0 that there is no effect on the time series, and H_1 that there is a structural break instead.

H_0 : $\beta_{DB*Y} = 0$

H_1 : $\beta_{DB*Y} \neq 0$

Tanzania Results

Dependent Variable- Tanzania Premiums

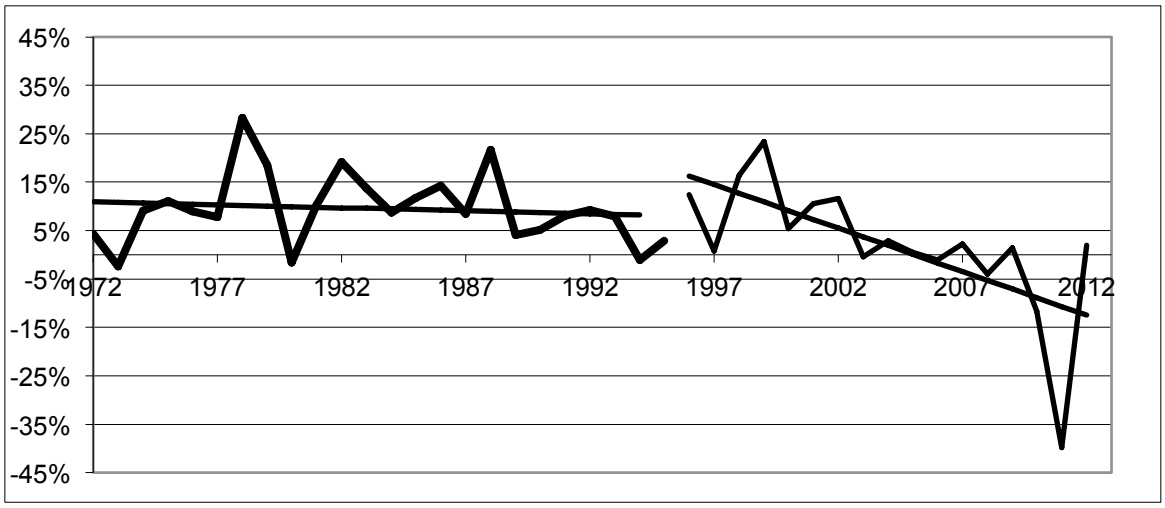
	Constant	Y (years)	D2011 (Dummy Variable for 2011)	DB (Intercept Dummy Variable for Change in Trend)	DB*Y (Slope Dummy Variable for Change in Trend)
Coefficient	10.5141 (3.1162)***	-0.0594 (0.2272)	-36.6601 (7.9439)***	24.8044 (11.7989)**	-0.9040 (0.4179)**

Adj Coeff of determination	56.02%
Number of observations	41

Notes: Standard errors in brackets. *Significant at 10% level. **Significant at 5% level. ***Significant at 1% level. Homoskedasticity has been tested for with Breusch –Pagan test (22.868%); non-normality has been tested for with Jarque Bera (37.034%); and serial autocorrelation has been tested for with Durbin-Watson (1.8127)

Results for the OLS regression for the Tanzania time series, show that the $D2011_t$ is significant (p valule=0.037) and the dummy was thus due. Notably the slope dummy DB*Y, where DB is zero before the liberalization year (1995) and 1 after that; is negative and significant. I can therefore reject H_0 and confirm there is a change in the slope which takes place in the liberalization year (1995/96) after which the slope parametre is negative, thus expressing a downward trend thereon as can be seen by visual inspection from figure 3.

Figure 3. Tanzania "percentage premiums data" time series plot showing structural break after cotton sector liberalization year (1995)



The econometric analysis of the data on Tanzania confirms a deterioration in premiums and

thus in the quality performance of exported cotton lint. Among causes reported by the TCB is that in the competitive system, grading has disappeared at the first point of purchase. As a consequence different grades are purchased and ginned together. In addition, ginners purchase seed cotton regardless of quality giving priority to volume in the attempt to avoid overcapacity. Following liberalization, there has also been a collapse in input provision and consequent mixing of seed varieties with subsequent losses in terms of lint quality. Actually, the proportion of upper grade cotton on total production fell from forty-five percent in the early nineties, to a low of seventeen percent in 1994/95 after liberalization.

Tanzanian cotton now has the reputation of being among the most seriously contaminated origins in the world as confirmed by ITMF surveys (2011; already considered seriously contamined in 2001, 2003, 2005, 2007, 2009 surveys). In addition, non fulfillments of contracts eventually lead to blacklisting of some local cotton companies by the International Cotton Association in Liverpool which to a great extent tarnished the image of Tanzanian Cotton Industry to the world cotton business family. The combined effects have resulted in the suffering of the reputation of Tanzanian cotton, with a consequent shift in exports to a lower segment of the market (Éstur, 2008).

Tanzanian cotton is also characterized by low productivity with yield level standing at an average of 750kg per hectare while the existing potential is of over 2,500kg per hectare. The TCB giustifies this with low utilization of inputs due to lack of credit at the disposal of farmers. Contract-farming has been tested for some years in specific cotton growing areas and the intention (TCB) is to extend the programme since it has proven succesful.

The time series for Tanzania shows an outlying data point (particularly low premium) in 2011 which is attributable to difficulties the sector suffered in the 2010/11 cotton campaign. Cotton output drastically dropped to 163,517 tons from 267,004 tons of seed cotton produced in the preceding 2009/2010 marketing season, a thirty-nine percent decline.

Underlying reasons go from the failure of the Voucher-Input system, that resulted in the total failure on provision of inputs, especially insecticides to farmers; to localized droughts and more than average rainfall in other areas instead. Eventually, ginners were not able to fulfill their contractual obligation of supplying bales to external buyers. In addition, cotton resulted seriously contamined: as reported by ITMF, cotton from Tanzania was 100 percent seriously contamined in 2010 (especially by organic matter -leaves, feathers, paper, leather and oily substances - grease and oil). Confirming the low value in the data, TCB reports that classification results for the year 2010/2011 indicate that only 47.5 percent of the cotton classed was of good grade (i.e GANY and above).

AFZ and AFZ/Tanzania premium analysis

In analyzing AFZ and AFZ/Tanzania time series I have used ARIMA methodology. ARIMA models are a very general class of forecasting models that include random walk models and more elaborate models whose forecasting equations may include lags of the differenced time series, auto-regressive or "AR" terms, and/or lags of the forecast errors, moving-average or "MA" terms. If the model succeeds in extracting all the "signal" from the data, there should be no pattern at all in the errors: the error in the next period should not be correlated with any previous errors, (the bars on the autocorrelation plot therefore should all be close to the zero line). Otherwise if the random walk model has significant positive autocorrelation in the residuals at lag 1, setting AR=1 is necessary, so-called ARIMA(1,1,0) model; or significant negative autocorrelation in the residuals at lag 1, setting MA=1 is needed , ARIMA (0,1,1) model; (autocorrelation lag=2 will give (2,1,0) etc.)

AFZ premiums analysis

The AFZ time series results from the average of premiums and discounts for Benin, Burkina Faso, Cameroon, Chad, Côte d'Ivoire and Mali; in percentages over the A Index. Among

these only Benin and Côte d'Ivoire have attempted a liberalization of the cotton sector; in both cases they soon after retrieved to former integrated design (zoning in case of Côte d'Ivoire). Mali, Chad and Cameroon have not even attempted a liberalization of cotton. As such, the time series fits the role of being representative of non-liberalized cotton sector quality performance. What I wish to find is that there is no negative trend (which would show a decrease in achieved premiums) in this time series.

Thus, the hypothesis I verify is whetеher there is some trend in the AFZ achieved premiums for cotton, i.e. in the AFZ cotton sector quality performance. My null hypothesis H_0 is that there is no change in the trend (meaning no growth and no decrease), while H_1 is that there is a change in the trend of achieved premiums. Controlling there is no autocorrelation in the residuals, i.e. no lags show to be significant, I have applied the constant mean forecasting model to the first difference of the series (i.e. putting the order of non-seasonal differencing to 1). Thus I get a (0,1,0) model with constant i.e. a random walk with drift model.

AFZ Results

Although visual inspection of figure 4 suggests there is a positive ternd in the AFZ premium time series, and the coefficient of the constant is actually positive (.745); the significance found is low (p=.25). Thus the data do not show a significant underlying trend (low significance of results show there is no evidence of a trend). However, this can be due to the small size of the tested sample. All in all, although on the one hand this does not allow me to claim there is a positive trend in the AFZ premium time series, it does on the other hand allow to say there is –notably- no negative trend and thus that there is no negative trend in the AFZ cotton sector performance (which has remained vertically integrated and statal).

The estimation sample is: 1984 – 2012; percentage differences time series

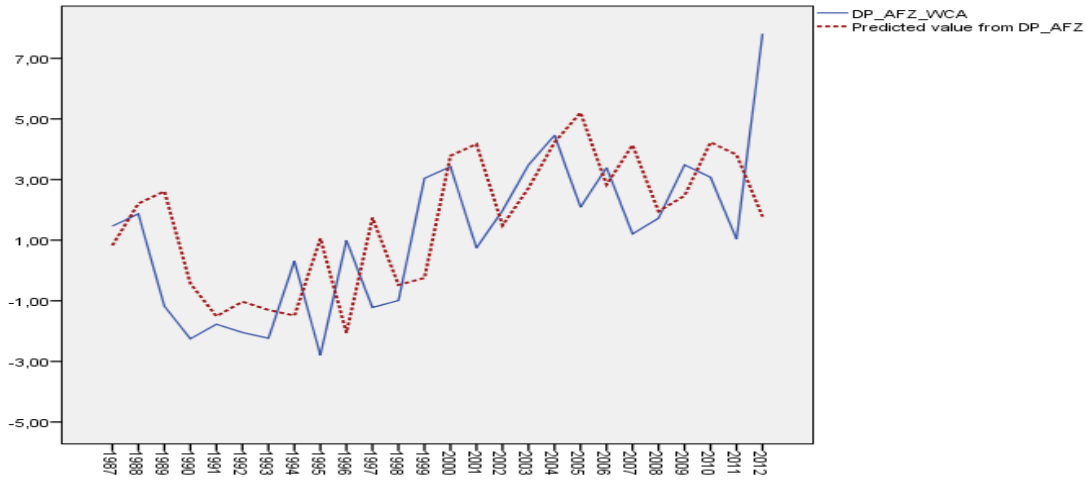
AFZ Model Summary AR (0,1,0)

Fit Statistic	Mean
MAE	2,186

	Estimate	t	Sig.
Constant	,745 (,633)	1,178	,250
Difference	1		

Notes: Standard errors in brackets.

Figure 4. AFZ percentage premiums time series, ARIMA plot



The non-negative cotton sector performance can be explained by a number of reasons. To begin with, all countries considered in the AFZ group have improved in terms of staple length living up to the demand of spinners; Burkina Faso for example has increased its proportion of cotton classed 1-1/8" rising from twenty percent in 1995/96 to eighty percent in 2005/06. In addition, almost all countries are virtuous in terms of contamination as confirmed by ITMF surveys where Cameroon (except in 2003) and Chad have been listed among the least contamined cotton origins from 2000; followed by Benin (except in 2003 and 2009.); and Côte d'Ivoire (except 2007 and 2011). However, contrarily to the rest of the group, Burkina Faso and Mali have always been listed among the most contamined cottons insetad. Nevertheless, Mali eventually improved and was listed among least contamined

cottons in the 2011 ITMF survey. Notably, the type of contamination affecting cotton from the AFZ reflects the problem of providing farmers with inadequate picking bags made of polypropylene which is by now known to be a problematic contaminant in cotton. However, it also means that other contaminants are taken care for by producers who cannot avoid ppp contamination instead. The ppp contamination problem can actually only be avoided by using cotton picking bags and wraps for cotton bales. One step in this direction has been taken by adopting coloured ppp picking bags (in place of white ones) so that contingent contaminants can be detected more easily.

Overall the quality of the AFZ cotton is considered good but not reliably so. The quality performance of cotton from Benin, which has remained regulated and carried out by the government, is for example reported as irregular by Éstur (2008). Nevertheless it has fetched an average premium of 2.41 cents a pound almost every year from 2003 to 2012 (except 2010 when a discount of 14,11 cents per pound is reported the biggest discount among the AFZ countries in that year; if we consider this value then the average premium falls to 0.57 cents per pound, the least among the AFZ countries) (Cotlook Ltd.). It is reported to be the world's sixth least contamined cotton origin in the 2011 ITMF survey. Burkina Faso is considered to have improved significantly cotton quality along the enormous growth in production; it also progressed in reducing contamination and in 2009 was listed among least contamined origins by ITMF. However, in 2011 Burkina Faso was listed back among most contamined origins. Grading which is implemented manually and visually by the major ginning company (SOFITEX) although in one location, is still considered lax and the proportion of seed cotton classed as first grade is higher than it should be (Éstur finds underlying reasons in inspectors who prefer avoiding conflict or personally take advantage from upgrading the seed cotton). From 2003 cotton from Burkina Faso has been fetching an average premium of 2.81 cents per pound., Mali is the origin with the worse quality performance, fetching an average premium of 1.95 cents per pound from 2003 (this is if we

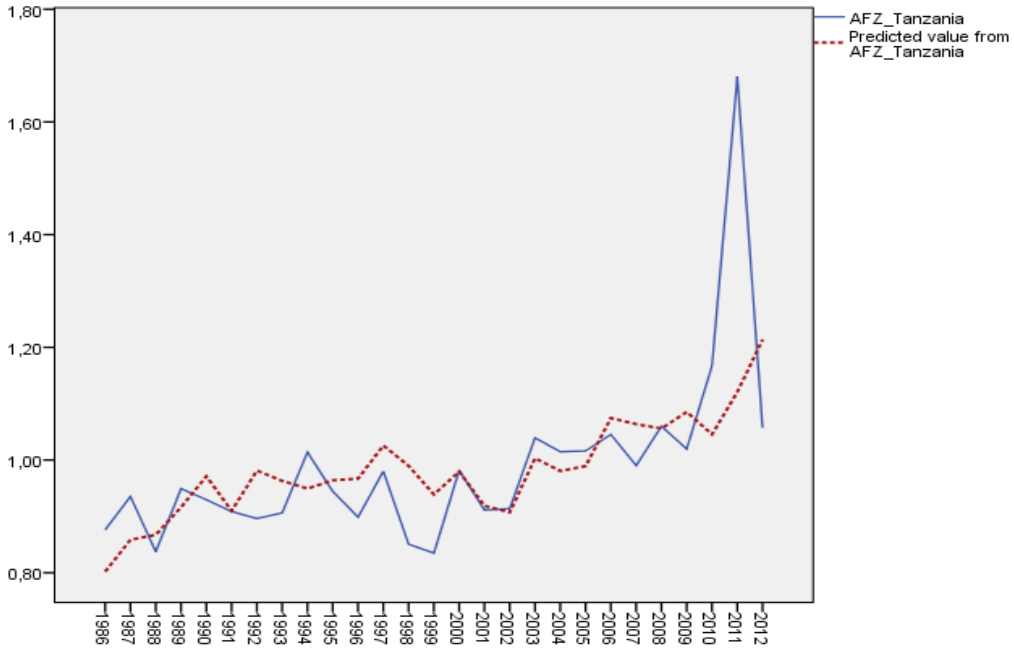
do not consider the heavy discounts suffered by cotton from Benin and from Cote d'Ivoire in 2010). Actually grading of cotton in Mali is described as very lax and contamination as serious, as confirmed by the fact that its cotton is listed among most contamined in every ITMF survey from 2001 to 2009. An additional concern comes from consistency problems often encountered as a consequence to that grading is implemented in three different locations although all national lint production is classified (manually and visually) by CMDT. Grading was considered stricter when it was based on lint classification results. Contaminants of cotton from Mali are varied but most often reported are plastic materials. This is consequent to the widespread use of plastic materials in the picking, storing, transporting, and baling of cotton which sums to other contamination. An improvement in this direction has been the expanded use of colored plastic materials, which are easier to detect visually than white plastic materials. In 2011 ITMF survey, Mali was listed as fifteenth least contamined origin indicating a strong improvement. Like much of WCA, has increased its average staple length and the proportion of cotton classed 1-1/8" was 96 percent in 2005/06.

Cameroon and Chad are the best quality performers in the AFZ group. Chad has been fetching the highest premiums over the A Index every year except for 2009 with the highest premium in 2010, 42.95 cents per pound, and the highest average premium (10.47 cents per pound). Cameroon is the second best quality performer with an average 4.38 premium from 2003. This is in line with the stricter grading implemented in Chad and Cameroon and of it being consistent with lint grading. In addition, in Cameroon micronaire tests for each bale are carried out unlike most other African countries. However, Cameroon cotton was very affected by stickiness in the early 1990s and suffered discounts prices were sharply discounted. In response to this, SODECOTON developed a quality improvement strategy which has been paying off. As stickiness mostly comes from late harvest, incentives for early picking were offered to farmers which have led to stickiness virtually disappearing. Yet, the

reputation of stickiness is persisting among spinners (Éstur), which confirms that it is difficult to regain a good reputation once it has been lost.

AFZ/Tanzania premium analysis

Figure 5. AFZ/Tanzania premiums time series comparison, using ARIMA



Nafter having tested the Tanzania and AFZ premiums time series separately, I want to test the ratio AFZ/Tanzania premiums time series to see whether the numerator (AFZ premium time series) and the denominator (Tanzania premium time series) diverge, i.e. to see whether the performances of their cotton secors diverge since this is not clear as a consequence of the blurry (i.e. not clearly a positive trend is found) results in the single analysis for the AFZ premium time series. My null hypothesis H_0 is that there is no trend (i.e. no divergence in the two time series); H_1 is that there is a positive trend in the ratio (i.e. that there is divergence in their performance).

AFZ/Tanzania Results

AFZ_Tanzania
ARIMA (2,1,0) Model Parameters

Fit Statistic	Mean
MAE	,073

		Estimate
Constant		0,017* (0,011)
AR	Lag 1	-0,792*** (0,216)
	Lag 2	-0,695** (0,341)
Difference	1	

Notes: Standard errors in brackets. *Significant at 10% level. **Significant at 5% level. ***Significant at 1% level.

The test of the ratio highlights that the two time series move in different directions and I can reject the null hypothesis. In the Afz/Tanzania analysis the model identifies an average upward trend (in ARIMA models the negative sign means there is a positive trend) which can also be detected by visual inspection of figure 4. The meaning of this is the better performance of the AFZ group of countries compared to Tanzania. We can sum this to the previous AFZ analysis results which were a non-negative[92] trend in the premiums time series. The divergence is particularly evident in 2011 due to the particularly bad year for cotton in Tanzania. However, an outlying data point in 2011 is also present in the AFZ group where Benin and Cote d'Ivoire suffered severe discounts in that year (-14,11 and -12,61 cents per pound respectively), but the effects of the discounts are ruled out by the high (42.95 cents per pound) premium fetched that same year by Chad.

Tanzania's bad performanace is exacerbated by the fact that half of its cotton is roller ginned and thus can ceteris paribus fetch a premium. Compared to saw ginning, roller ginning has a higher ginning out-turn, and produces fibre that is longer and of a better quality, and consequently commands a premium of up to 2 cents per pound, but the process is only suitable for ELS and medium-long upland varieties. Cotton from AFZ instead, has a

[92] the sign of the coefficient is actually positive, but I cannot say there is a positive trend because significance is low; however this could be due to the small size of the sample

disdvantage in this sense since it is exclusively saw ginned (although staple length would be enough for it to be roller ginned). Notably, expectations of better performance in non-liberalized cotton sectors are confirmed.

6 Final Remarks

Liberalization is considered here not as solely a privatization of the sector but as a complete opening of the sector to competition. The distinction is due since there are countries which have privatised succesfully their cotton sector as in the case of Zimbabwe which was listed among least contamined cotton in 2009 (ITMF); though remining in the realm of duopsony or oligopsony at best.

As mentioned a liberalization of the cotton sector is often accused of failure due to the subsequent collapse of input credit provision. However, liberalization causes a more extended dismemberment of the cotton value chain particularly affecting information flow to producers which is needed to incentivize careful production and post-production management. In addition, increased competition makes quantity prevail on quality when ginners purchase cotton in the attempt to avoid overcapacity, with a consequent detrimental effect on quality.

Contrarily to other crop sectors that have also been undergoing liberalisation in SSA; in cotton low quality gives origin to detrimental consequences for the sector survival. A first short term, direct negative impact on the premium resulting in a lower price received by producers and processors consequently affecting production in terms of quantity. A second, long term impact on country reputation from which premiums and discounts also partly

derive, and that is much considered by international merchants when deciding where to purchase cotton lint and at what price. Moreover, it is aknowledged that it is easier to destroy this kind of good reputation than to establish it, let alone re-gain it.

Conclusions

The purpose of this dissertation is to contribute to the ongoing debate on the liberalization of SSA cotton sectors.

The declared rationale for a liberalization of the SSA cotton sector is that the cotton parastatals are claimed to be an unsustainable burden on the relative country budget and the banking system, absorbing scarce public resources and jeopardizing national financial budgets. Moreover, in the monopolistic cotton systems, farmers are claimed to receive a price for cotton that is lower than the world price[93]. The general view is that the state monopolies, on average, function poorly and furthermore they impede private sector development which would instead enhance efficiency and higher producer prices. Thus, the objectives of IFI when promoting a liberalization of the SSA cotton sector were:

- increase producer prices so as to help farmers exit poverty
- enhance efficiency in the industry (by increasing competition)
- eventually increase production in response to the higher producer prices and considered that SSA cotton has a comparative advantage in the production of cotton

Consequently, reforms of the cotton sector have been implemented in almost all of SSA cotton producing countries in the nineteen nineties. Although reforms have resulted in a raise in the share of producer price on the f.o.b. export price, and efficiency has grown in the processing industry; they are nonetheless thought to have fallen short of expectations in some cases causing a depletion of the sector. In literature, the failure of reforms is generally primarily ascribed to the collapse of the input provision system consequent to the failure in coordination in competitive systems (which goes to the detriment of certain stages in the cotton value chain) as compared to a vertically integrated organisation. This dissertation

[93] This is controversial because cotton system in SSA are accused of burdening the state budget by guaranteeing a panseasonal price for cotton which can be higher than the world price it cannot anticipate.

seeks to widen the realm of causes of the disappointing performance of liberalization in the SSA cotton sector lingering on critical features in the cotton production value chain other than input provision.

The first chapter gives a snap shot of the SSA cotton sector through a value chain analysis that fleshes out the criticalities and shortcomings of the sector, thus providing a rationale for future intervention. Whereas the value chain usually considered in literature when dealing with cotton in SSA generally ends with ginning, here the analysis comprises the textile and garment manufacturing stages – from cotton to garment value chain. The analysis of the shortcomings of the latter part of the value chain allow to clear why the grand part of the value added is not achieved in the production region, thus also giving a rationale to future investments in specific branches. Attention is also drawn on the fact that although investing in the fibre-to-garment part of the chain is critical, it is more appropriate to invest in some facilities than others (e.g. preferably in knitting than in other types of weaving machines; and for example it is not recommendable to invest in dyeing plants because of the structural need of water in such process, making it inadequate to most SSA countries). The chapter further identifies structural shortcomings outside the cotton sector that undermine the smooth operating of plants, affecting efficiency of production and most critically, future investment. Overall the picture conveys the idea of a sector that has yet to exploit its full potential with multiple fragilities consequent to shortcomings identified inside the value chain and others that are outside the cotton value chain but with which the cotton sector needs to deal.

In chapter two the given bird's eye view of the dynamics of the sector draws me to identify a "design sensitive" feature of the SSA cotton sector other than input provision, which in my view have a say in reform outcomes, i.e. quality performance. Notably, the comparison drawn with other successful SSA cash crops, which are considered to have succesfully reformed their previuosly vertically integrated sectors, reinforces the intuition on the criticality of quality performance specifically to the cotton sector.

In chapter 3, R&D in cotton is considered; a subject seldom tackled when considering reforms of the sector. However, much of the outcomes of production (variety determines fibre potential and yields for example) depend on this stage of the value chain. As explained in the chapter, R&D in cotton in SSA is mainly public and is funded by governments although these rely in grand part on donor funding; this makes it vulnerable to decisions taken outside the sector and outside the country. There is very little data available related to R&D in cotton and it is not possible to identify a trend in expenditure specifically for research in cotton related to the undertaking of reforms of the sector. However, the available data shows that countries with vertically integrated cotton sectors have a greater proportion of fte researchers related to the total number of researchers in agriculture, confirming the commitment of governments of those countries to cotton and the critcality of this stage to the performance of the sector.

Finally in chapter 4, I test if quality performance is sensitive to the liberalization process as I suggest in this dissertation. I firstly explain where the demand for quality originates, as it distinguishes cotton from other SSA cash crops, which have a declining quality demand instead and have contrarily to cotton been succesfully reformed (chapter 2). Eventually an econometric analysis is drawn so as to suggest if liberalization has affected the quality performance of the SSA cotton sector. Quality performance of the cotton sector can be best measured by the average premiums or discounts achieved by exported cotton; thus, I draw an analysis of average premium or discounts time series for a liberalized cotton sector, for a non-liberalized cotton sector and finally their comparison.

The contribution of this thesis

From an analytical point of view, a part from explaining the reasons why the grand part of the value added in the cotton value chain is not achieved in the producing countries; this research sheds new light, in turn giving the right weight to the neglected feature of quality in

cotton; highlighting it is an outcome of concerted actions throughout the cotton value chain and particularly important in the determination of the price achieved on the world cotton market which is very competitive.

The intuition on quality is tested empirically to observe whether a liberalization of the sector has consequences on this feature. The data sample available is not very broad so conclusions need to be cautious. Nonetheless, the outcomes of tests show a negative trend in Tanzania's premium for cotton after 1995 (the year of the sector liberalization) while the test for a trend in the premiums calculated for the whole African Franc Zone shows a non−negative trend instead. Thus, considering the features of the cotton sector in SSA, reflections on the policy direction to be taken in the sector organisation, can in my opinion be attempted.

A few considerations first.

The cotton sector benefits of a comparable advantage of SSA in growing cotton (climate and low cost labour), and the sector is acknowledged to be critical (by IFI also) in the economics of SSA cotton-producing countries - at the country level it contributes to national economic growth, to employment, and is a source of revenue and foreign exchange; at the household level it involves the rural poor (the poorest among poor) and is consequently recognized as a means of fighting poverty, enabling smallholder farmers to access cash which contributes to household food security but also notably enables purchase of non-food goods (school and health). Furthermore, cotton is important not only for producers but also for those in associated activities: UNIDO states that millions of people in SSA derive their livelihood from the cotton sector.

However, the SSA cotton sector is acknowledged to be vulnerable in relation to the very competitive world cotton market, as a consequence to a number of reasons among which are the subsidies of major cotton producers to support their cotton sectors (the U.S. new doesn't show to have decreased its subsidies to the cotton sector –Farm Bill 2014; and China for

example); these have an acknowledged plummeting effect on the world cotton price which sums up to its general negative trend (not unusual for commodities in general).

The SSA cotton sector is further affected by the acknowledged macroeconomic vulnerability of the countries of this region (lack of rule of law, financial markets failure etc.).

Now, the criticality of the SSA cotton sector has brought, as mentioned, IFI to call for a liberalization; however, considering the outcomes to date, the real question should be whether the conditions for the sector to be succesfully liberalized are there or not. To find an answer we can draw inspiration from Kikeri et al. (1994) who list the pre-conditions for a succesful privatization. Kikeri et al. list the "country and economic conditions" due to be in place before privatization or liberalization of state owned enterprises (SoEs) are implemented. Notably, these are

"developed capital markets, competitive goods and services markets, and effective regulatory capacity".

Even more sticking to the SSA cotton debate, the author's statement that

"Privatizing SOEs that operate as monopolies is more complex and the regulatory capabilities of the country become a crucial factor."

moreover

"privatizing utilities and natural monopolies is most difficult in least developed countries, where institutional and regulatory capacities are weakest."

The author further adds that

"For low-income countries, a precondition for successful privatization is to create an enabling environment in which the private sector can effectively operate."

Among other conditions he mentions

"macroeconomic reforms, improving regulatory frameworks, strengthening the financial system, and improved governance."

Kikeri et al. (1994) recon that privatization is made difficult by problems of post-privatization regulation and competition policy as well as implementation and political constraints, thus not necessarily yielding the desirable outcomes.

Were this not sufficient, further inspiration for action in the design of the SSA cotton sector can be drawn from Mahoney's table "Predicting the Organisational Form of Vertical Control" (Appendix 1) where the non separability feature of cotton production in relation to quality is enough to give scope for a vertical integration, be it through a relational contract or a unified governance, as the author puts it.

These reflections actually give a rationale to the considerable experience of liberalization accumulated by SSA cotton sectors which has given disappointing outcomes whether it has been implemented in a big-bang fashion or a gradual fashion.

So what is to be pursued?

If on side it is true that a vertically integrated design of the sector has brought it to be an African success story, it is also undeniable that negative aspects of vertical integration have grounded rationale for liberalization intervention.

Zimbabwe's relatively succesful privatization of the cotton sector can be considered as a mile stone and be a rationale to reconsider the terms of liberalization from competition to privatization safe-guarding regional monopolies for example. However these are now in the hands of multinationals.

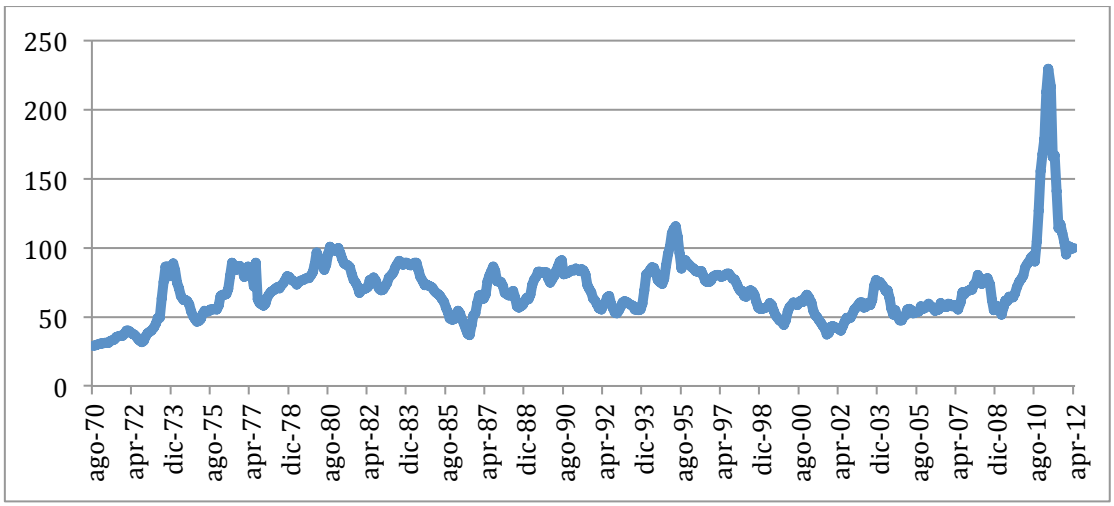
Furthermore, recognising the important role in sector coordination, farmers' cooperatives should be encouraged and sustained. Moreover, farmers cooperatives have the welcome quality of being reputation-sensitive, thus giving a rationale for the necessary extra effort for quality implementation among producers.

Concluding, in general I think inspiration can be drawn from List's "National System of Political Economy" a historical description of what developed countries have done to become what they are today, and more recently but in the same mood, Chang and his "Kicking Away the Ladder", who give a rationale to focus on the right time to implement a

liberalization (of the cotton sector), in line with outcomes on reflections with Mahoney and Kikeri et al. (1994).

Appendix 1

Figure A1. Cotlook A Index

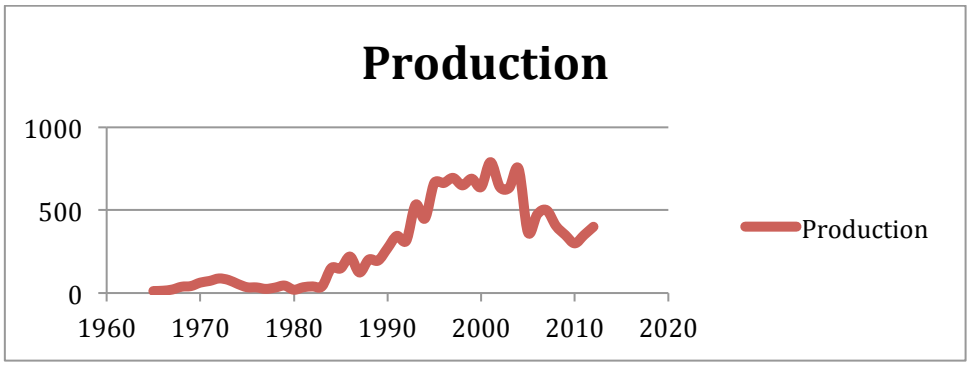


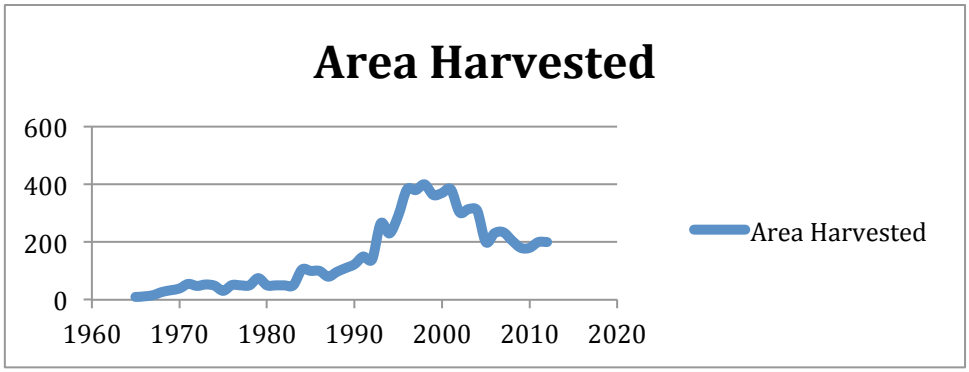
Source: ICAC

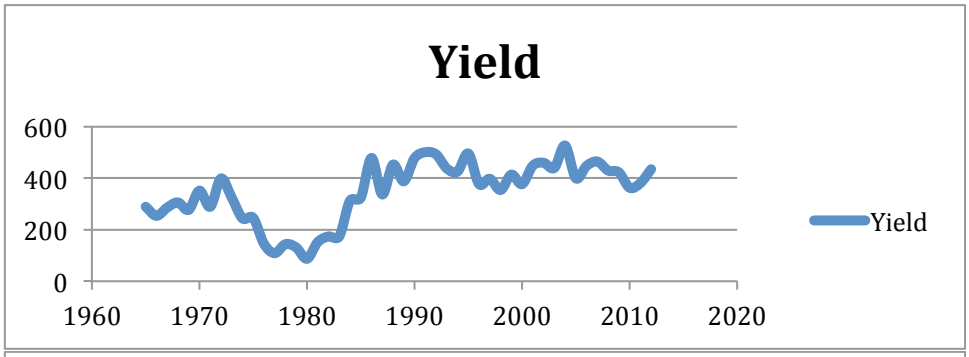
Cotton Country Figures

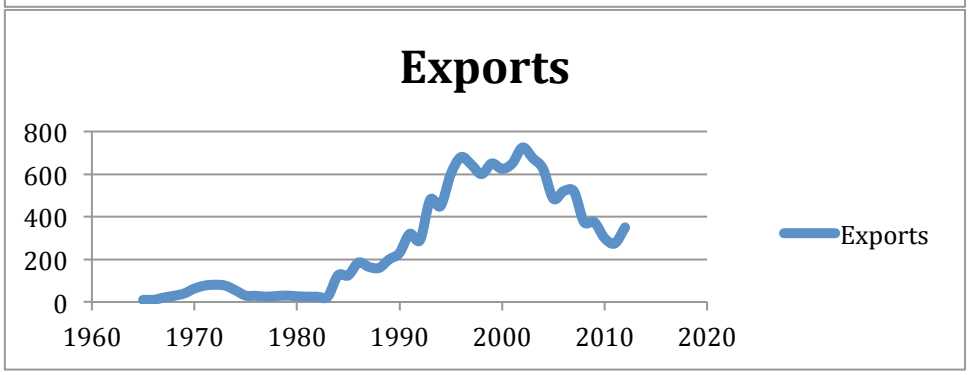
Source USDA
Production – 1000 480 lb. bales
Area Harvested – 1000 HA
Yield – Kg/Ha
Exports - 1000 480 lb. Bales

Figures A2. *Benin*









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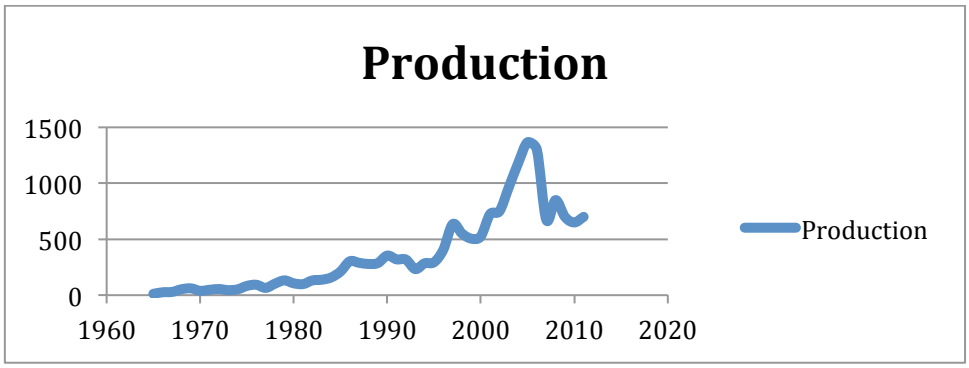

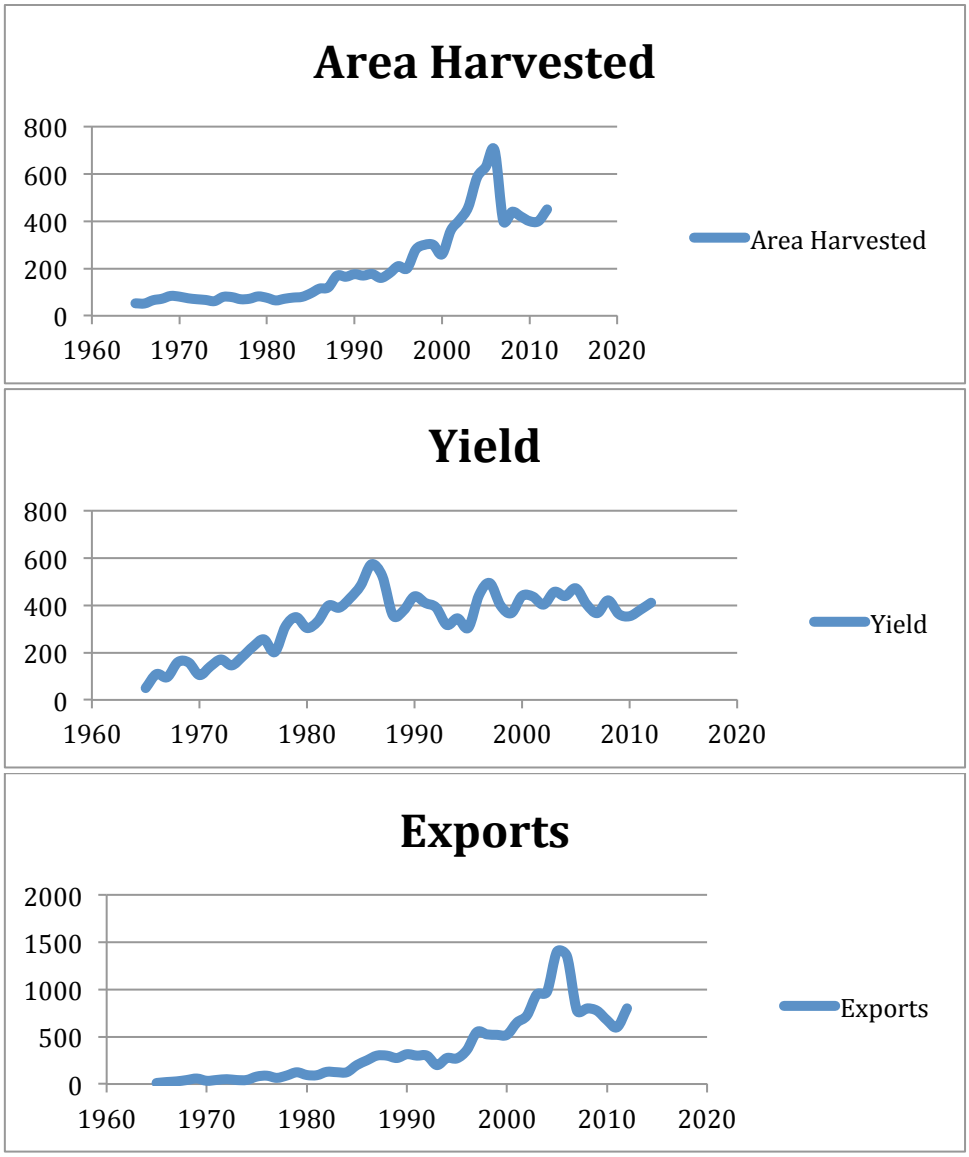

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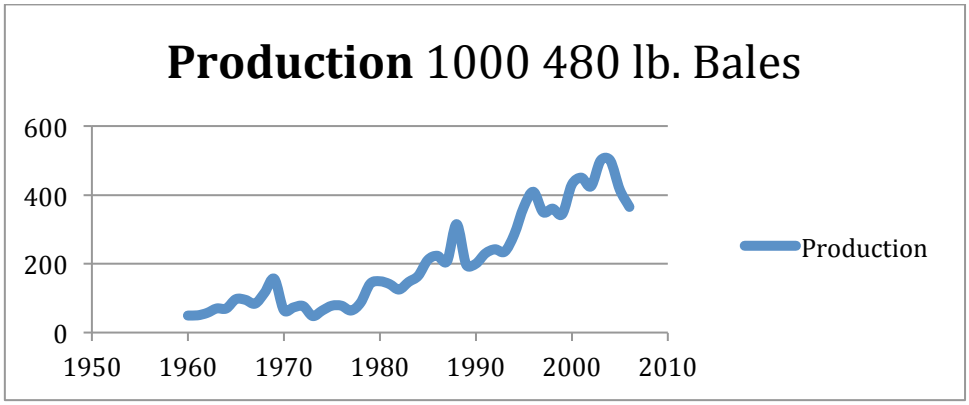

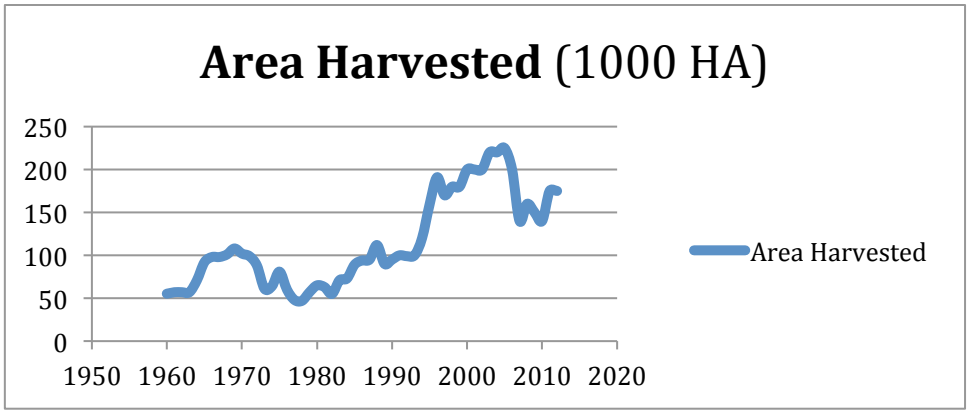

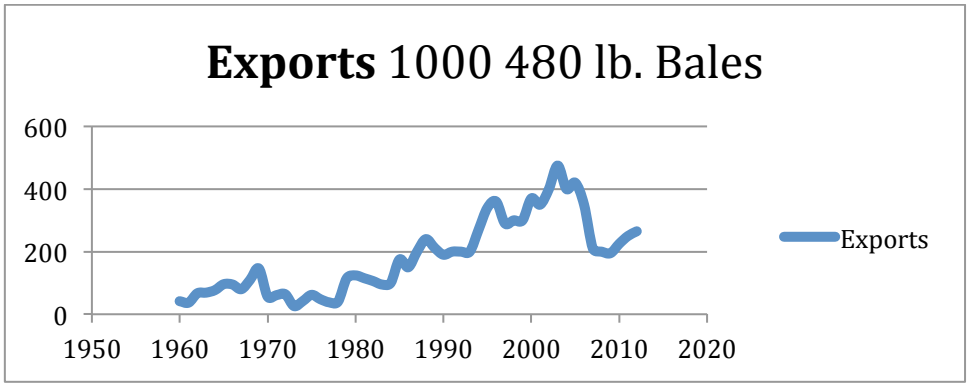

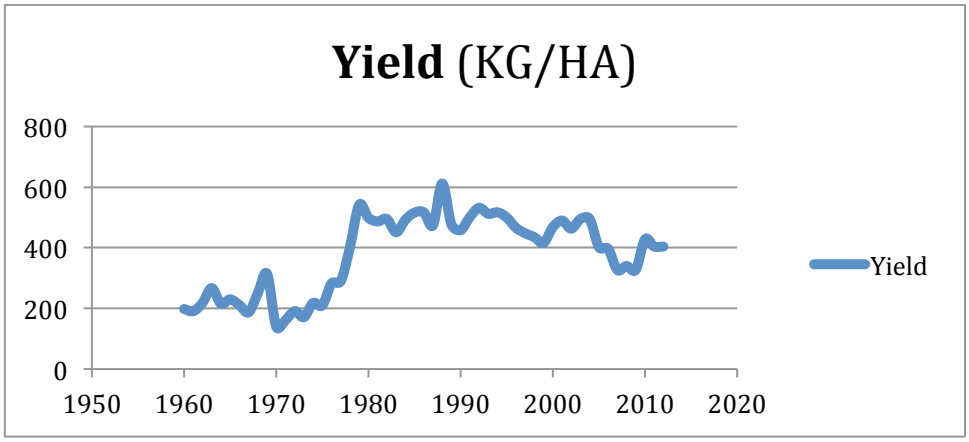

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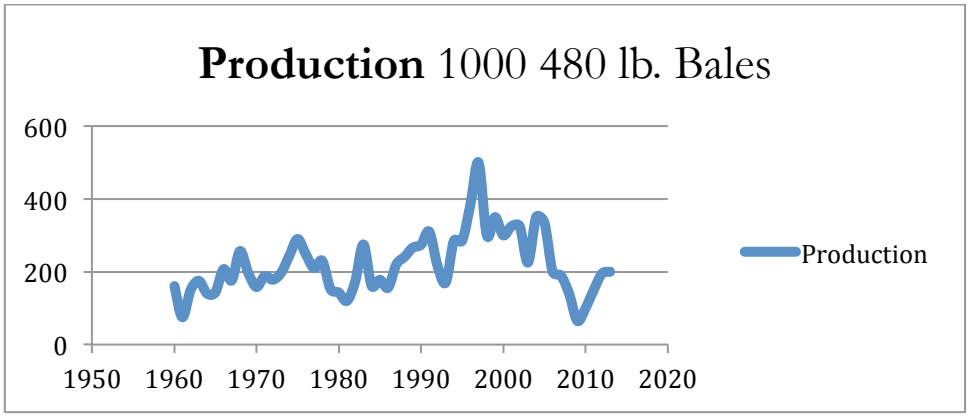

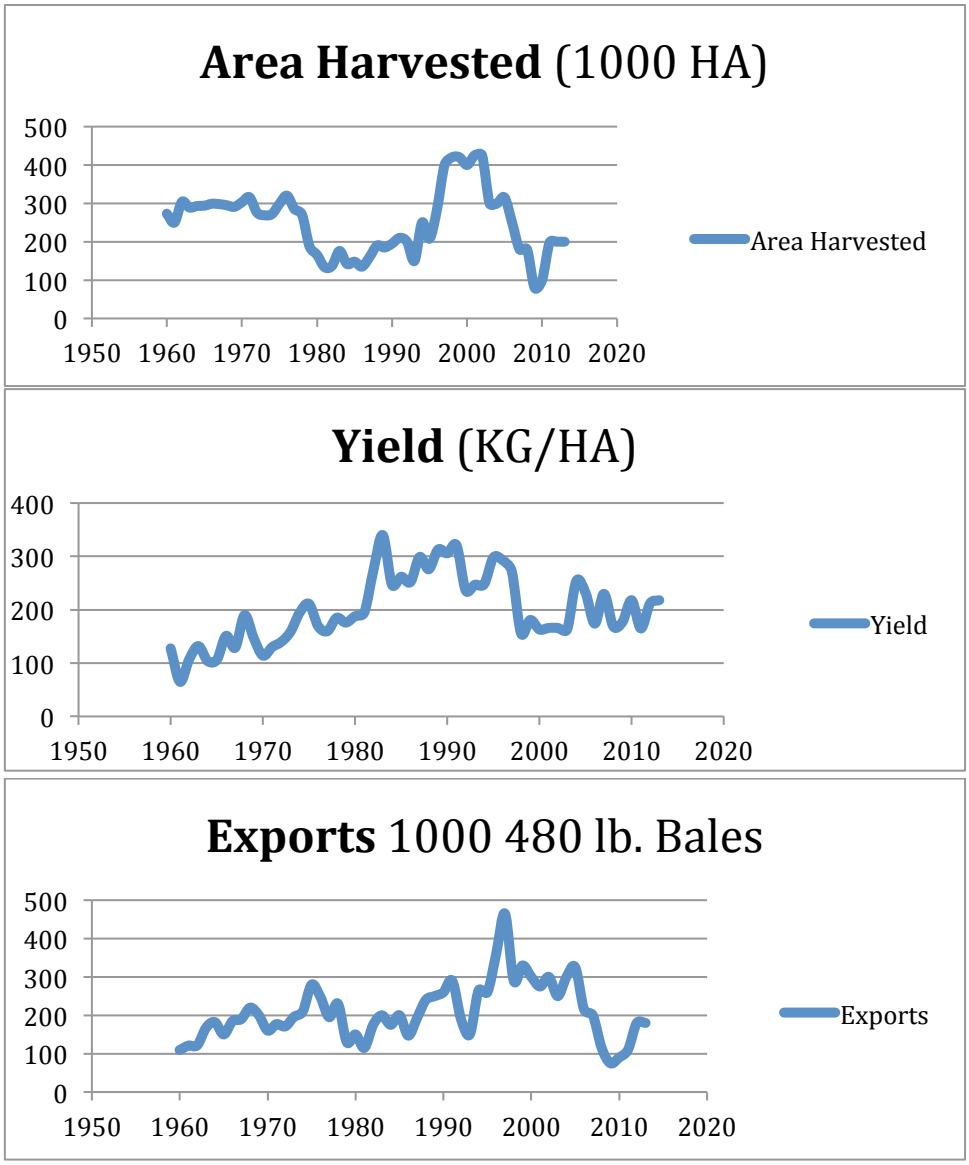

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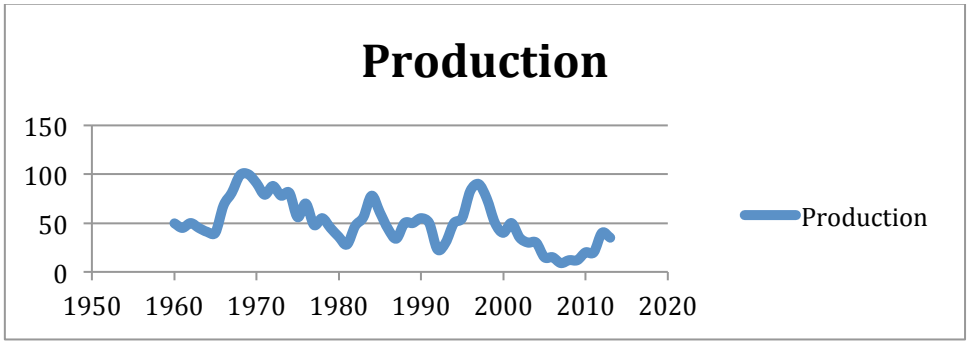

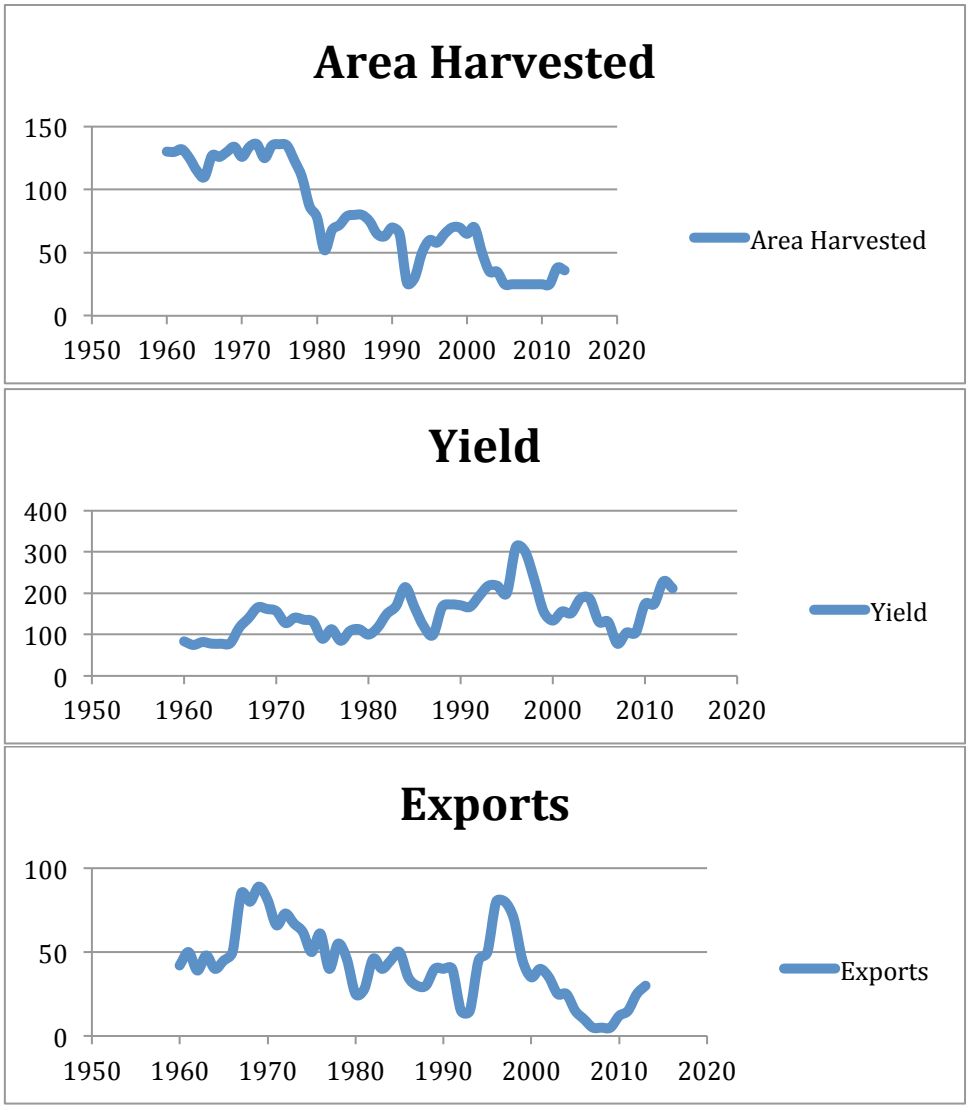

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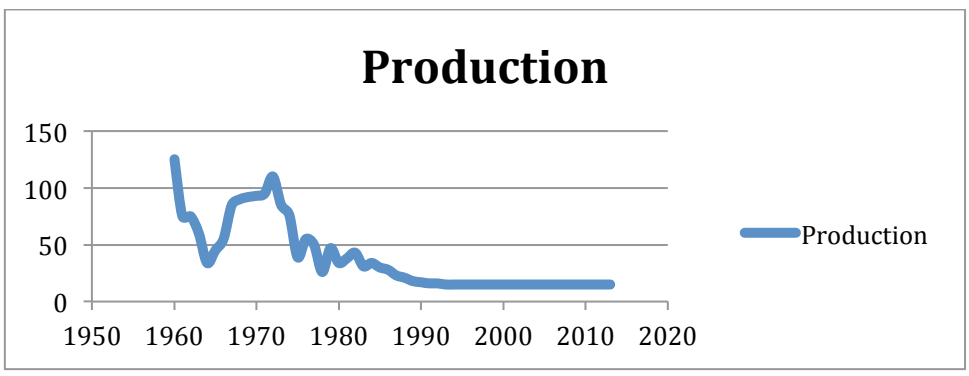

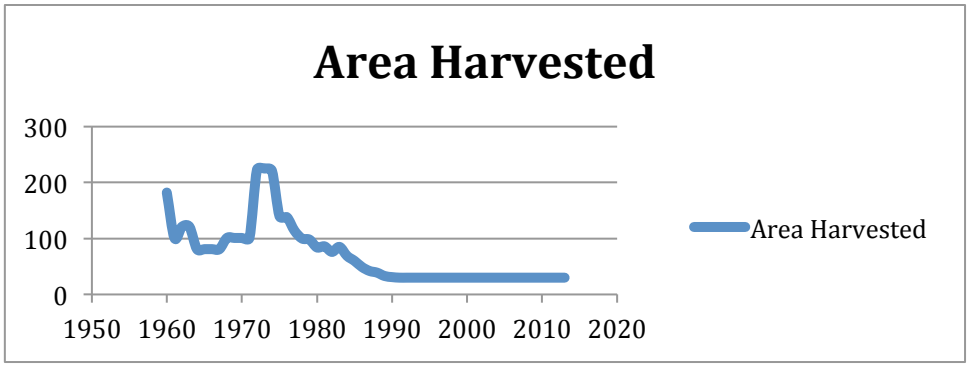

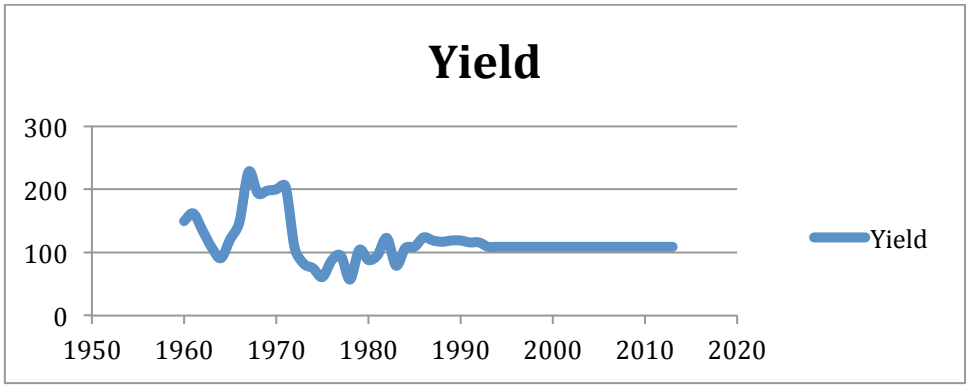

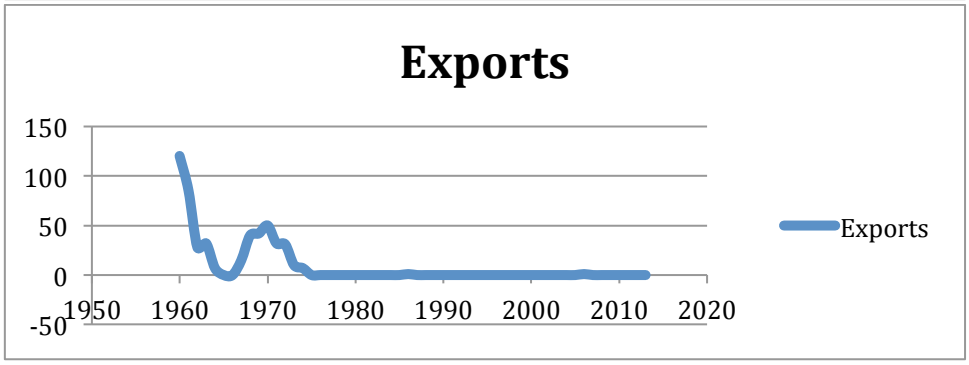

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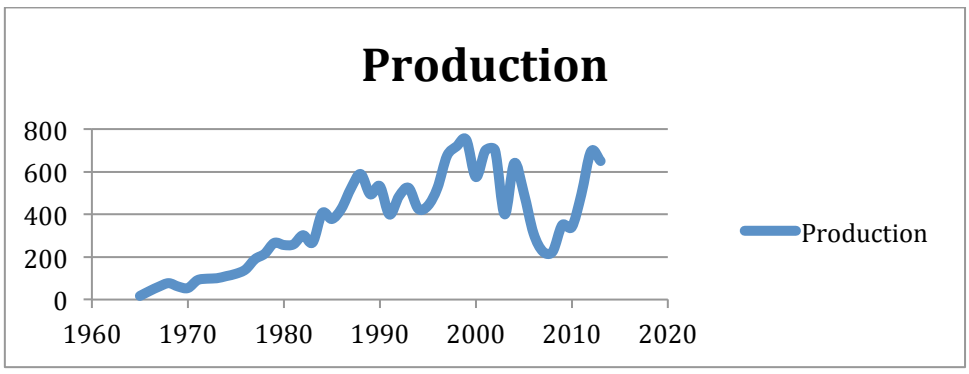

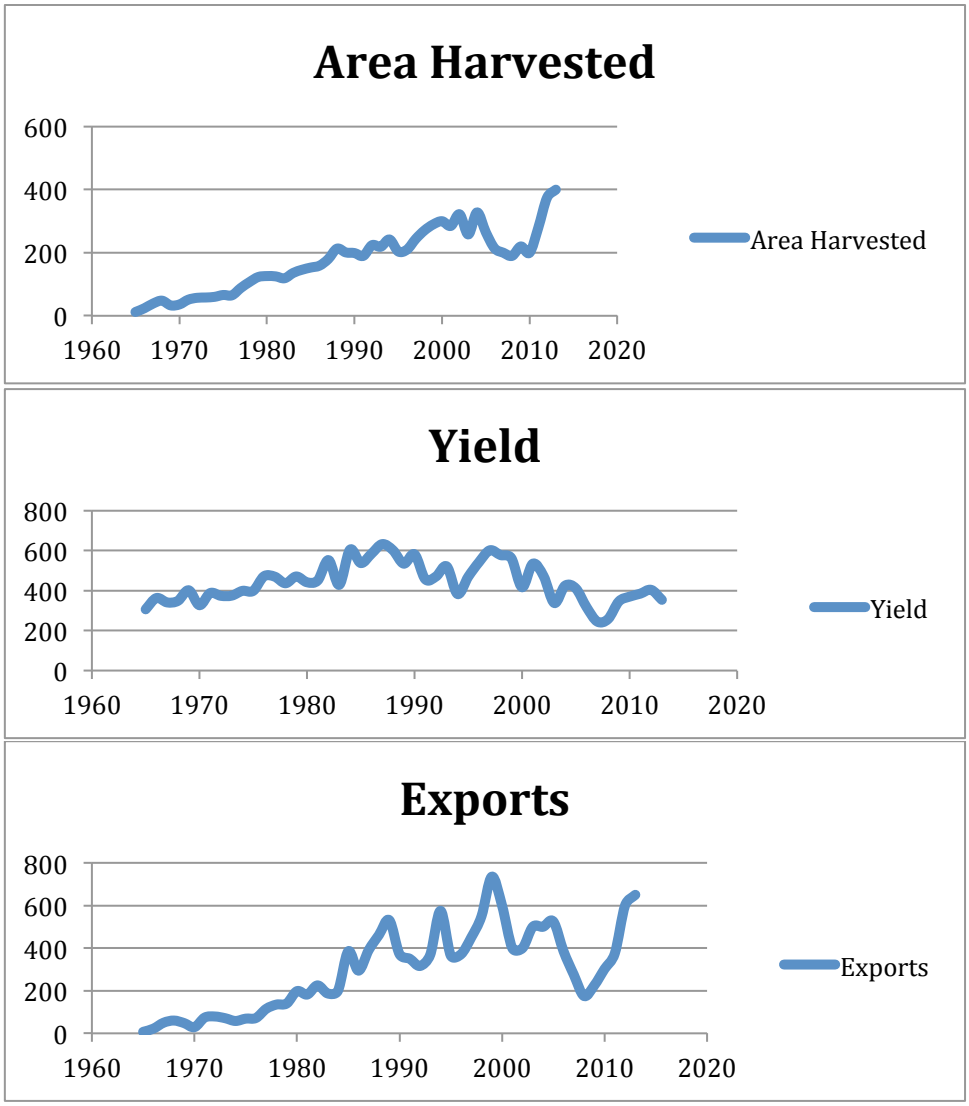

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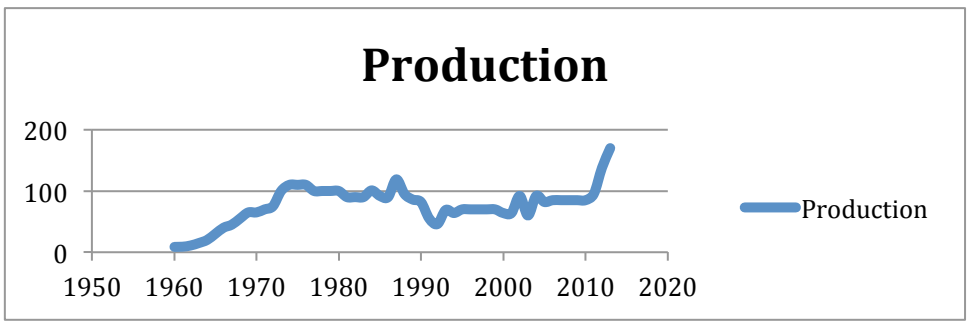

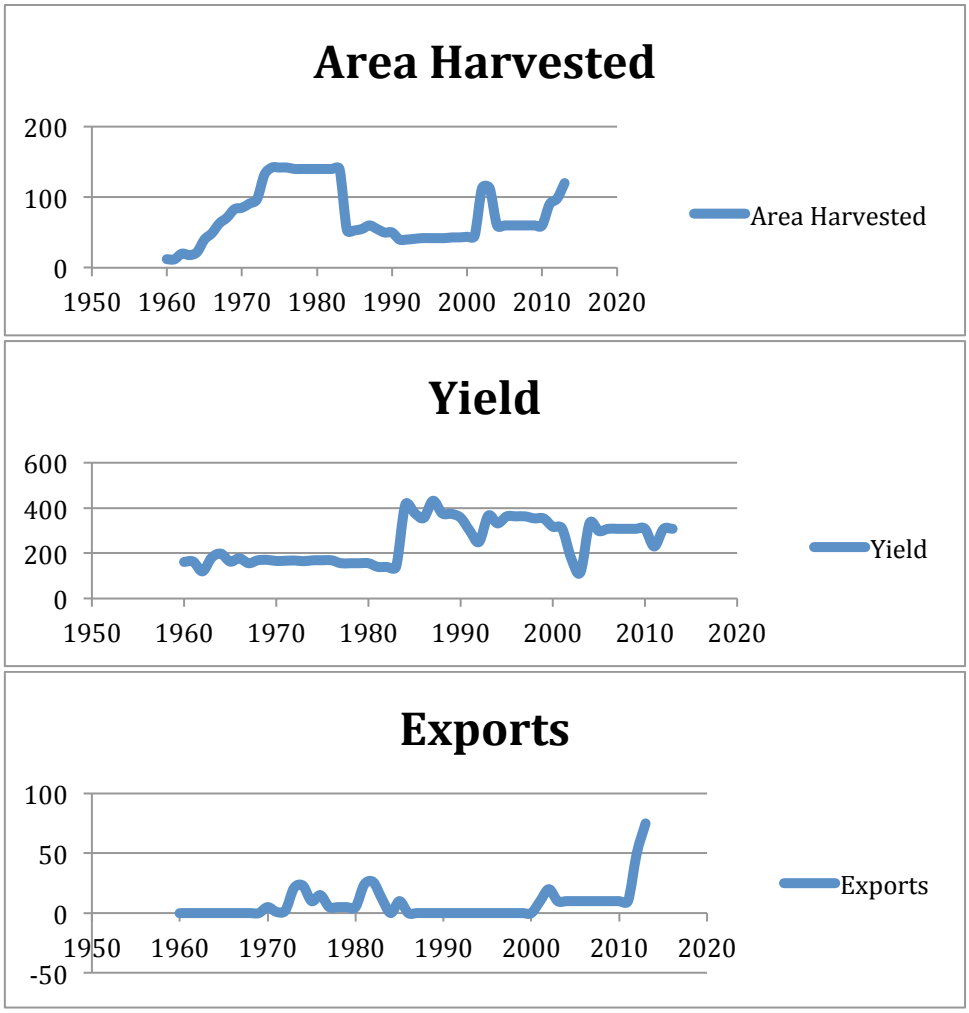

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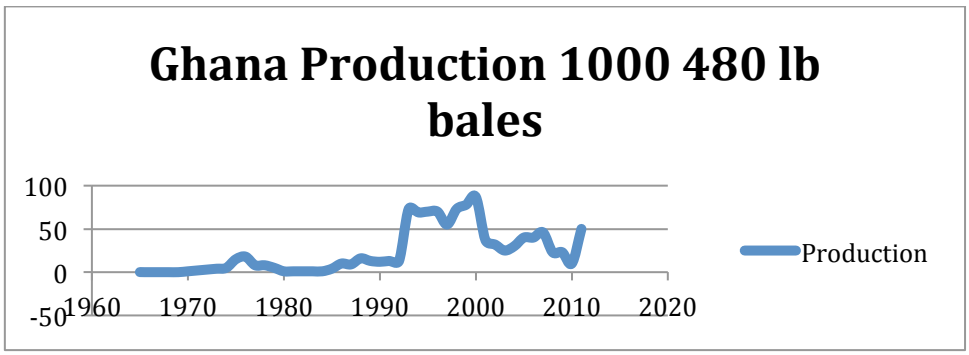

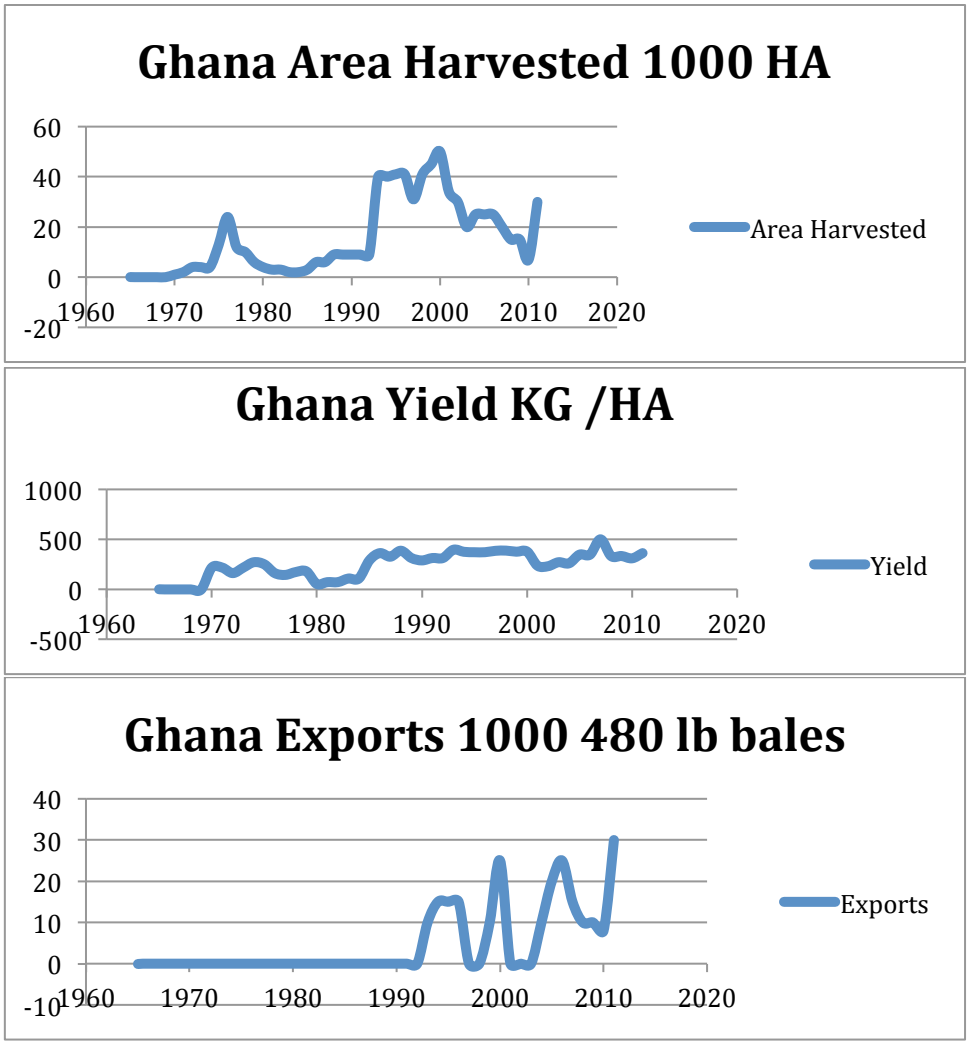

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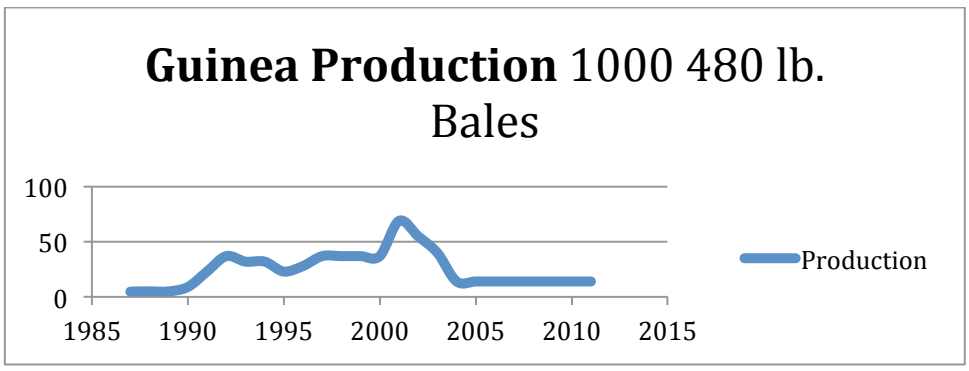

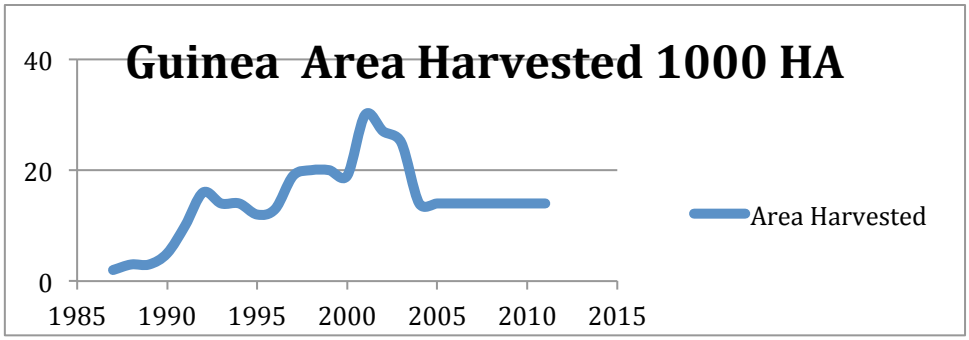

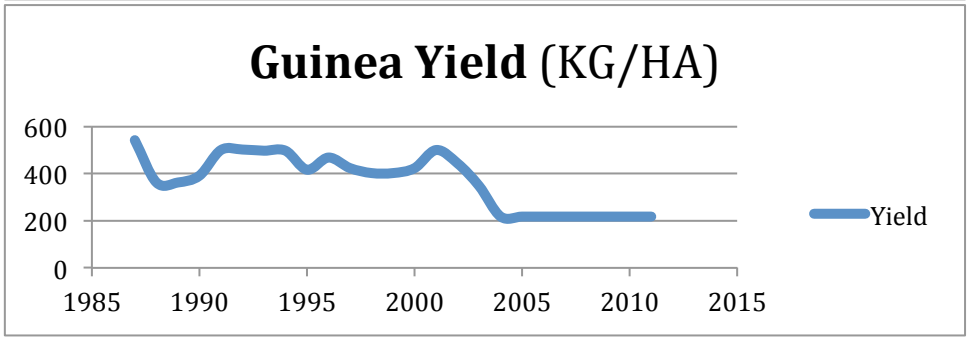

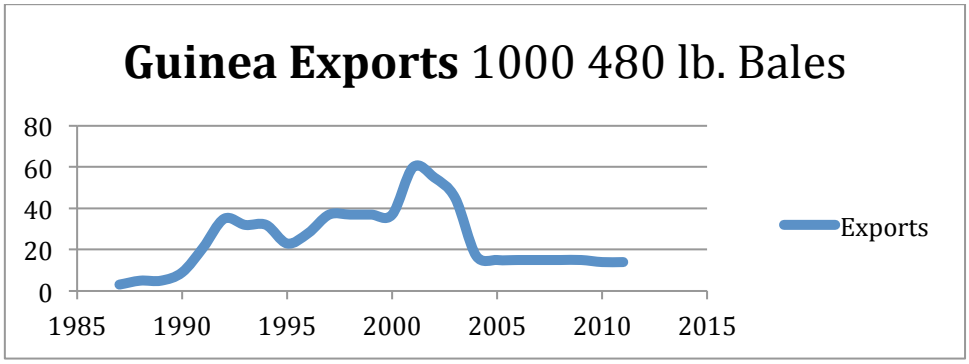

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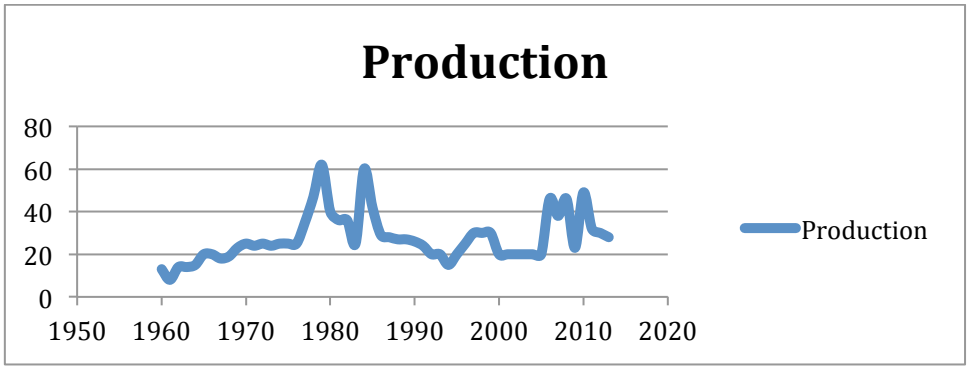

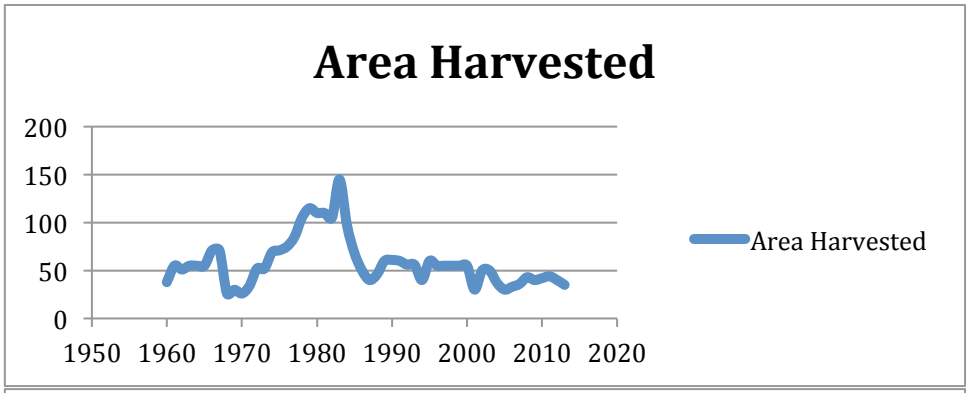

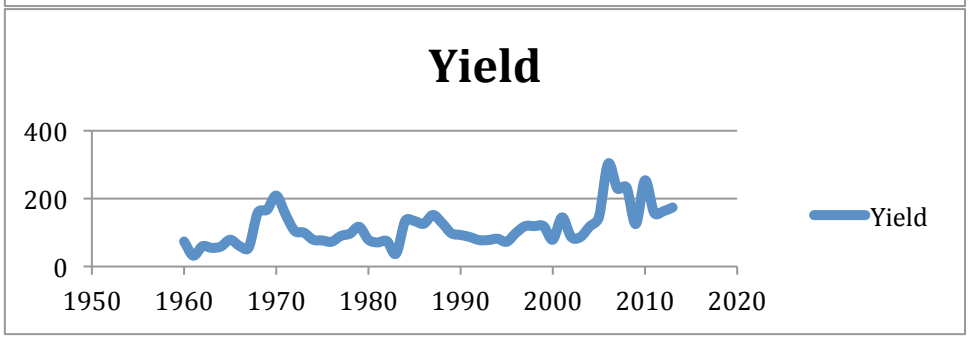

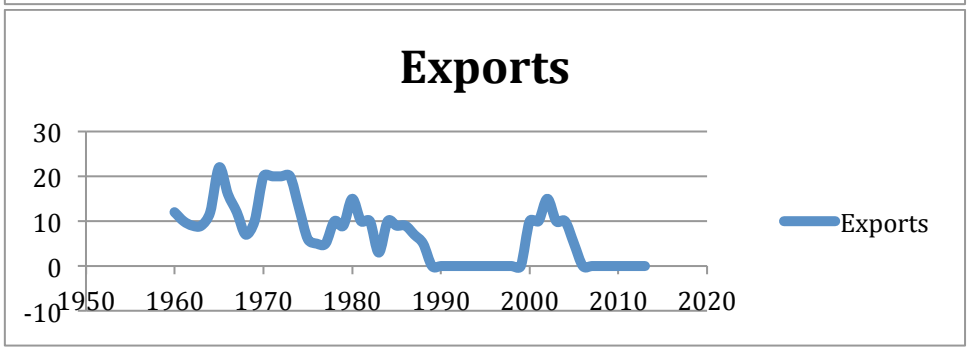

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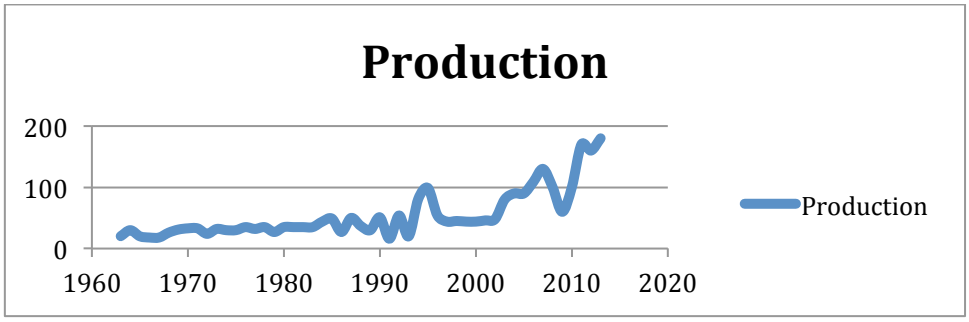

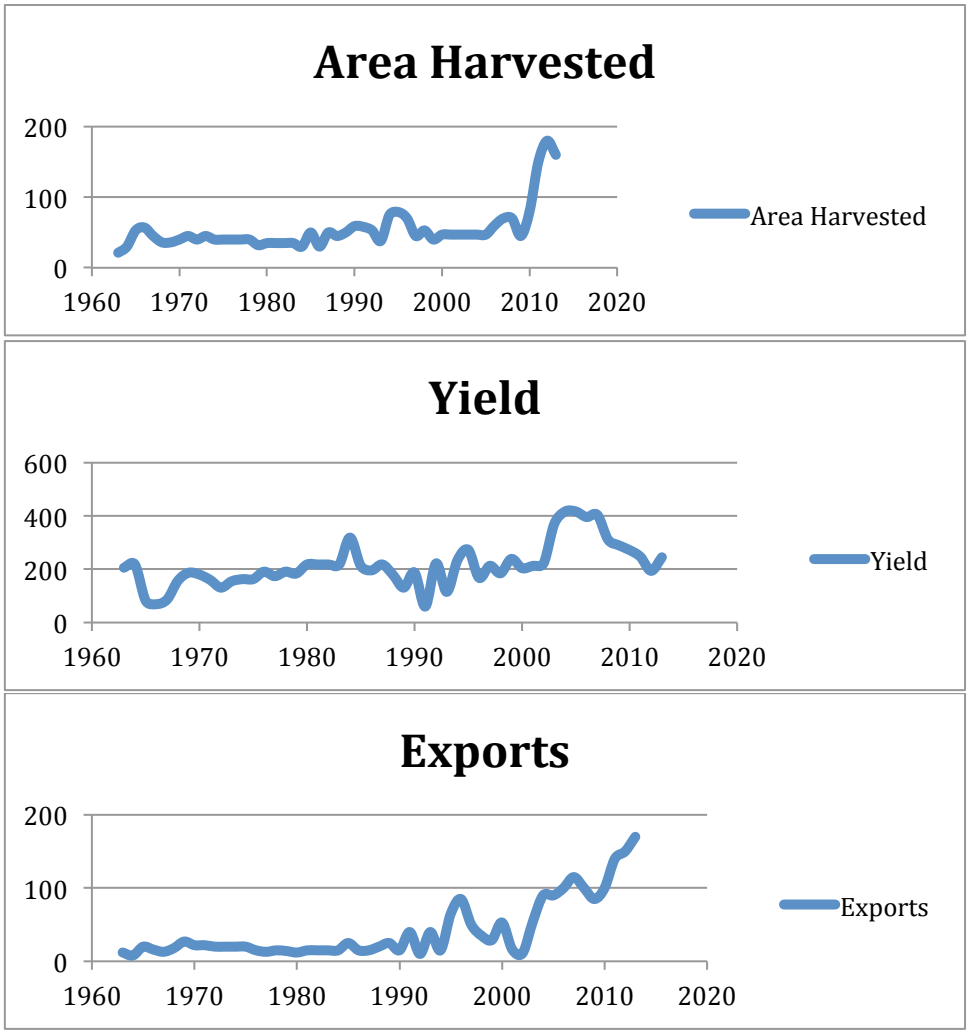

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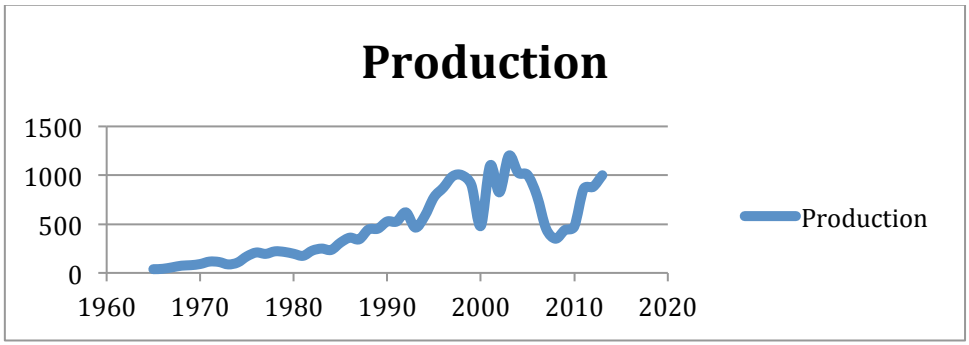

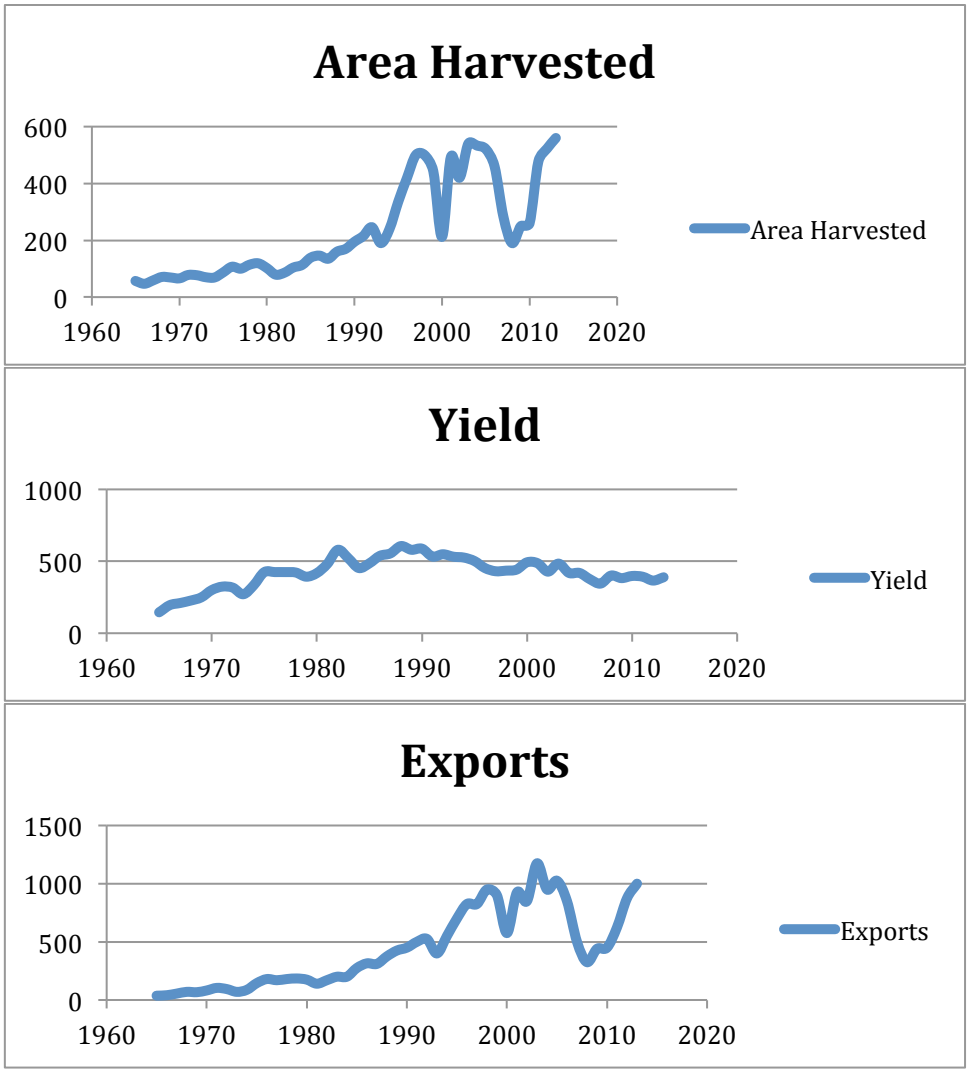

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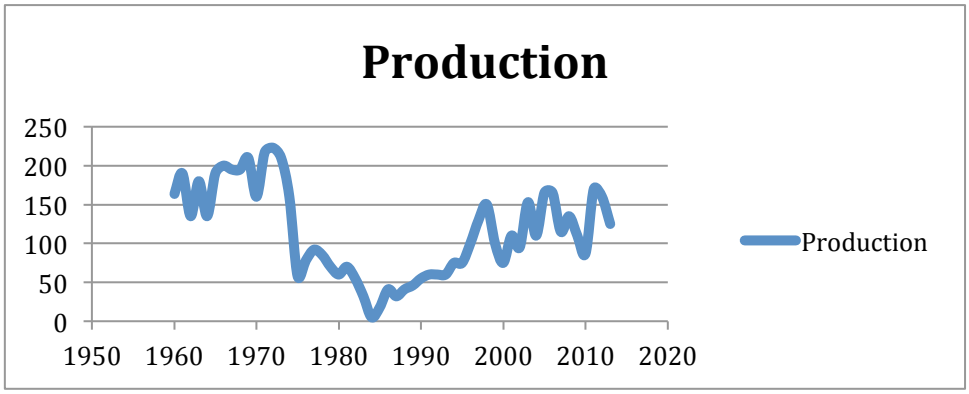

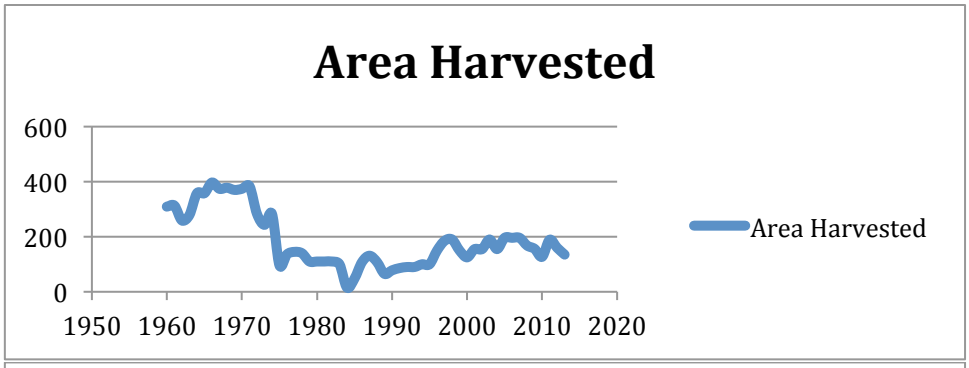

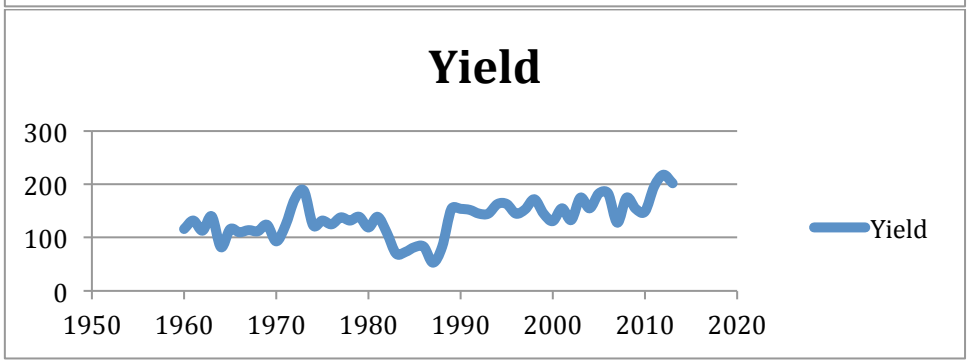

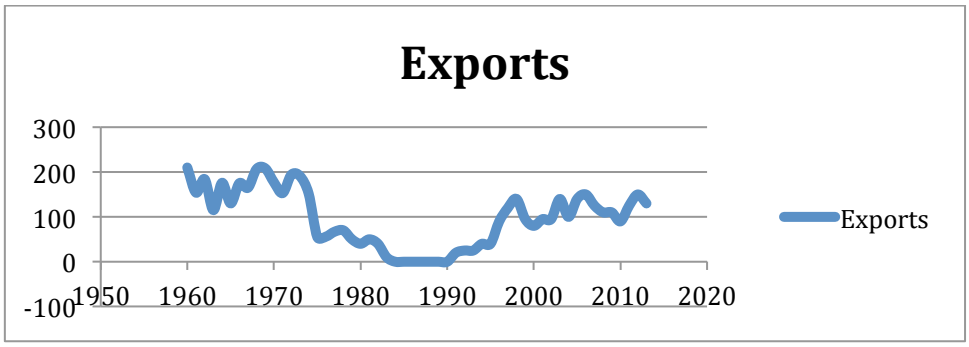

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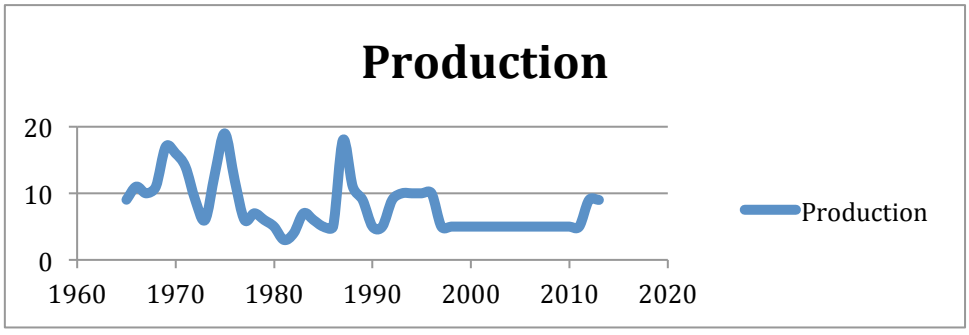
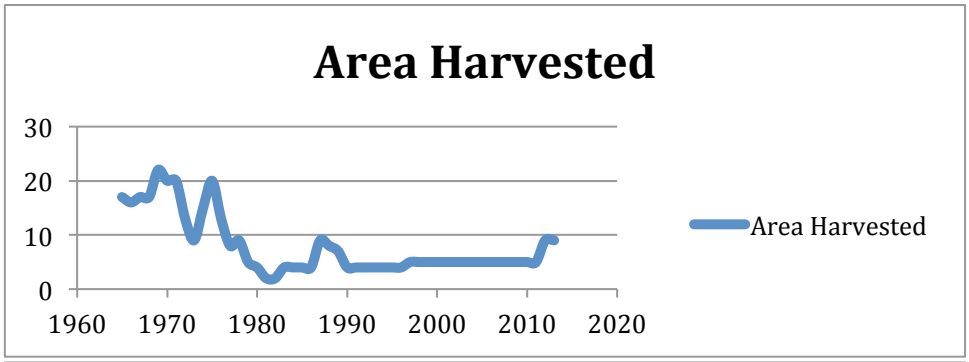
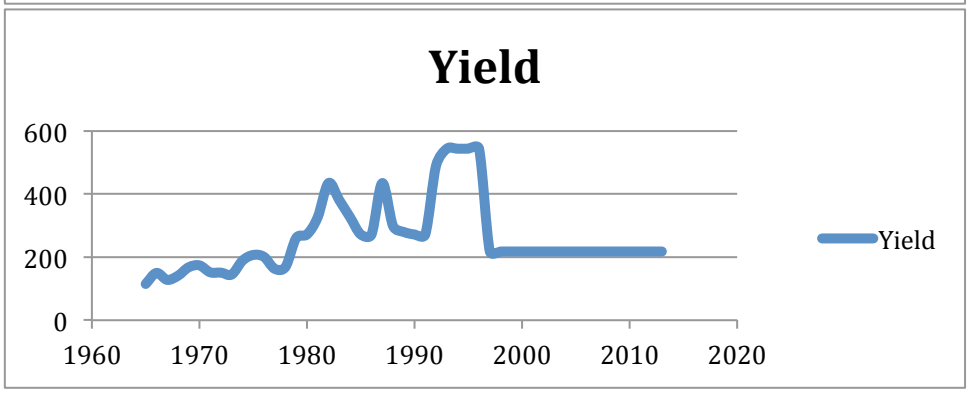
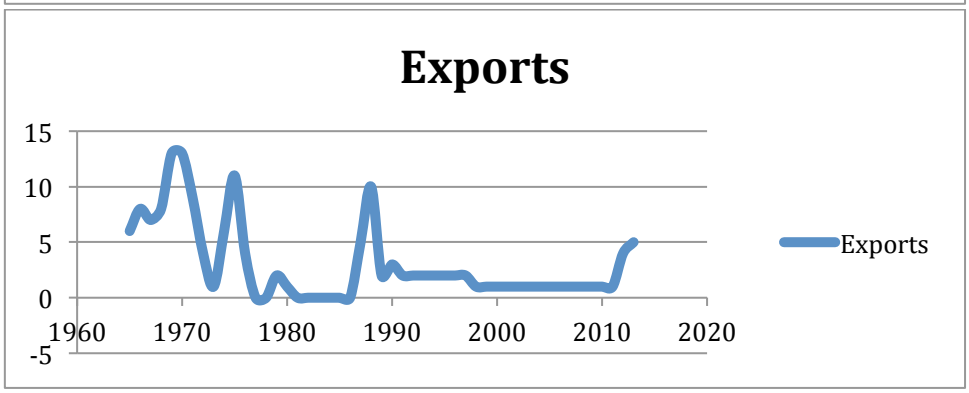
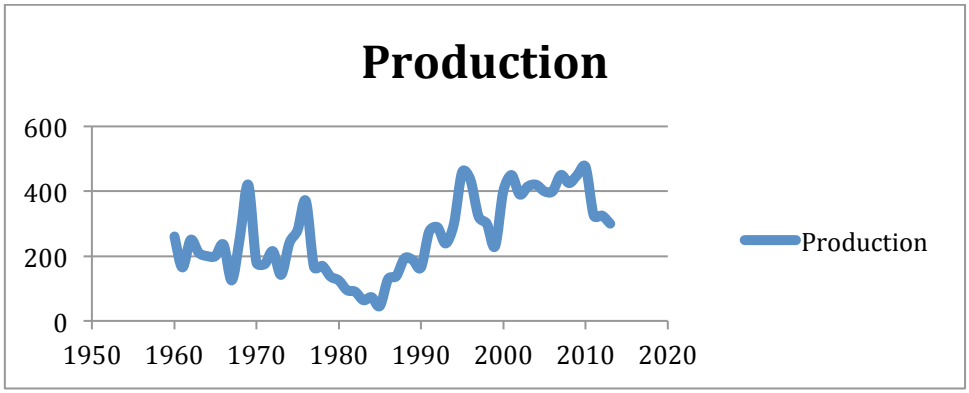


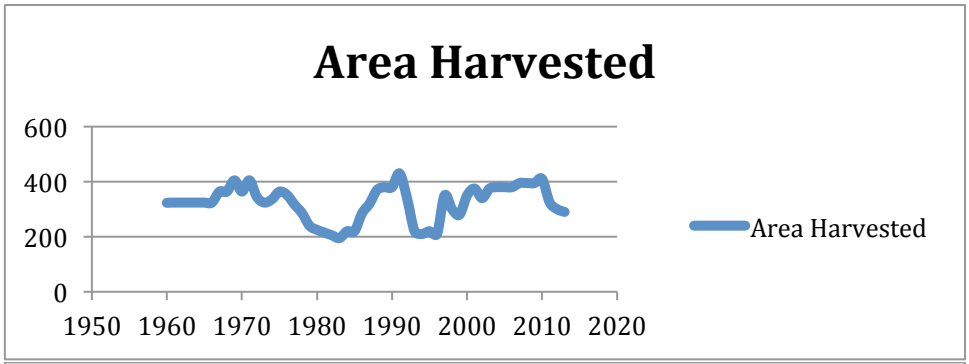


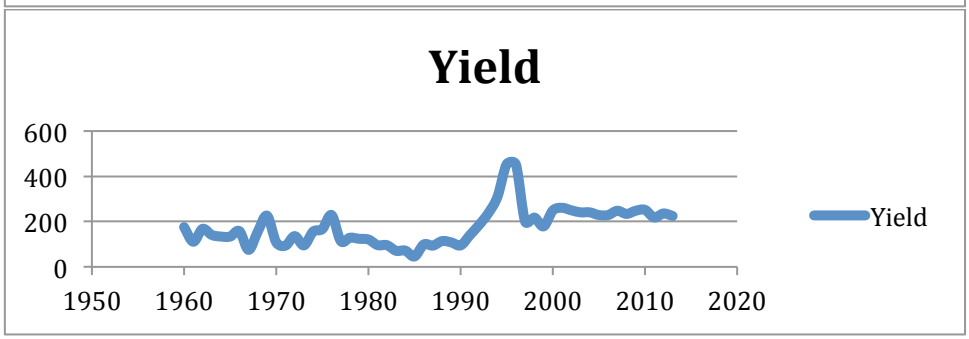


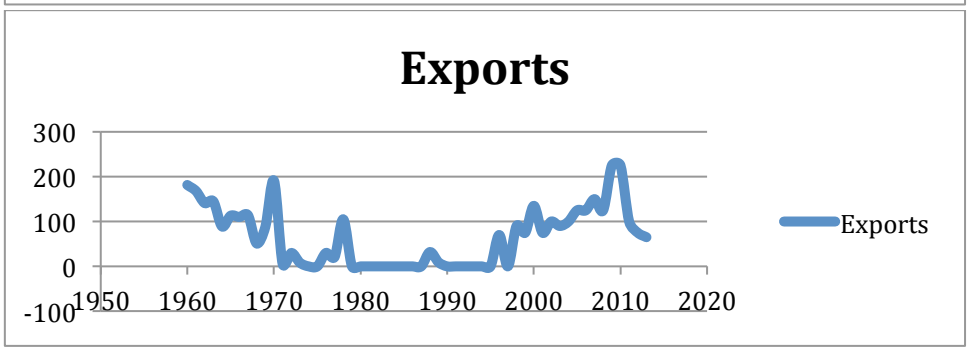


Figures A17. *Nigeria*

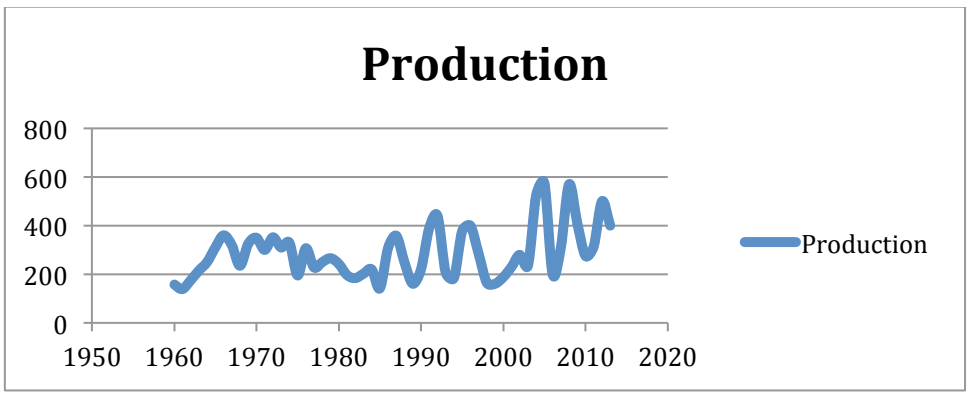


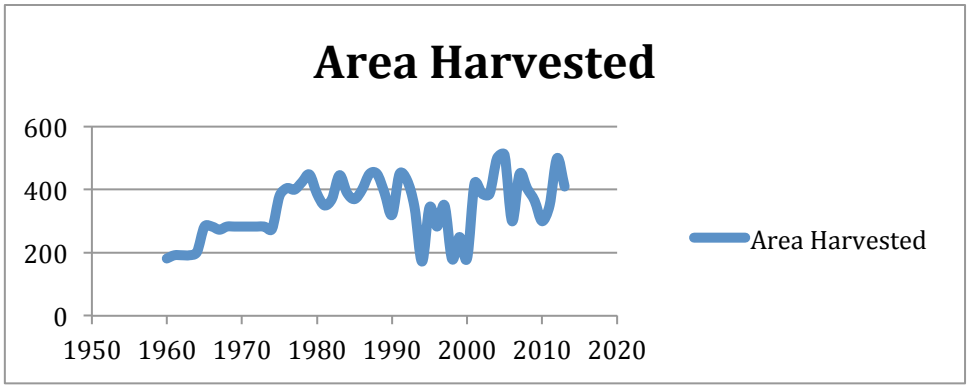


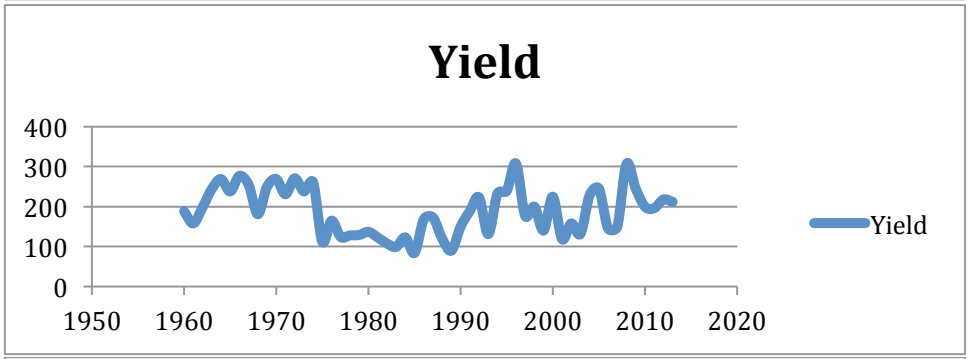


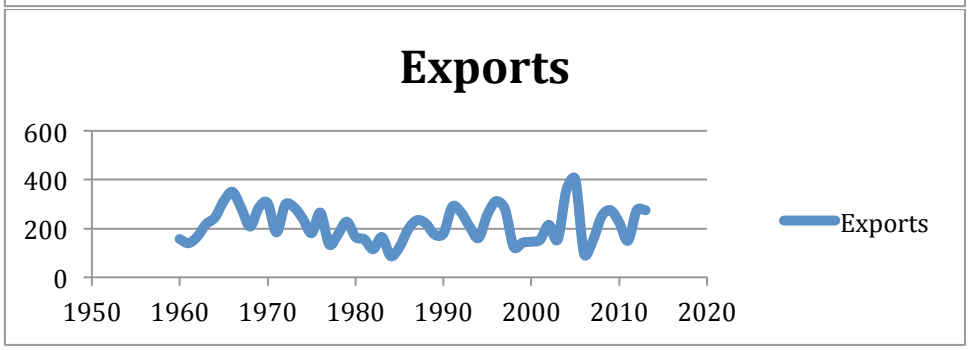


Figures A18. *Tanzania*

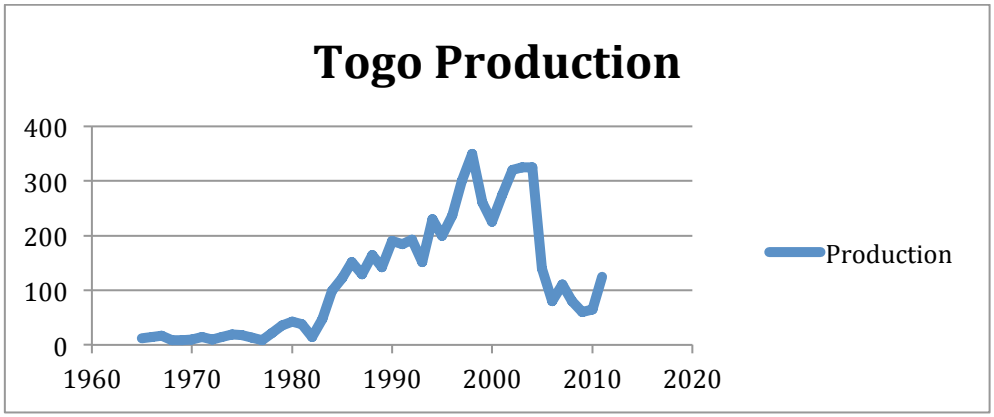


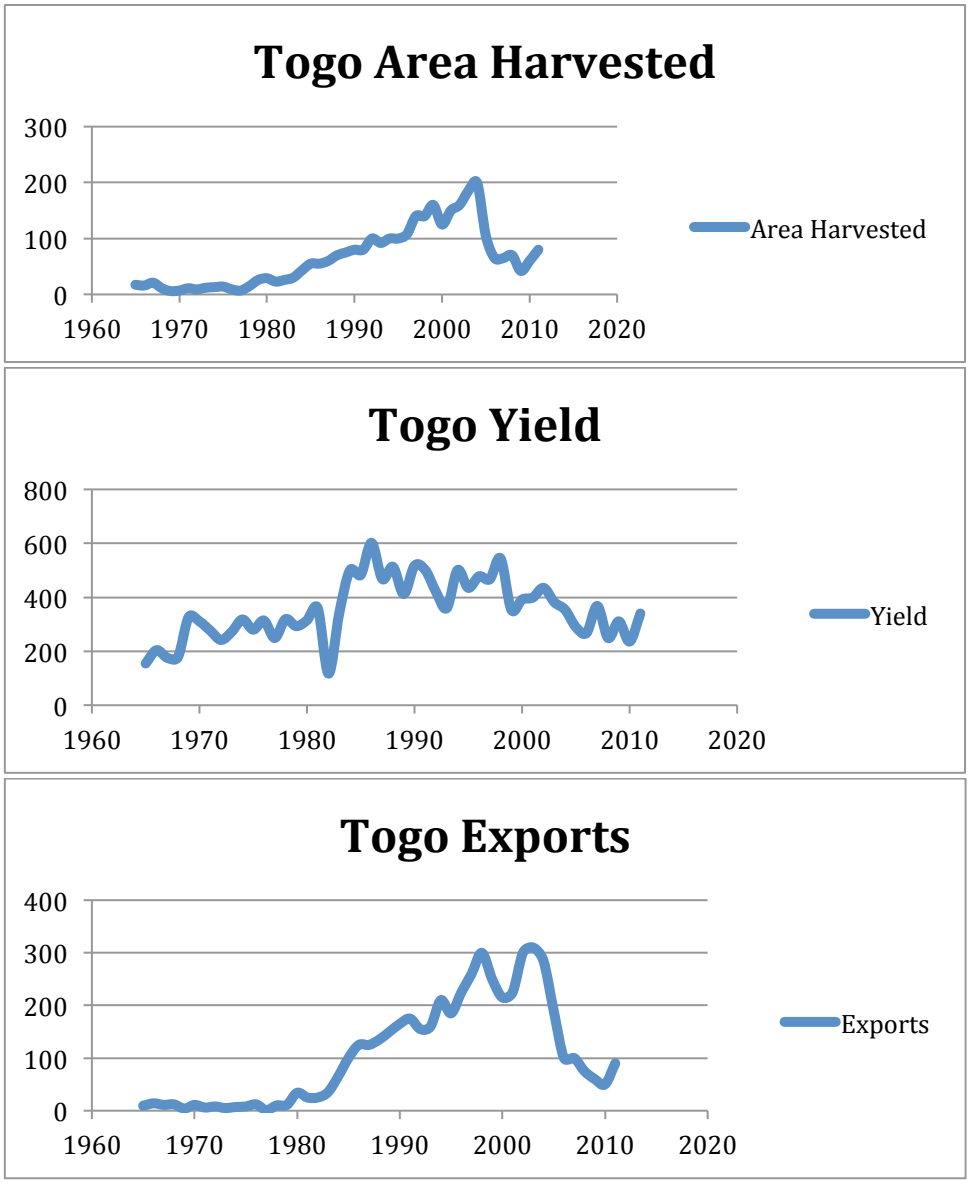






Figures A19. *Togo*





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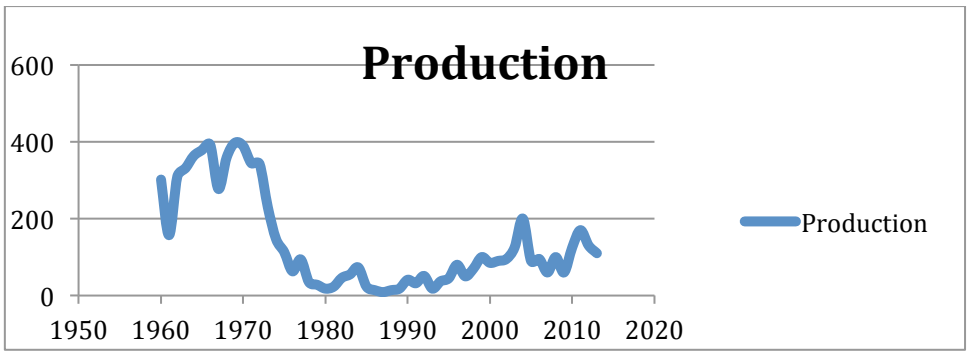

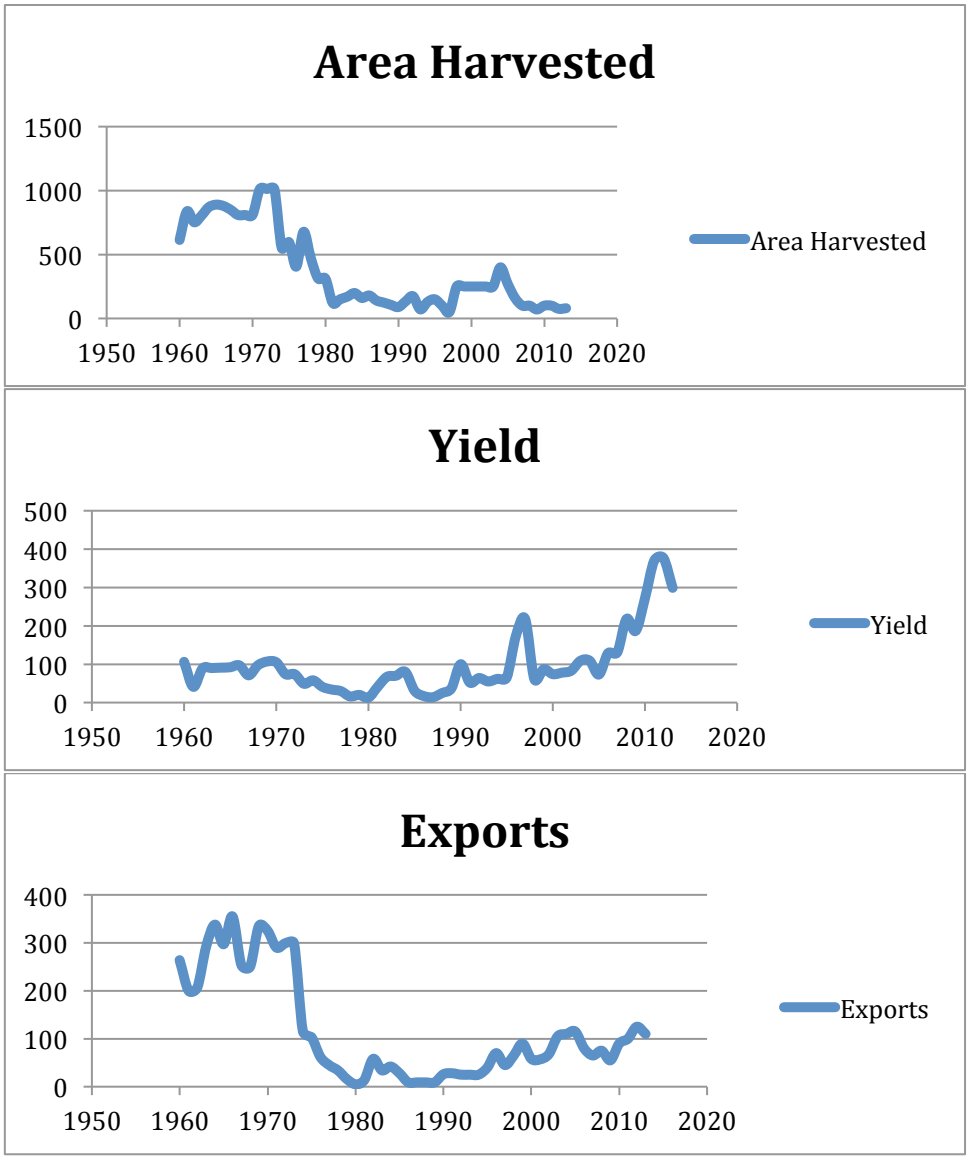

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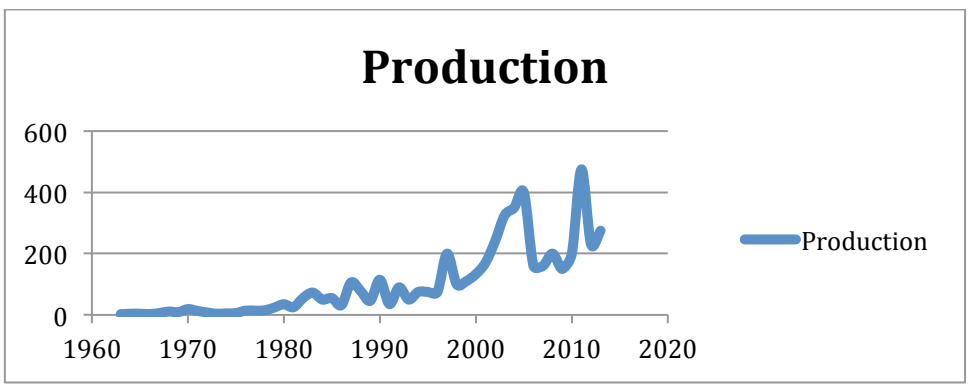
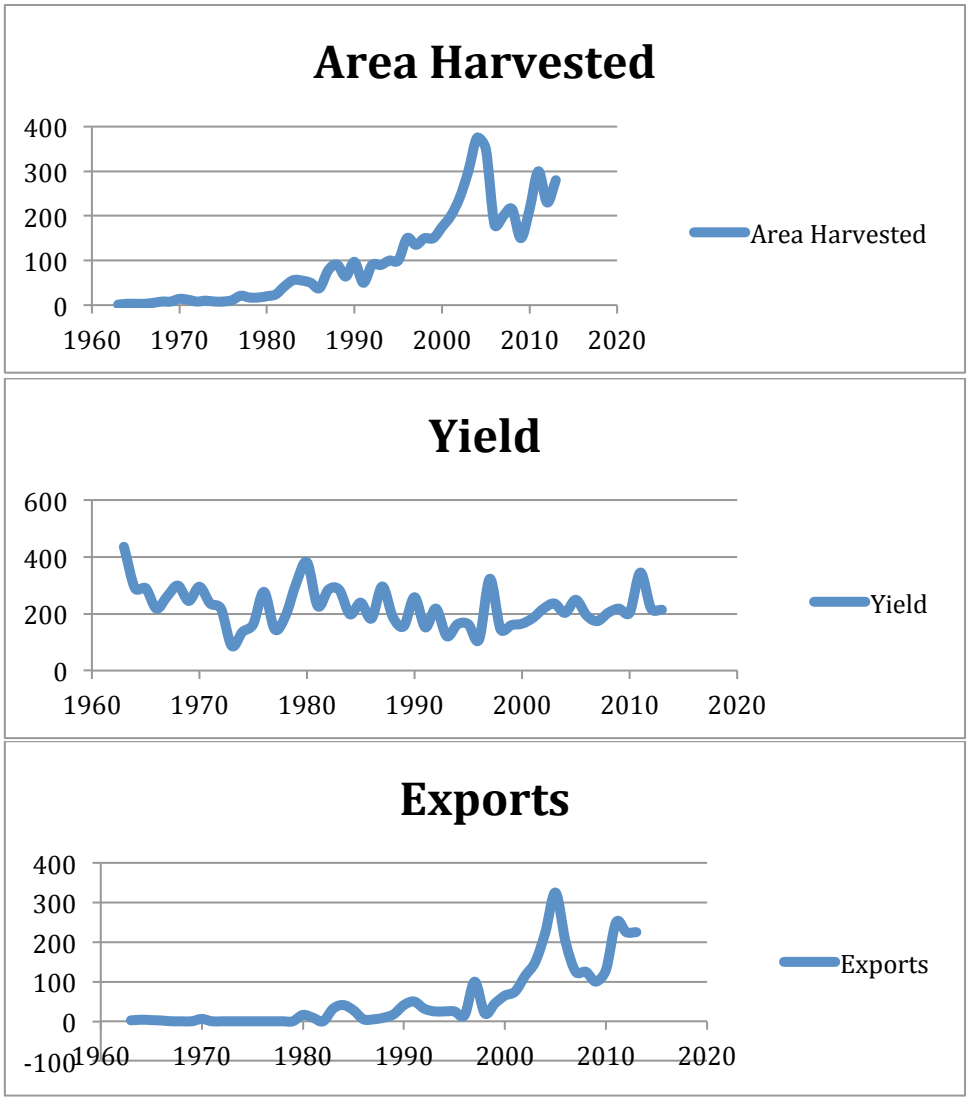
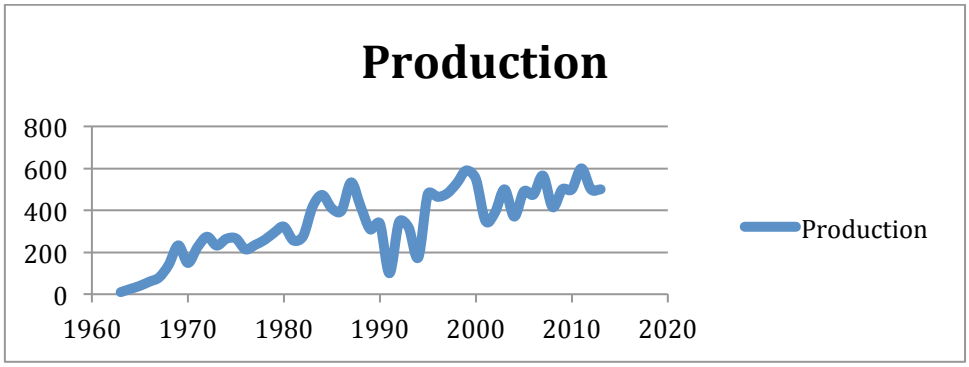
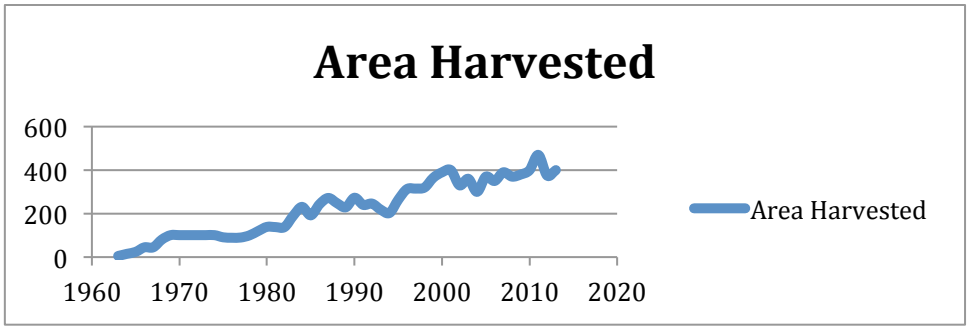
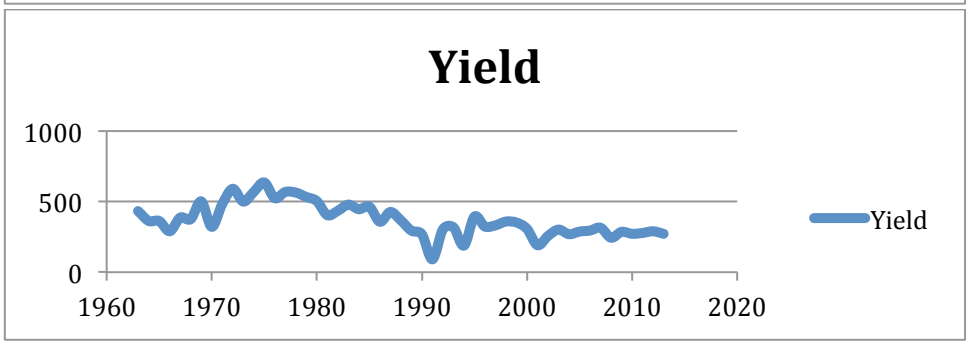


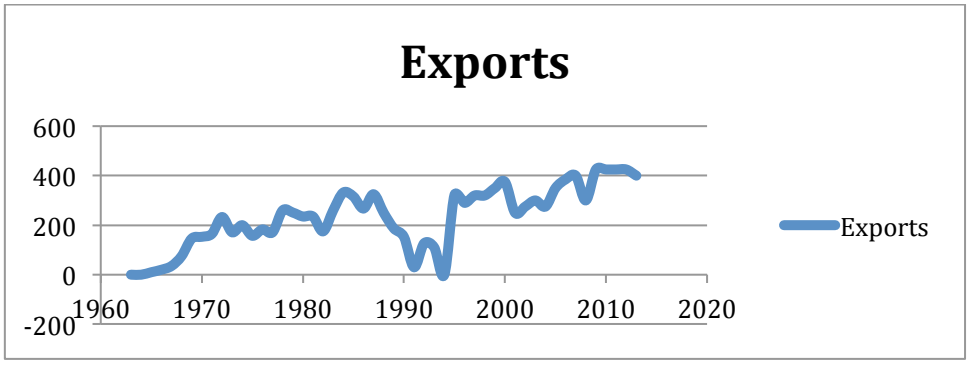


Figures A22. *Zimbabwe*



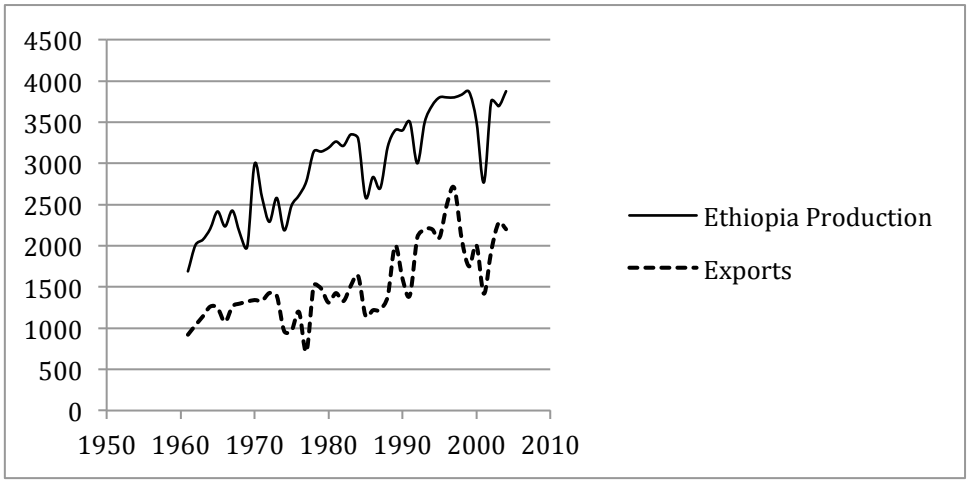

Area Harvested
600
400
200
0
1960
1970
1980
1990
2000
2010
2020
Area Harvested


Yield
1000
500
0
1960
1970
1980
1990
2000
2010
2020
Yield


Exports
600
400
200
0
-200
1960
1970
1980
1990
2000
2010
2020
Exports

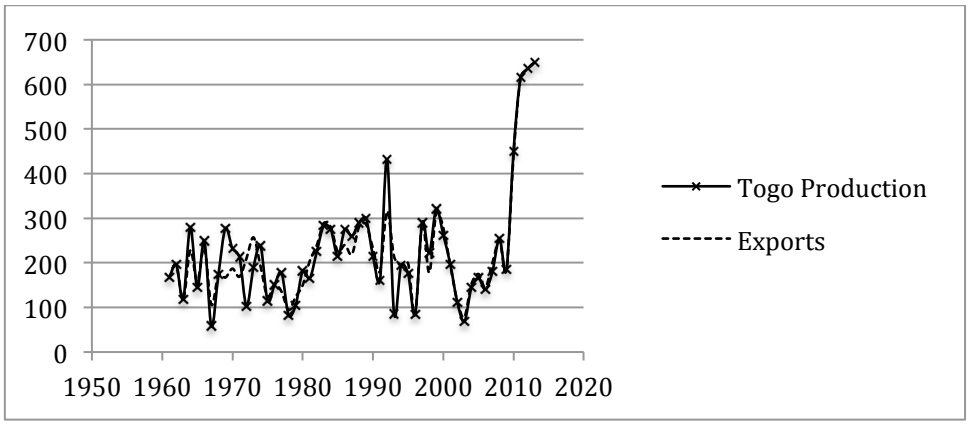
Coffee Figures

Figures A23. Ethiopia - Green Coffe Production and Exports (1000 60 KG BAGS)



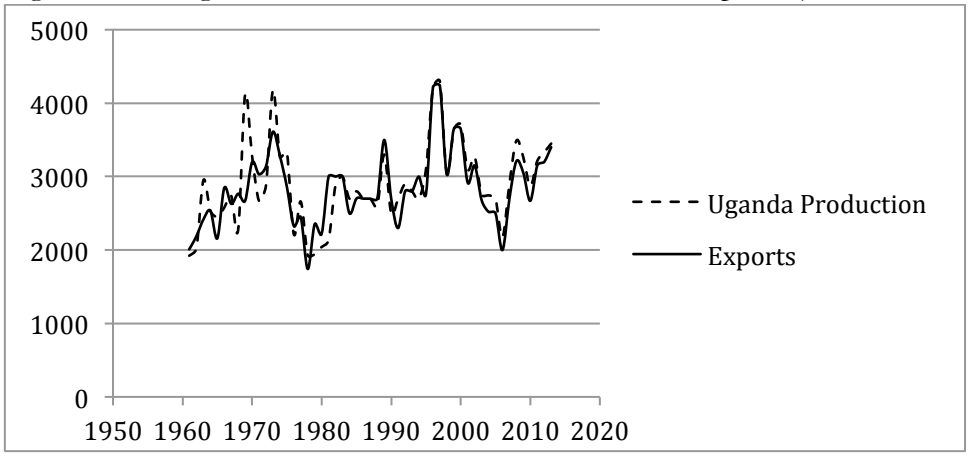
Source USDA

Figures A24. Togo - Green Coffee Production and Exports (1000 60 KG BAGS)



Source USDA

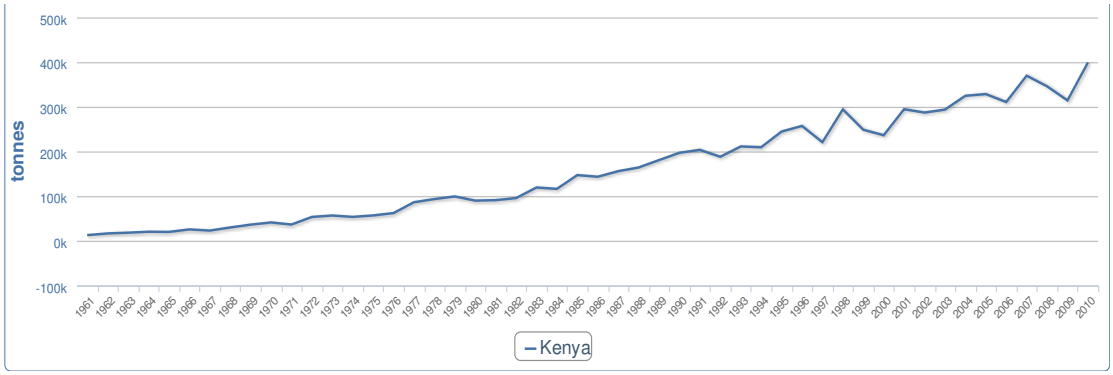
Figures A25. Uganda - Green Coffee Production and Exports (1000 60 KG BAGS)



Source USDA

Tea Figures

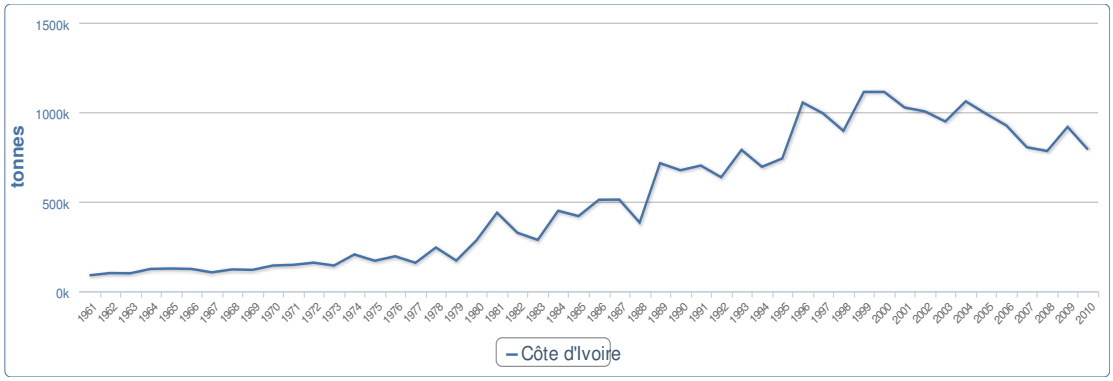
Figures A26. Kenya -Tea Production (tonnes)



Source: Faostat

Cocoa Figures

Figures A27. Côte d'Ivoire - Cocoa Production (tonnes)



Source: Faostat

Table 5
Predicting the Organizational Form of Vertical Control

	Task Programability	Nonseparability Problem	Asset Specificity	Predicted Organizational Form
Case 1:	Low	Low	Low	Spot market contract
Case 2:	Low	Low	High	Relational contract
Case 3:	Low	High	Low	Relational contract
Case 4:	Low	High	High	Unified governance
Case 5:	High	Low	Low	Spot market contract
Case 6:	High	Low	High	Relational contract
Case 7:	High	High	Low	Inside contract
Case 8:	High	High	High	Unified governance

Predicting the Organizational Form of Vertical Control
from "The Choice of Organizational Form: Vertical Integration versus other Methods of Vertical Control", Mahoney 1989

Appendix 2

DP_AFZ_WCA

Series:DP_AFZ_WCA

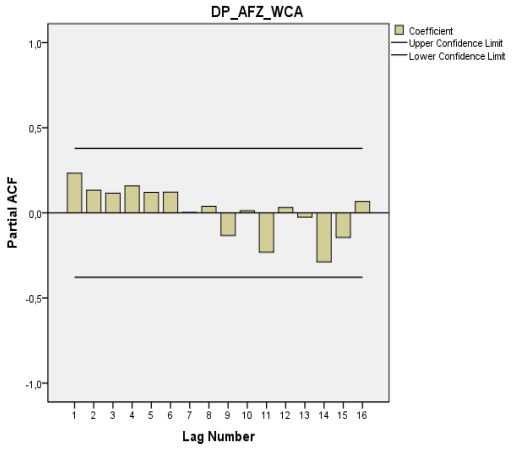
Lag	Autocorrelation	Std. Error[a]	Box-Ljung Statistic		
			Value	df	Sig.[b]
1	.233	.179	1.690	1	.194
2	.180	.176	2.739	2	.254
3	.174	.173	3.762	3	.288
4	.225	.169	5.527	4	.237
5	.214	.165	7.199	5	.206
6	.223	.162	9.106	6	.168
7	.130	.158	9.786	7	.201
8	.148	.154	10.709	8	.219
9	.004	.150	10.709	9	.296
10	.094	.146	11.119	10	.348
11	-.113	.142	11.749	11	.383
12	.042	.138	11.843	12	.458
13	-.001	.134	11.843	13	.541

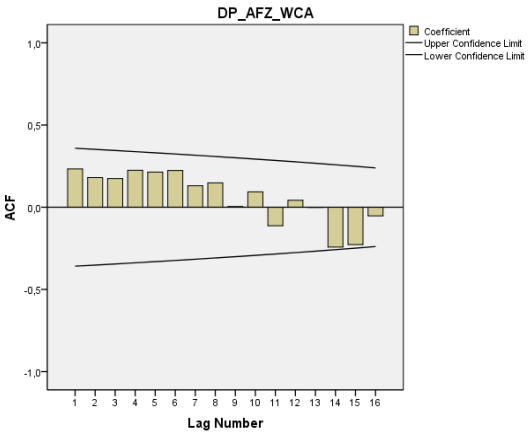
a. The underlying process assumed is independence (white noise).

b. Based on the asymptotic chi-square approximation.

Series:DP_AFZ_WCA

Lag	Partial Autocorrelation	Std. Error
1	.233	.189
2	.133	.189
3	.115	.189
4	.159	.189
5	.120	.189
6	.122	.189
7	.003	.189
8	.038	.189
9	-.133	.189
10	.012	.189
11	-.232	.189
12	.032	.189
13	-.026	.189





Model Description

			Model Type
Model ID	DP_AFZ_WCA	Model_1	ARIMA(0,1,0)

Model Summary

Model Statistics

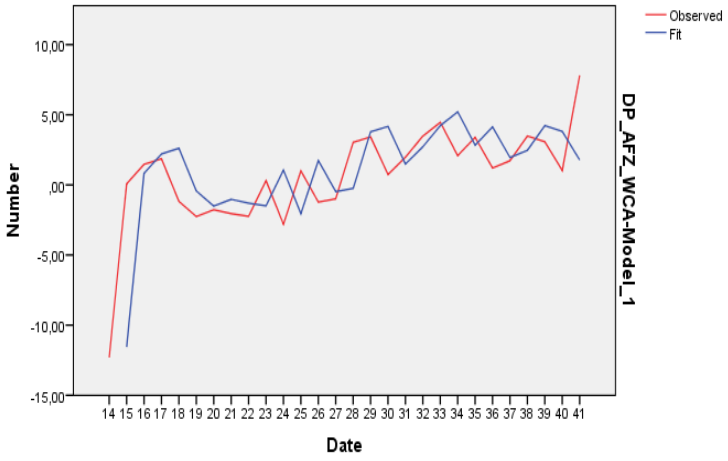
Model	Number of Predictors	Model Fit statistics				Ljung-Box Q(18)			Number of Outliers
		MAPE	MAE	MaxAPE	MaxAE	Statistics	DF	Sig.	
DP_AFZ_WCA-Model_1	0	651.086	2.186	14221.878	11.643	16.266	18	.574	0

ARIMA Model Parameters

			Estimate	SE	t	Sig.
DP_AFZ_WCA	No Transformation	Constant	.745	.633	1.178	.250
		Difference	1			

Model Statistics

Model	Number of Predictors	Model Fit statistics	Ljung-Box Q(18)			Number of Outliers
		Stationary R-squared	Statistics	DF	Sig.	
DP_AFZ_WCA-Model_1	0	.099	11.322	14	.661	0



AFZ_Tanzania

Series:AFZ_Tanzania

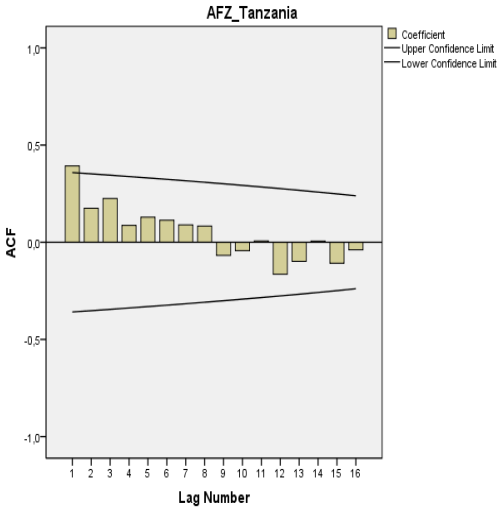
Lag	Autocorrelation	Std. Error[a]	Box-Ljung Statistic		
			Value	df	Sig.[b]
1	.393	.179	4.795	1	.029
2	.175	.176	5.785	2	.055
3	.225	.173	7.488	3	.058
4	.087	.169	7.750	4	.101
5	.129	.165	8.356	5	.138
6	.114	.162	8.849	6	.182
7	.090	.158	9.171	7	.241
8	.083	.154	9.461	8	.305
9	-.068	.150	9.663	9	.378
10	-.043	.146	9.750	10	.463
11	.007	.142	9.752	11	.553
12	-.165	.138	11.179	12	.514
13	-.098	.134	11.722	13	.551

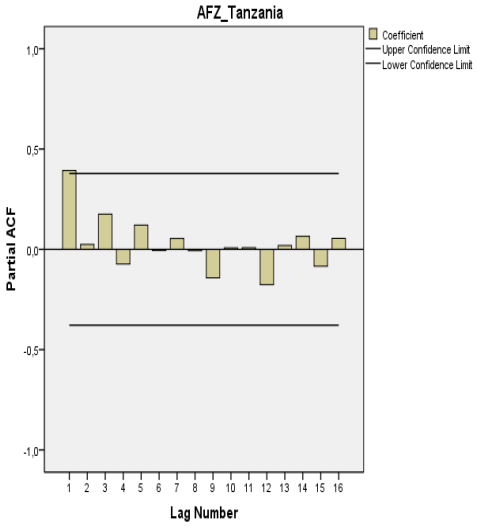
a. The underlying process assumed is independence (white noise).

b. Based on the asymptotic chi-square approximation.

Series:AFZ_Tanzania

Lag	Partial Autocorrelation	Std. Error
1	.393	.189
2	.025	.189
3	.175	.189
4	-.073	.189
5	.121	.189
6	-.006	.189
7	.054	.189
8	-.007	.189
9	-.142	.189
10	.008	.189
11	.008	.189
12	-.176	.189
13	.019	.189





Model Description

			Model Type
Model ID	AFZ_Tanzania	Model_1	ARIMA(2,1,0)

Model Summary

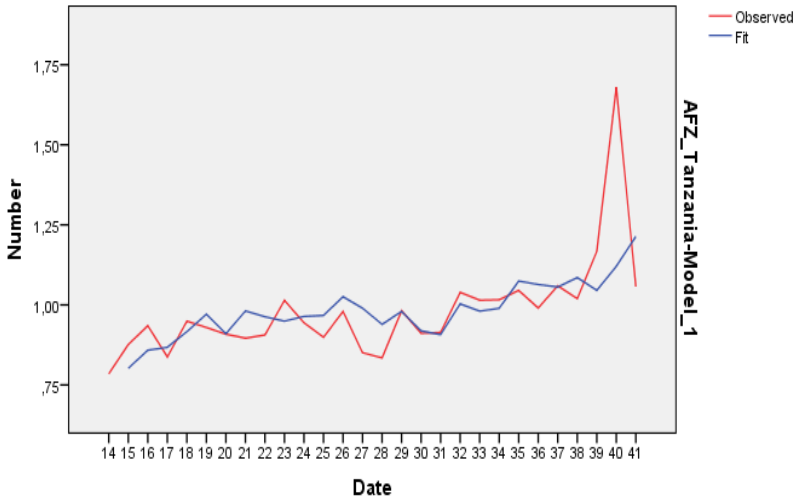
Fit Statistic	Mean
Stationary R-squared	.459
R-squared	.341
RMSE	.134
MAPE	6.687
MaxAPE	33.310
MAE	.073
MaxAE	.560
Normalized BIC	-3.647

Model Statistics

Model	Number of Predictors	Model Fit statistics	Ljung-Box Q(18)			Number of Outliers
		Stationary R-squared	Statistics	DF	Sig.	
AFZ_Tanzania-Model_1	0	.459	8.143	16	.944	0

ARIMA Model Parameters

					Estimate	SE	t	Sig.
AFZ_Tanzania-Model_1	AFZ_Tanzania	No Transformation	Constant		.017	.011	1.582	.127
			AR	Lag 1	-.792	.216	-3.668	.001
				Lag 2	-.695	.341	-2.040	.053
			Difference		1			



Appendix 3

Testing the AFZ sample without the first observation

Time Series Modeler

Model Description

			Model Type
Model ID	DP_AFZ_WCA	Model_1	ARIMA(0,1,0)

Model Summary

Model Fit

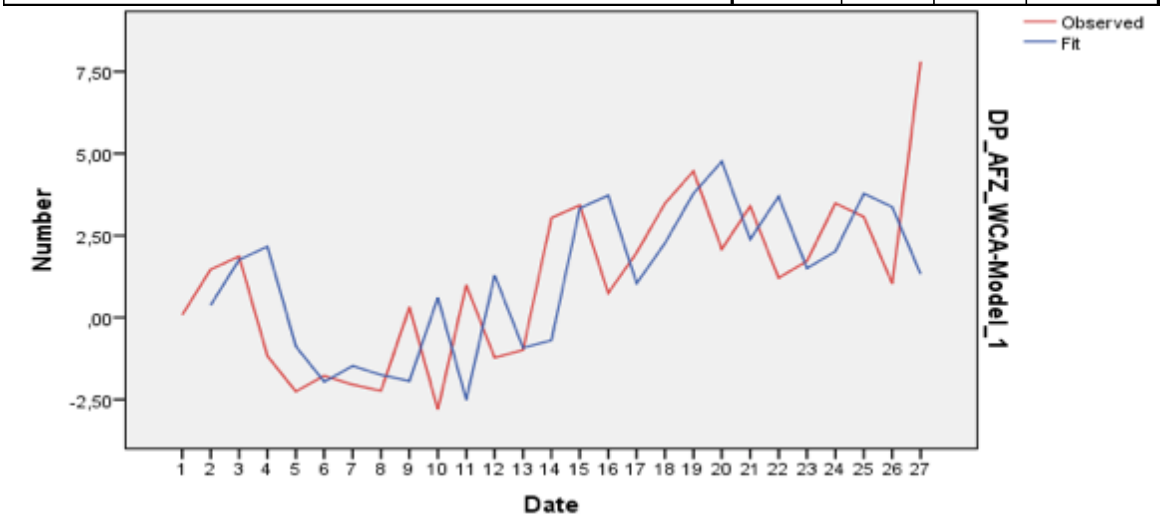
Fit Statistic	Mean	SE	Minimum	Maximum
Stationary R-squared	,000	.	,000	,000
R-squared	,124	.	,124	,124
RMSE	2,368	.	2,368	2,368
MAPE	125,722	.	125,722	125,722
MaxAPE	722,132	.	722,132	722,132
MAE	1,765	.	1,765	1,765
MaxAE	6,482	.	6,482	6,482
Normalized BIC	1,849	.	1,849	1,849

Model Statistics

Model	Number of Predictors	Model Fit statistics		Ljung-Box Q(18)			Number of Outliers
		Stationary R-squared	MAE	Statistics	DF	Sig.	
DP_AFZ_WCA-Model_1	0	,000	1,765	26,363	18	,092	0

ARIMA Model Parameters

				Estimate	SE	t	Sig.
DP_AFZ_WCA-Model_1	DP_AFZ_WCA	No Transformation	Constant	,297	,464	,640	,528
			Difference	1			



The AFZ premiums time series (encompassing the first observation) (Appendix 2) test results showed a positive trend, however with low significance (p=.25), thus only enabling me to state that the AFZ premiums time series has a non-negative trend.

Testing of the AFZ premiums time series without the first observation (above) still results in a positive non significant trend, as can be seen from results reported above (coefficient estimate=.297, p=.528).

Furthermore, the used testing programme (Expert Model) points out the contingent existence of outliers and in both cases it has not observed such data.

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