



COTTON AND ITS BY-PRODUCTS

in Zambia

BACKGROUND PAPER





COTTON AND ITS BY-PRODUCTS SECTOR IN ZAMBIA

Background Paper

Prepared by West K. Chitah (Consultant)

20 December, 2016



UNITED NATIONS
UNCTAD

Geneva, 2017

Acknowledgments

UNCTAD commissioned this background paper as part of UN Development Account Project 1617K: "Improving the value added of cotton by-products in Eastern and Southern Africa (ESA)". The paper was prepared to inform discussions with stakeholders in the early stages of the project. For more information, please visit the project site at: <http://unctad.org/en/Pages/SUC/Commodities/SUC-Project-1617K.aspx>."

This paper was prepared by a consultant, Mr. West K. Chitah, former Director, Cotton Development Trust, Zambia. The work was supervised by Ms. Yanchun Zhang, Chief, Commodity Policy Implementation and Outreach Section (CPIOS) with the contributions of Ms. Kamila Mukhamedkhanova, Economic Affairs Officer, Special Unit on Commodities.

Disclaimer

The material in this paper represents the personal views of the author only, and not the views of the UNCTAD secretariat or its member States.

This is an unedited publication.

The designations employed and the presentation of the material do not imply the expression of any opinion on the part of the United Nations concerning the legal status of any country, territory, city or area, or of authorities, or concerning the delimitation of its frontiers or boundaries.

Note

Material in this publication may be freely quoted or reprinted, but acknowledgement is requested, together with a copy of the publication containing the quotation or reprint to be sent to the UNCTAD secretariat.

Contacts

For further information on the Special Unit on Commodities, please contact us at:

UNCTAD
Special Unit on Commodities
Palais des Nations
8-14, Avenue de la Paix
1211 Geneva 10
Switzerland
Phone: +41 22 917 1648 / 6286
E-mail: commodities@unctad.org

UNCTAD/SUC/MISC/2017/2

Table of Content

1. Introduction.....	6
1.1. The cotton crop	6
2. Agricultural conditions in Zambia	8
2.1. Agro-ecological regions of Zambia	8
3. Cotton production in Zambia	8
3.1. History of cotton in Zambia	8
3.1.1. Pre-Reform institutional set-up and performance	9
3.1.2. From Reform through 2003: phases one to three	9
3.1.3. From 2000 to 2010.....	11
3.1.4. The Cotton Act 2005.....	12
3.1.5. Improved sector coordination	12
3.4. Textiles industry.....	13
3.4.1. Recent developments in Zambia`s textile industry	13
4. Cotton by-products.....	13
4.1. Development of cotton by-products in Zambia	14
4.2.1. Impediments to the enhanced utilization of cotton by-products	14
4.2.1. Inception	15
4.2.2. Production level	15
4.2.3. Investment level	17
4.2.2. At the operational/production level.....	17
4.2.4. At the trade level.....	17
5. Stakeholders in the Cotton by-Product Utilization	18
5.1. Cotton farmers numbering	19
5.2. The policy makers and legislators.....	19
5.3. The Ministry of agriculture, the Ministry of Commerce and industry and the Ministry of finance	19
5.4. The cotton ginning companies	20
5.5. The cotton sector is regulated by the Cotton Act 2005	20
5.6. The Seed Control and Certification Institute	20
5.7. The Cotton Development Trust.....	20
Other Cotton Value Chain Stakeholders.....	21
5.8. The textiles industry in Zambia	21
5.9. The oil crushing industries.....	21
5.10. Stock feeds manufacturers	21
5.11. The livestock and dairy industry	22
5.12. Banking institutions fall under the Bankers Association of Zambia.....	22
5.12.1. The Zambia Development Agency (ZDA)	22
5.12.2. The Zambia Investment Centre (ZIC)	23
5.13. Other prospective stakeholders	23
6.6. Which cotton by-products for Zambia?	23
6.1.1. Current status of edible oil in Zambia.....	25
6.1.2. National edible oil requirements	26
6.2. Cotton seed cake and meal.....	27
6.2.1. Livestock industry and the cotton by-products	28

6.6. Cotton stalks.....	28
6.3.1. Cotton stalks and wood products	29
SADC exports	29
6.3.2. Prospects of cotton stalk utilization in Zambia	30
6.7. Issues for UNCTAD mission and Zambia cotton by-products stakeholders	30
Appendix I. Summary table for cotton by-products stakeholders in Zambia	33
Continued Appendix I.....	34
References.....	35

LIST OF ACRONYMS

ACTIF	African Cotton and Textiles Industry
CDT	Cotton Development Trust
CAZ	Cotton Association of Zambia
CBZ.....	Cotton Board of Zambia
CEEF	Citizens` Economic Empowerment Fund
CFU	Conservation Farming Unit
CIRCOT.....	Central Institute of Cotton Technology
DAZ	Dairy Association of Zambia
ESA.....	Eastern and Southern Africa
FAO	Food and Agricultural Organization
FISP	Farmer Input Support Program
GRZ	Government of the Republic of Zambia
IAPRI.....	Indaba Agricultural Research Institute
ICAC.....	International Cotton Advisory Committee
ITC.....	International Trade Center
LINTCO.....	Lint Company of Zambia
MCTI	Ministry of Commerce Trade and Industry
MFLD	Ministry of Fisheries and Livestock Development
SADC	Southern Africa Development Conference
SCCI	Seed Control and Certification Institute
UNCTAD	United Nations Conference on Trade and Development
UNZA	University of Zambia
WTO	World Trade Organization
ZAM.....	Zambia Association of Manufacturers
ZDA	Zambia Development Agency
ZAFFICO	Zambia Forestry and Forestry Industries Cooperation
ZAMBEEF.....	Zambia Beef Products
ZCGA.....	Zambia Cotton Ginners Association
ZIC	Zambia Investment Centre
ZNFU	Zambia National Farmers Union

1. Introduction

Mining, and copper mining in particular, is the main stay of Zambia's economy contributing about 20% of its GDP and making up 70% of the country's foreign exchange earnings. Zambia has, however, since 2014 been experiencing a sharply declining economic growth from over 6.0% in 2014, to 3.2% in 2016. This decline is largely a result of declining earnings from the mining sector. With an annual population growth of 2.9%, Zambia is almost registering negative per capita growth. There is, therefore, urgent need to diversify Zambia's economy by developing other sectors of the national economy so as to reduce dependence on copper.

The Zambian agricultural sector has great potential. Zambia has 42 million ha cultivatable land of which only one million ha (14%) is currently utilized. The agricultural sector and agro-processing currently account for about 40% of the GDP, about 15% of the exports and about 80% of total employment in Zambia (formal and informal). In addition, the agricultural sector provides the raw materials to agro-industries which account for 84% of the manufacturing value addition. Cotton production and processing is part of this positive achievement making up about 15% of this.

1.1. The cotton crop

Cotton belongs to the genus *gossypium* which is the most important member of the *malvaceae* family. Cotton is the most important of the vegetable fibres especially used in the manufacture of a large proportion of clothing and garments for humankind constituting about 35-40%. Although cotton is essentially grown for its fibre which accounts for about 35% weight of the primary product called seed cotton, it has the seed as the main by-product which accounts for about 65% weight of seed cotton. The cotton seed for purposes of producing usage items is divided into four main products:

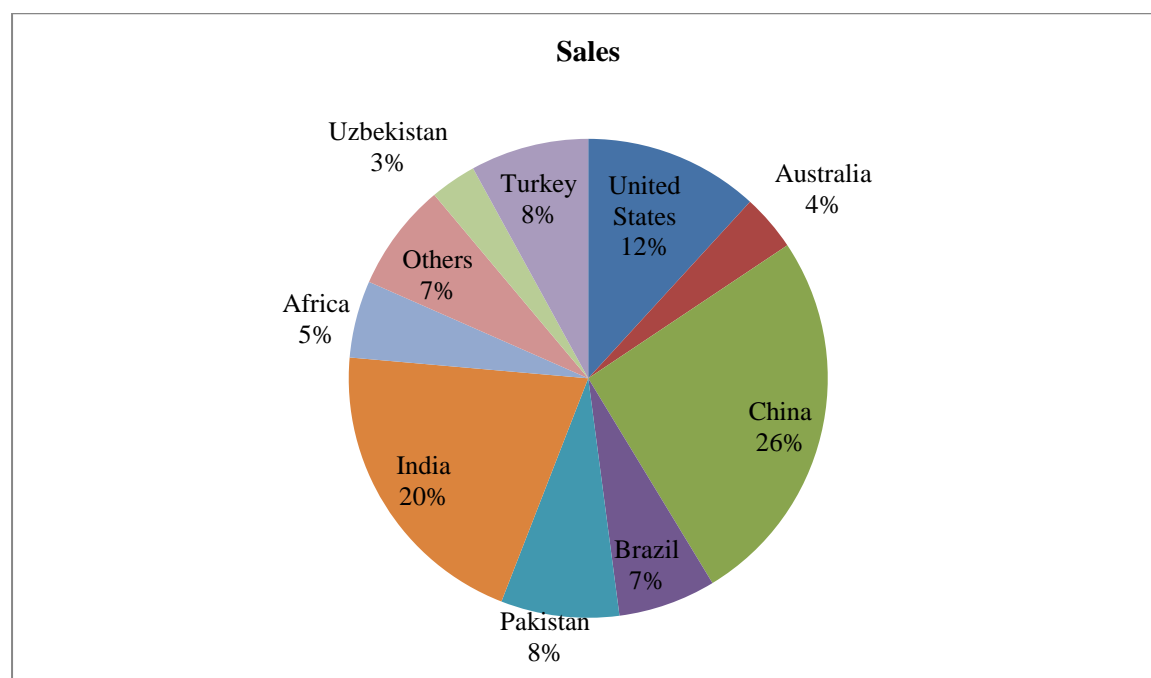
- Cotton seed oil
- Cake and meal used in livestock feed
- Cotton seed hulls also used in the livestock feed
- Linters used in the manufacture of a wide range of products such as film, plastic, etc.

Furthermore, the vegetative plant remnants have in recent years found industrial use in the manufacture of particle boards, hard boards, pulp and paper.

Cotton possesses a combination of unique basic qualities such as strength, heat resistance, absorbency and the adaptability for use in various types of textiles. These qualities have over many decades given cotton at least 35% of the world textile trade over many textile fibres, including synthetics.

Cotton requires a long and warm growing season. It is, therefore, grown in majority of tropical countries and in many sub-tropical countries. The leading world producers are China, India, USA, Turkey and Pakistan, Brazil, Australia and Uzbekistan.

Figure 1 World Cotton Trade (Total World Exports)



Source: ICAC

While cotton producing countries are numerous, world production is dominated by a few of them as shown in Figure 1. In 2011-2012, China produced 7.4 million tons (26%), India 5.9 million tons (20%) and the United States 3.4 million tons (12%) of cotton. Total production by these three countries has fluctuated since 2007-2008 between 62% and 67% of the world's total.

In Africa the main cotton producing countries are Egypt, Sudan, Burkina Faso, Mali, Zimbabwe and Tanzania. Within the ESA region Tanzania, Zimbabwe, Uganda and Zambia are the major cotton producers. Mozambique, Malawi and Kenya are also important cotton growing countries in the Region as shown in Table 1.

Table 1. Production of Cotton within the ESA Before 1995 in metric tons

Country	Metric Tons/Annum	Year
Kenya	32,000	1991/92
Tanzania	307,000	1992/93
Malawi	52,000	1992/93
South Africa	29,000	1993/94
Zambia	37,000	1993/94
Zimbabwe	180,000	1993/94

Source: CDT

Depending on their staple length and growing conditions cultivated cottons belong to the following types:

- The Egyptian-American and Sea-Island cotton of the *Gossypium barbadense* species which possess a long staple length.
- The American and African Upland cotton of the *Gossypium hirsutum* species with a medium staple length.
- The Asian types of cotton belonging to the species *Gossypium herbaceum* and *G. arboreum* with short staple length.

All the cotton produced in Zambia, and indeed, in much of Sub-Saharan Africa, belongs to the medium staple species of *Gossypium hirsutum*.

In sub-Saharan Africa (SSA), cotton is grown by over two million rural households who often depend on it as a source of income for their livelihood. Among the export crops with substantial smallholder farmer involvement in SSA, cotton ranks second in value only to cocoa, and notably, cotton production is spread more widely across the continent. The profitability of cotton production and processing in Africa has large and widespread impact on rural growth and poverty in the continent (Tschirley, 2009).

2. Agricultural conditions in Zambia

Zambia is a land locked country with a total land area of 752,620 square kilometers. Zambia occupies a near central position in the Southern African Region, lying between latitude 8-18 S and longitudes 22-33 E and covering an area of 752,620 square kilometers.

Zambia has a tropical climate with a clearly separated dry and rainy season. The total arable land available for agriculture is 42 million hectares which represents about 47% of the total land area.

Soil characteristics in Zambia are mainly influenced by climatic factors, parent material, and topography. The predominant soils in Zambia have low nutrient reserves and retention capacity and are acid to strongly acid.

Zambia's agriculture is predominantly rain fed. Zambia's irrigation potential is estimated at 500,000 hectares. Only about 50,000 hectares are irrigated despite abundant water resources.

2.1. Agro-ecological regions of Zambia

Zambia is divided into three agro-ecological regions based mainly on soil climatic conditions which are also a result of altitude. These are:

- Agro-ecological Region I: lying between 600 meters and 800 meters above sea level and with annual rainfall of between 500 milliliters and 800 milliliters of rain. This Region comprises the low lying areas of the Luangwa and Zambezi River Valley areas of Southern and Eastern Provinces. Although the rainfall is erratic in this Region it produces good quality cotton.
- Agro-ecological Region II: lying between 800 meters and 1,000 meters above sea level with an annual rainfall of between 800 milliliters and 1,000 milliliters of rain. Region II comprises the central belt of Zambia and is the major agricultural regions of Zambia. About 80% of cotton is grown in this area comprising the central plateau in Central, Southern, Lusaka and Eastern Provinces.
- Agro-ecological Region III: lying between 1,000 meters and 1,800 meters above sea level with annual rainfall of above 1,800 milliliters. No cotton is grown in this region mainly because of lower temperatures and poor soils.

3. Cotton production in Zambia

Cotton is among Zambia's main crops ranking second to the staple food crop maize in terms of value and in terms of number of farmers who grow it. About 300,000 farmers grow cotton annually earning a total collective income of about US40 Million. (CDT 2014)

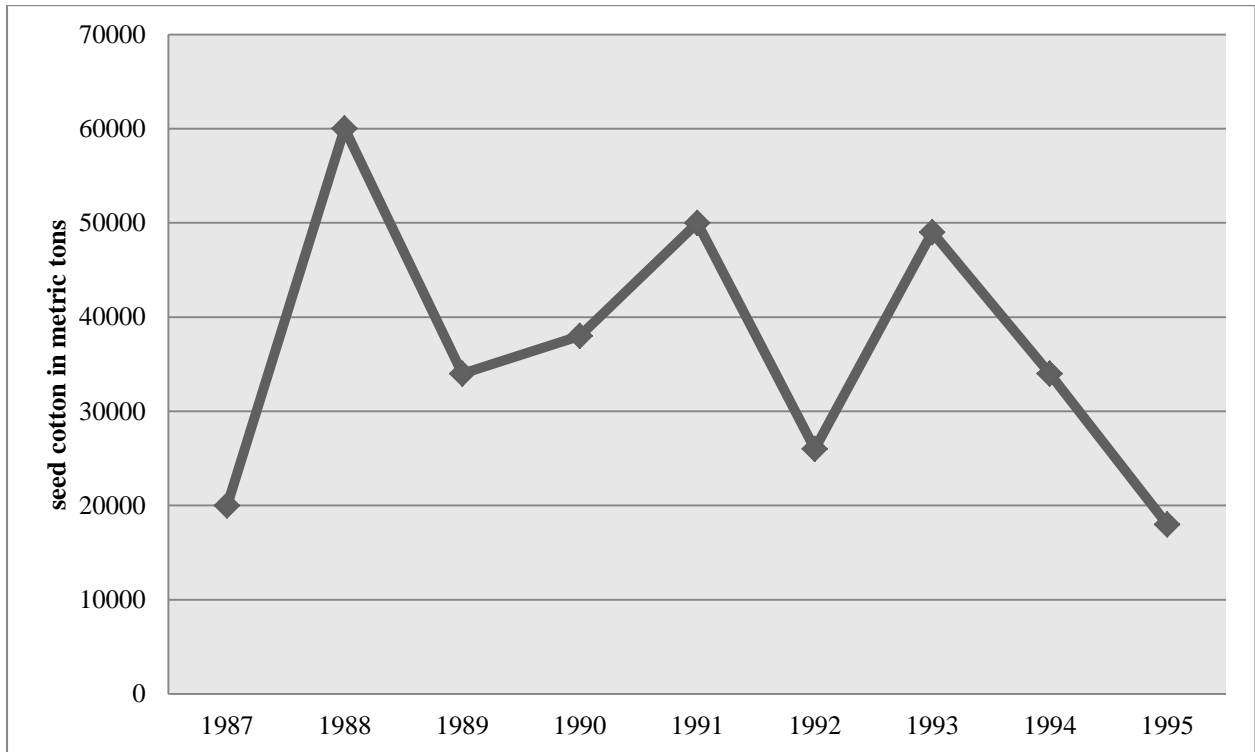
3.1. History of cotton in Zambia

The cotton industry in Zambia has been transformed from a position of no significance at the country's independence in 1964 to a developing industry and important sub sector of the national economy. Production of seed cotton increased from a mere 7,000 metric tons in 1964 to about 50,000 in 1992 when the economy underwent economic reforms. Between 1964 and 1992 the cotton industry was managed by the Lint Company of Zambia (LINTCO), a state controlled company, which operated in all cotton producing areas of Zambia supporting cotton production by providing inputs, credit and marketing services to cotton farmers.

LINTCO ginned the entire cotton crop at three sites Lusaka, Gwembe and Chipata and sold cotton lint locally and abroad. It also operated a Seed Multiplication scheme in conjunction with the Ministry

of Agriculture. In 1988 LONRHO Zambia Ltd installed a ginnery at Mumbwa which came on stream in 1988 fed by seed cotton purchased from LINTCO. In the early 1990's low throughput at the LONRO Ginnery prompted LONRHO to offer cotton farmers services in the form of inputs, credit, extension and marketing services on an increasing scale working parallel with LINTCO.

Figure2. Seed cotton production in Zambia, 1987-1995



Source: Crop Forecasting Survey

3.1.1. Pre-Reform institutional set-up and performance

LINTCO had a near monopsony in buying seed cotton and a monopoly in distributing cotton inputs on credit. Very little empirical information is available for this period, though some insight into the performance of the cotton sector during LINTCO's tenure can be inferred from the only available data from part of that period: the annual crop forecast surveys conducted by the government's Central Statistical Unit (Figure 1). The data suggest that, from 1987 to the year immediately following liberalization (1995), production was low, fluctuating, and in secular decline, falling below 20,000 metric tons of seed cotton in the 1995 harvest year (Figure 2). In 1994, as part of a concerted and broad-based effort to restructure Zambia's economy, LINTCO was sold to Lonrho Cotton and Clark Cotton, two private companies with regional cotton interests. The sale limited competition between the companies, as Lintco's gins in the center of the country were sold to Lonrho, and those in Eastern province were sold to Clark geographically separating the operational areas of the two companies. When the Zambian economy was freed from state control in 1990, the Government of Zambia embarked on agricultural policy reforms whose main thrust was to promote private sector participation in the production, marketing, input supply, and credit provision to producers.

To achieve this, the Government put in the agricultural policies whose main objectives were to ensure national and household food security, to improve the agricultural resource base, to generate incomes and employment, to contribute to sustainable industrial development and to expand significantly the sectors contribution to the national balance of payments.

3.1.2 From Reform through 2003: phases one to three

Since reform Zambia's cotton sector has passed through five overlapping phases: in phase one (1994 - 1997), LINTCO was sold and the sector expanded rapidly on an entirely private and unregulated basis; phase two (1998 - 2000) was marked by a severe credit default crisis, which was resolved in

phase three (2000 - 2003) entirely through private sector innovation; in phase four (2002 - 2006), government became involved in the sector, with mixed results. Phase five (2006 - present) has seen the entry of more significant new players at the ginning level and a recurrence of the credit default crisis of the late 1990s though not on the same level. From the sale of Lintco in 1994 through 1996, competition between Lonrho and Clark was minimal, as they operated in different areas of the country. Each company initiated outgrower programs and had very little problem with credit repayment. From 1994 through 1998, cotton production increased by a factor of three to four, depending on data source, facilitated by high international prices and promotion of the crop by Lonrho and Clark.

Table 2. Seed cotton production trends 1999-2004 in metric tons

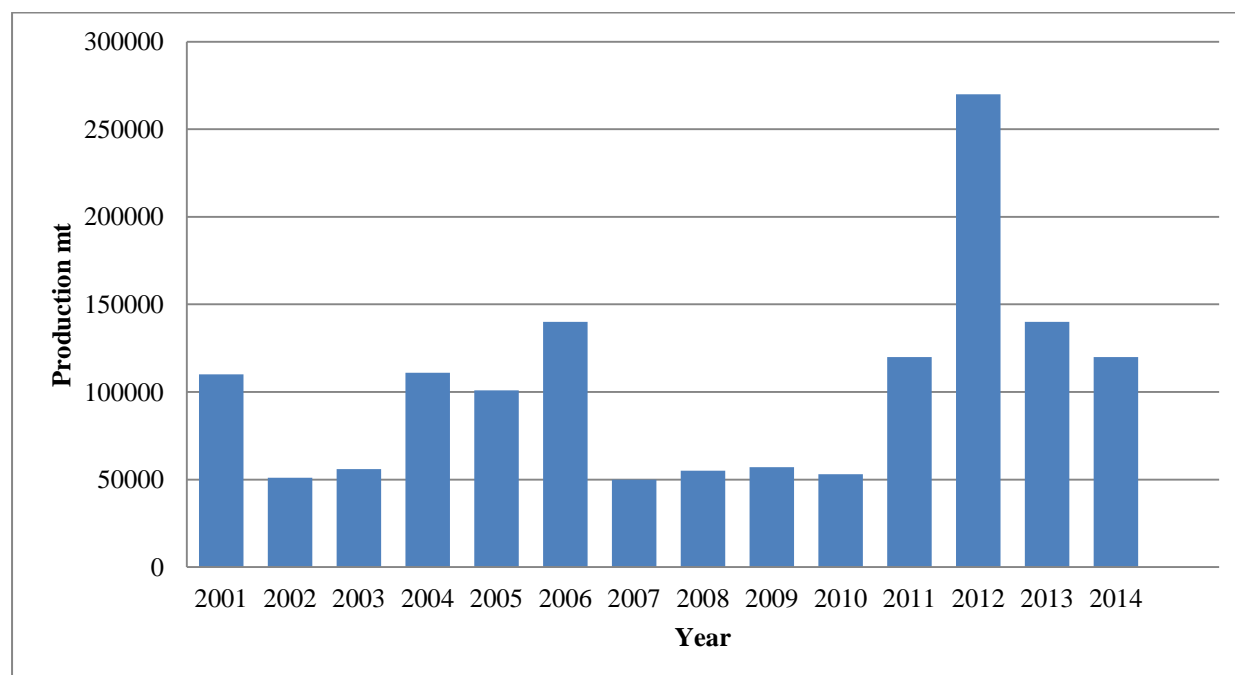
Crop Year	1999/2000	2000/2001	2001/2002	2002/2003	2003/2004
Production in Metric tons	45,000	75,000	116,000	118,000	172,000
No. of Farmers	95,000	120,000	145,000	160,000	272,000
Average Cotton price US\$	0.18	0.20	0.21	0.25	0.30
Total Payment US\$	8,100,00	15,000,000	24,360,000	29,500,000	51,000,000

Source: CDT

From 1997 more cotton ginning companies were attracted to the Zambian cotton sector. Between 1997 and 1999 four ginning companies set up new ginneries and started operating cotton out-grower programs. Cotton ginning companies started competing against each other in the same growing areas. There was a scramble by cotton ginning companies to buy cotton from growers, which was made worse by the vast ginning capacity that had expanded from less than 100,000 metric tons in 1994 to 152,000 metric tons in 1999. And ginners struggled to increase their throughput and to minimize unit ginning costs. The expansion of ginning capacity had moved faster than the seed cotton production.

The recovery of production loans became increasingly difficult in this environment as competing ginning companies, some of which did not operate out grower schemes and hence could afford to offer higher prices, buy cotton from farmers participating in other companies out grower programs. These problems were worsened by a drop in world cotton prices which were passed on to the farmers.

Figure 3. Seed cotton production 2001-2014 in metric tons



Source: Kabwe, 2014

Government at the time was committed to a liberalized economic policy and made no attempt to limit this competition. As the number of ginners and assemblers expanded, the sector was experienced several problems. First, ginning capacity expanded to over 150,000 metric tons per annum, while

production rose to 105,000 metric tons in 1998 only to decline the following two years. This over-capacity in ginning created sharp competition among ginners in the purchase of seed cotton from the farmers in order to increase their throughput and minimize unit-ginning costs. The emergence of agents and independent traders contributed substantially to this scramble for cotton.

There was widespread loan default among cotton farmers as confusion and disharmony reigned in the seed cotton market. Competing firms, some of which did not provide input credit and, hence, could offer higher prices, purchased cotton from farmers financed by other firms. These problems were made worse by a decline in world market prices from their peak in 1995, which was passed on to farmers.

Farmers had been satisfied with pre-1995 local seed cotton prices over several years, and having limited information on world market pricing, found it difficult to understand the reasons for the price declines. This, together with a lack of transparency in how each buyer determined its prices and deducted input costs, led to a sense of protest by many farmers and their representatives who felt exploited. Lonrho estimated that loan repayment rates dropped from almost 86% in 1996 to about 65% in 1999.

At the same time, increased default created incentives for out-grower firms to capitalize their bad loans into the cost of inputs for those farmers who did repay, resulting in lower net prices for cotton after deducting the cost of inputs. Farmers who remained loyal and repaid their loans were thus penalized, potentially fueling a vicious cycle of further loan defaults or exit from out-grower programs.

The sector reached a crisis in 1999. Dunavant, purchased Lonrho, the largest cotton buyer in Zambia. Lonrho cited \$2 million per year in unpaid loans as part of the reason for departing. Other out-grower companies cut back on the number of farmers they supported from the 1999/2000 season, driving production to a post-reform low of barely more than 45,000 metric tons in 2000 (Figure 3).

As a result, the sector underwent important structural change and recovered dramatically through the 2005 harvest season. The agents and independent buyers that contributed so much to the credit repayment problems in the late 1990s stopped participating. At least one of the new ginners went out of business in late 2002. These developments were associated with two parallel strategies adopted by Dunavant adopted two parallel strategies in 1999 by launching its Distributor System, which dramatically improved credit repayment among farmers and by using this system to expand its production network.

Clark also improved its more traditional system and expanded its production in Eastern province while maintaining high repayment rates. Partly as a result, national production more than quadrupled between 2000 and 2005, driven by yield growth and new entry of smallholders. Credit repayment for Dunavant improved from about 65% to over 90% (Figure 3). Both companies largely resolved the problem of polypropylene contamination that had threatened the country's export market, and the country began to receive one of the largest premiums for African cottons on world markets.

3.1.3. From 2000 to 2010

Despite this, two factors during this second boom were creating the conditions for the second crash of 2006 and 2007. First, more and better-financed ginners had become active in the sector. By the 2006 season, 7-8 ginners were active buying, this figure rising to at least 10 by 2007. Second, after holding steady against the dollar from 2002 into 2005, the kwacha appreciated rapidly from about US\$4,800 in late 2005 to a low of 3,200 in mid-2006, during the harvest of that year.

This rapid and unexpected appreciation of the kwacha severely affected the profitability of cotton to ginners and led to Dunavant not honoring its pre-planting minimum price. The Government gave support to the cotton farmers. Credit default rose to the highest levels since the late 1990s. Some out-grower companies attempted to offset its loan defaults by adding a 50% mark up to the price of inputs.

The two leading companies reacted by reducing the content of their input credit package for the next year and trimming the number of farmers receiving even this reduced package. As a result, after falling slightly from 2005 to 2006, production fell by more than half from 2006 to 2007, before recovering somewhat in 2008 and 2009.

The nature of this second crash, however, raised concerns about the current strength of the sector. Goeb (2010) shows that the farmers that exited cotton in 2000, during the first crash, were substantially less capitalized (one-quarter the median asset levels and two-thirds the median land holdings) and less experienced in cotton than farmers that remained in the sector; Zambia's cotton sector does not appear to have lost its better farmers during that crash. During 2007, however, farmers exiting had comparable incomes, assets, and land holdings to those remaining in, though those exiting did have less experience in cotton. This pattern, together with the much slower recovery in production after this crash, the greater number of ginners competing for cotton, and the reduced input package provided by the main ginners (partly in response to the sector's changing structure and consequent side-selling problems), raises important questions about what stakeholders needed to do to assure a more vigorous rebound.

3.1.4. The Cotton Act 2005

Following the crisis in the marketing of cotton and the drastic drop in cotton production during the early and mid-2000's, the main cotton stakeholders consulted among themselves to suggest measures to be taken to reform the Zambian cotton industry. It was evident that the issues of coordination and regulatory framework had to be addressed and linkages strengthened both within and among them. There was need to strengthen the regulatory framework. This consultative process included Government through the Ministries of Agriculture and Justice and went on for several years and led to the passing of the Cotton Act of 2005 in September, 2005. The main objective of the Cotton Act was "to regulate the production, marketing and trade cotton in Zambia." The enforcing agency established for the implementation of the Cotton Act was the Cotton Board of Zambia which was first appointed in 2007.

The Cotton Act stipulates as broad as possible a representation of key cotton industry stakeholders on the Cotton Board.

3.1.5. Improved sector coordination

On the hand almost all key stakeholders created their own organizations to improve their internal coordination and to improve linkages with other stakeholders. The ginning companies formed the cotton Zambia Cotton Ginners Association (ZCGA) in 2006 to replace the defunct Zambia Cotton Producers Association (ZACOPA) formed earlier to deal with the problem of farmer contracts and side-buying of cotton. The Cotton Association of Zambia was formed in 2005 through the Zambia National Farmers Union the farmer apex body to coordinate the cotton farmers and to strengthen their participation in the development of the Zambian cotton value chain. It was formed to improve their linkages to agri-business so as to improve their performance.

These institutional initiatives have made some positive contributions to the resilience and sustainability of the cotton industry in Zambia. Loan default has been reduced to an average of about 80% and side-buying to less than 5%. The number of ginning companies has reached ten and the national ginning capacity has increased to over 381,000 metric tons between 2007 and 2016 as ginneries have been installed. There is relatively better harmony in the industry and production has remained stable after peaking to 275,000 metric tons in 2012 (partly due to the good world cotton price of 2011). There have been no institutional initiatives between 2009 and 2015. There, however, have been recommendations made to the Minister of Agriculture to improve the Cotton Act to make better enforceable in the marketing of cotton (CBZ, 2016)

The post privatization period in Zambia can be generally described as positive development of the sector. Over 300,000 smallholder households, representing 10% of the entire population of smallholder households depend on the crop for their livelihood. With an average size of the six people per household, the number of household members directly depending on cotton is close to one million, or approximately eight% of the entire population of Zambia.

Despite some positive outcomes seen in the sector between 2007 and 2015, productivity at farmer level has remained very low, averaging around 850kg per hectare (ha) among cotton farmers over the post privatisation period. This compares poorly to the yield potential of over 2,500kg per ha of all the varieties of cotton found in Zambia (Kabwe 2012, Chita 2010). In further comparison, the Zambian on-farm average seed cotton yield is less than that of Zimbabwe and West African countries which is over 1,000kg per ha (Tschirley 2009). This implies that the use of improved production technology

and information extended among the cotton farmers over the last decade of post privatization have not widely translated into improved productivity among cotton farmers in Zambia.

If cotton production in Zambia has to be sustainable, there is need to improve productivity beyond 850kg/ha closer to the potential of available varieties of over 2000kg/ha through improved productivity (Tschirley, 2009).

3.4. Textiles industry

The textiles industry in Zambia was started modestly by private entrepreneurs of Asian origin about 1964. The industry recorded rapid growth during the eighties and nineties and was contributing between USD30 M and USD50M in export earnings annually constituting 11% and 16% of Zambia's non-copper exports. They were largely integrated industries doing spinning and weaving, as well as garments and clothing. The cotton yarn, in the sixties and seventies, was largely imported with a small amount locally sourced. The products, clothing and garments, from these firms were taken up by the domestic market and the exports to the region. The textiles in Zambia created employment (15,000-20,000) and contributed positively to the GDP (16-20%). These companies' competitiveness was very much challenged with the coming on the market in the early eighties of the trade in second hand clothes that greatly reduced the domestic demand for locally manufactured clothes to less than 30%. In 2006 the WTO Multi-Fiber Arrangements (MFA) that for more than 30 years had barred the Peoples' Republic of China and other Far Eastern countries textiles products from certain world markets expired and made many African countries' textile exports, including Zambia's, uncompetitive leading to the collapse of majority of textile firms.

Table 3. Textiles in Zambia before 2005

Textile Mill	Location	Demand (lint) in metric tons*
Swarp Spinning	Copperbelt	14,000
Mukuba Textiles	Copperbelt	1,900
Starflex Textiles	Copperbelt	1,200
Excel Textiles	Copperbelt	1,650
Mulungushi Textiles	Kabwe	3,000
Kafue Textiles	Kafue	3,000
Others	Mostly C/belt	1,000
Total		25,750

Source: CDT

Note: *Demand estimated on basis of mill processing capacity

In 1968 and 1982 respectively the Government set up parastatal textiles companies, the Kafue Textiles Company Ltd. and the Mulungushi Textiles in Kabwe. Both companies were integrated from spinning to fabric and garments. Kafue Textiles was sold to private buyers in an obsolete state in 1994 following many years of under capitalization. The Mulungushi Textiles also stopped operations in 2007 due to unfavorable domestic and international trade conditions in textiles.

3.4.1. Recent developments in Zambia's textile industry

In order to stimulate artisanal textile production, the Cotton Association of Zambia working with the International Trade Centre has introduced the handloom textile technology in Zambia. They have set up two pilot hand loom clusters in Mumbwa and in Lusaka. This is low cost transformation of the cotton fibre which will enable smallholder farmers to add value to their cotton by hand spinning it into yarn to produce hand-woven textile items at village level. This has the potential to generate employment and to increase incomes for women and the youth in rural areas.

4. Cotton by-products

When seed cotton is ginned it produces about 40% lint, 57% cotton seed and 3% waste. The lint is the main product and goes into yarn production but the cotton seed is also of important economic value and can undergo further volarisation that can add 20—25% value. In terms of weight, therefore, there

is more cotton seed produced from a unit of seed cotton than there is lint. Thus, from the 2012 season production of 275,000 metric tons of seed cotton produced in Zambia, there was also available about 156,000 metric tons cotton seed. About 125,000 metric tons of this constituting 80% of seed produced (about 20% is planting seed) could be available for cotton seed value addition. The cotton seed contains high levels of edible oil (18-25%) and protein (50%) depending on seed quality and species.

Cotton is, therefore, not only a fibre crop but also an oilseed crop in its own right. Increased utilization of cotton seed as a cotton by-product, therefore, offers a realizable and attractive proposition and opportunity to develop the value chain and increase the economic benefits. The harvesting of seed cotton from the field by the cotton farmers leaves behind considerable amounts of vegetative biomass of significant economic importance, especially in the face of present day environmental challenges i.e. every metric ton of seed cotton harvested from a cotton field leaves behind about three tons of wooded stalks and vegetative biomass. The utilization of these cotton stalks is increasingly assuming a viable and attractive proposition. (CIRCOT, 2009)

4.1. Development of cotton by-products in Zambia

Until early 2000's the Zambian oil seed oil expression industry was driven by the demand for cake and not demand for oil. Demand for stock feeds was very low before due to low demand for meat, poultry and dairy products brought about by declining real incomes. The demand for these products is notoriously income elastic. As a result of low demand for cake, oil expressers were reluctant to crush domestically produced oil seeds preferring to import crude oil for refining into edible product. There is no available data on this but is based on statements of credible informants. However, about 75% of Zambia's crude oil was imported and refined locally .The remaining 25% of crude is produced from domestic oil seeds and most of it is derived from soya beans. (E Fleming, 2002)

The only significant by-product of the cotton industry then was fuzzy seed. At 1998/99 production levels the ginners produced about 50,000 tons of seed, of which around 4,000 tons was retained for planting, leaving about 46,000tons for crushing, direct animal feed or export .It is estimated that only 15% was crushed locally, mainly by Supa oils Co. in Kabwe. The most important oil expressing companies in the early 2000,s are listed below together with an estimate of their contribution to domestic oil production. Table 4 below shows the prominent oil pressing companies that operated in the nineties and their proportion of local edible oil production.

Table 4.%age crude oil production from domestic oil seeds

Oil Company	%age of National Oil Production tons	Note
Amanita Premium Oils	70	No cotton seeds
Southern Oil mills	10	All oils seeds
Hi-pro Foods	15	All oil seeds
Supa Oils	3	Only cotton seeds
Meadow Feeds	1	All oilseeds
Kesons Oil Katete	1	All oil seeds

Source: E. Fleming

4.2.1. Impediments to the enhanced utilization of cotton by-products

Zambia has, in the regional context, very few geographic and natural advantages over its neighbours. Both Tanzania and Mozambique have ideal soil and climatic conditions for cotton production, strengthened by their proximity to the sea ports. Zimbabwe shares Zambia's good soils and climatic conditions but has a vastly superior infrastructure, although quite deteriorated now. In the face of such an environment, Zambia has to do better or at least as well as its neighbours to be able to successfully compete for investment and to remain competitive in the regional markets. (Fleming: 2002).It is, therefore, important to identify the potential impediments and to suggest ways of addressing them so as to improve investment in the further development of the sector

The most cited impediments by stakeholders in the development of cotton by-product industries in Zambia are the lack of awareness, inadequate investment and market information, inadequate access to finance, inadequate and unstable production of cotton seed and other cotton by-products, monopoly supply of cotton seed by a component of the sub-sector etc.

In order to develop cotton by-products in Zambia it is important to assess the economic viability of the by-products industry which requires an evaluation of the market conditions. This will include the assessment of the availability of adequate and good quality raw materials and the market potential of the products. It also requires policy analysis to identify strengths and gaps with a view to designing appropriate investment policies that will attract investors into the setting up of cotton by-product industries.

The impediments to the development of the cotton by-products in Zambia appear at the following levels:

4.2.1. Inception

At inception the main impediments in Zambia are the general lack of awareness, the inadequate information needed to stimulate interest on the status of the cotton by-products. The level of general awareness largely pre-determines the production and investment environment for the development of cotton by-products particularly the policy, legal and institutional framework.

In Zambia, the main agricultural, investment and manufacturing policy documents (NAP 2004-2015, NAIP-2014- 2018, CITP-2009-2014, SPIJC-2013.) do not give any specific or priority reference to the development of cotton by-products. Whereas the main agricultural policy documents NAP 2004-2015 and SNDP 2011-2015 mention the increases of cotton production as a poverty reduction and crop diversification strategy this is alongside other crops with relatively weak value chains. The CIT Policy 2009-2014 and the SPIJC 2013 on cotton value chain development emphasizes the development of yarn- to- textiles value addition as a wealth creation and poverty reduction strategy. The policy framework for the development of cotton by-products is, therefore, relatively weak.

Although Zambia Development Agency Act 2006 is generally viewed as pro-business it has introduced screening of new investors restricting the scope of incentives for new investors. (UNCTAD-2009) There is a general shortage of information on the by-products sub-sector in Zambia. The little that is available is scanty and outdated.

4.2.2 Production level

The main impediments at production level are mainly the low farmer seed cotton yields and their negative impacts on the national production of seed cotton. The average national farmer yield of seedcotton is just 800 kg/ha comparing less favorably with Zimbabwe at 1000 kg/ha. The optimum farmer yield of seed cotton is 1050 kg/ha. An increase of yield by 250 kg/ha to 950 kg/ha would increase the national production by 75,000 metric tons and increase the amount of cotton by-products materials correspondingly.

The non- participation of farmers in the downstream value chain is an impediment to the development of the utilization of the cotton by-products. Farmers at 300,000 represent the biggest interest group in Zambian cotton value chain. Efforts to increase cotton farmer incomes through increased productivity have been slow and inadequate. From 1994 to 2014 farm cotton yields have only increased modestly from about 650 kg/ha to about 800 kg/ha. Farmer participation in value addition can result in increased incomes- by at least 10% in the processing of cotton stalks alone. For this to happen, however, farmers must own their seed cotton and its post ginning products of lint and seed. For this also to happen farmers should either own ginneries or be able to toll gin. With excess national ginning capacity of more than 40%, toll ginning should be possible if farmers are better coordinated to be able to consign. On the other hand, farmers, and still with better coordination, can own ginneries and be able gin their seed cotton in order to own the raw materials for further development. In-fact, this has already been started with Cotton Association of Zambia Ginnery at Mumbwa acquired in 2013.

Increasing seed cotton yields will lower production costs/kg and increase the competitiveness of all Zambian cotton products, if such savings are passed onto farmers by ginneries, and so on through the cotton value chain. To encourage farmers to plant, grow and harvest more cotton (and spend the necessary time in training and education), it is essential for ginneries to partner with farmers. The

distrust/tension between the two parties needs to be resolved, since both are dependent upon one another for success (Tschirley, Kabwe, 2009). Perhaps an outside organization can serve as mediator to develop a transparent pricing system that protects and benefits both.

As cotton production increases, it would be ideal that it also increases the incomes of both farmers and ginners, realizing, of course, that such income gains would depend on world cotton prices. Yet, ginners would especially benefit by increased cotton volumes that would increase their gins throughput. Moreover, there may be a way to protect incomes of both farmers and ginners by hedging cotton production using cotton futures. Hedging activities may be done through the Cotton Association of Zambia.

The other related factor to production is the volatility of seed cotton production from season to season. For example, in 2012 seed cotton production was 275,000 metric tons only to drop to 137,000 metric tons in 2013. This is mainly as a result of farmer response to purchase price paid by the ginning companies and also weather. The local purchase price of seed cotton in local currency is based on the ruling world market price. In years following good world cotton lint prices there is marked increase in cotton production as more farmers are attracted to grow cotton and others increase and/or improve their efforts. This was the case in 2012 when world cotton prices surged from about US \$ 0.64 to above US \$0.90. Cotton production in Zambia increased from about 37,000 metric tons the previous year to 275,000 metric tons in 2012. The seasons 2001-2003 recorded reduced cotton production because of drought (45,000-75,000 metric tons).

Discriminatory farmer support policies and initiatives by the Government of the Republic of Zambia (GRZ) that favor the production of maize are cited as impediments to the development of other value chains including the cotton by-products. For example, the Farmer Input Support Program (FISP) to small-scale farmers implemented through the Ministry of Agriculture has been providing planting seed and fertilizer at subsidized prices for the growing of maize for over ten years excluding other crops. This is viewed as discriminatory by many cotton industry stakeholders as farmers drift from cotton to maize. (The author does not share this opinion because Government intervention in an industry such as cotton that has been grown by the private sector would be undesirable as it will bring distortions and uncertainty in the industry. This has the potential to discourage and slow down the private sector.) In fact, there has been no evidence of farmers drifting from cotton to maize.

The weak enforcement of regulatory framework is an impediment to the development of cotton by-products particularly in the cotton production sub-sector where seed cotton is grown through contractual arrangements between the cotton farmer and the cotton ginner with the later providing inputs on loan recoverable from the deliveries of seed cotton. To avoid the loan repayment some farmers abrogate their contractual obligations and sell the seed cotton to different ginning companies thereby causing double loss to the contracting company i.e. seed cotton and the loan expense. During the late nineties and early 2000s Lonrho cotton was losing an average of USD 1.0 MI p.a. and was cited as a reason to exit cotton operations in Zambia. The high default rates of more than 90% by cotton farmers experienced in post reform period between 1995 and 2005 greatly harmed the industry and greatly contributed to the reduction of the national cotton production levels from 30,000 metric tons in 2006 to about 65,000 metric tons in 2007 (Tschirley, Kabwe 2009).

Although no data available, the cotton ginning companies invest heavily in their supply base and ginning capacity. The effect of broken contracts and loan recovery and finally on the financial viability of the entire value chain including the development of by-products is serious as no seed cotton in Zambia has successfully been grown among smallholders without pre-financing. Although loan recovery from cotton farmers has improved from less than 60% in 2000 to the current 80%, the recovery rate is still unfavorable to the stable development of the cotton value chain, including the cotton by-products.

To facilitate enhanced cooperation between value chain participants, the Government should provide an enabling environment, characterized by an effective, formal contract enforcement system that involves credible sanctions for breaking contracts. Several mechanisms can be used, but the design parameters should be local and cost effective.

Value chain coordination. Aside from contract enforcement, what other strategies might strengthen the value chain? Better coordination among value chain participants is contingent on private sector initiatives but can be facilitated by a transparent, stable public policy environment, clear regulation to

promote the cotton industry. Zambia has developed key institutions that play a key role in shaping the industry and providing an interface for all stake holders they only have to be strengthened.

4.2.3 Investment level

The impediments at this level are the inadequate and unfavorable financing conditions including the macro-economic climate. Although Zambia has a current ease of doing business rating of 97%, Zambia's Competitive index is only 3.60 points and Competitive ranking is at 118.0. Zambia's interest rates and deposit interest rates are currently at 15.50% and 8.99% respectively. Inflation rate is currently at 18.90%. These factors make the cost of investment and access to local financing expensive. The lack of electricity and the poor rural infrastructure, including roads and communications make investment in rural areas expensive and difficult. Currently Zambia is experiencing a shortage of electricity and most industries are receiving only about 70% of their requirements.

Inappropriate technology, particularly, in oil crushing reduces the efficiency viability of the industry. Cotton seed oil is extracted using the mechanical crushing technology in ginner owned firms which substantially reduces the output from as high as 18% to 11%.

The investor has to further take into account the low skills of Zambians in the by-product industries. Training has to be included in the investment costs. This is a serious impediment because the training of personnel has to be costed in the financing plan as well as reduced capacity of operation of the facilities by as much as 15% in the first two years of operation as staffs are trained on the jobs.

4.2.2 At the operational/production level

At the operational/production level cost of doing business seems prominent and many stakeholders talked to consider it an impediment. The macro-economic environment discussed above are a big cause for this but also the high operation costs. The high operation costs are linked cost of transportation (fuel at US\$ 0.13 per liter is the highest in SADC) and the poor rural infrastructure, lack of appropriate energy sources electricity in most cotton growing areas.

The sourcing of raw materials, particularly, cotton seed is an important impediment. Currently all the cotton seed produced in Zambia, about 90,000 metric tons annually, is owned by the ginners who have exercised monopoly control over it. For any investment to succeed, the stable, reliable and cheap supply of raw materials is crucial. Currently in Zambia more than 60% of the main raw material for the development of the cotton by-product, the cotton seed, is exported by the ginning companies. New investors have to either to import or to produce their own cotton seed by growing seed cotton and ginning it. Obviously not feasible. Institutionally what can be done to make Zambian produced cotton seed available to local industry? At the moment requires an answer. The process following after production is the trading of the products.

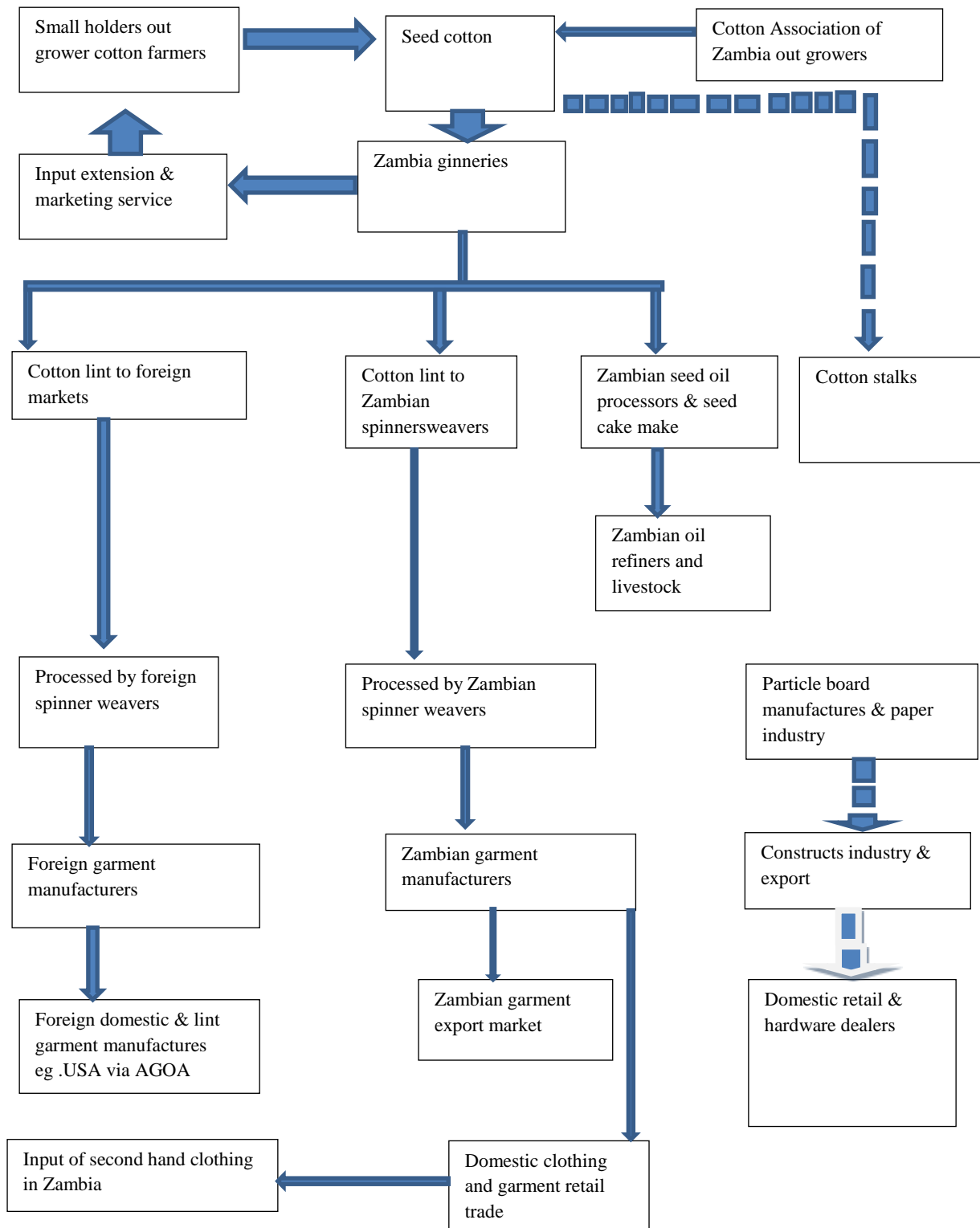
4.2.4 At the trade level

Unfair competition with foreign products, particularly, palm oil from the Far East and also smuggling from within the region constitute the main impediments. Currently Zambia imports 100,000 metric tons of crude oil from South East Asia. The effective and fair enforcement of regulatory framework is important in both local and foreign trade.

Imports are undermining prospects for growth in the domestic edible oil industry as reduced uptake of locally produced edible oil raw materials increase (Mofya Mukuka,2015). Only 40,000 metric tons of edible oil is produced from locally produced raw material constituting about 33% of the national edible oil requirements and this is mainly from soya beans and sunflower seeds. The high palm oil crude imports are a disincentive to domestic processors in utilizing locally produced raw materials as it is cheaper to import crude oil and semi-processed oil for refining locally. Imports currently constitute 90% of Zambia's national oil requirements.

5. Stakeholders in the Cotton by-Product Utilization

Figure 4. Cotton market value chain



Source: Author

The cotton value chain is elaborate and very long. It, in fact, comprises three distinct value chains i.e. the seed cotton production value chain, the lint-to-textiles value chain and also the cotton by-product value chain.

In Zambia the cotton production value chain has over the last two decades received substantial investment of about USD1 billion and is relatively better developed and contributing substantially to the socio-economic development of the country making up at least 17% of the agricultural GDP and

21% direct and indirect employment. The local lint to textile value chain is only recently showing signs of recovery after nearly collapsing in mid-2000s.

Although no specific data is available, the utilization of cotton by products is relatively under developed despite its vast potential. In view, of the current economic challenges facing the country as a result of reduced earnings from copper, it is worthwhile to critically examine the potential of the cotton by-products to create viable industry for Zambia in order to contribute to the country's socio-economic development. The cotton by-product development will rely on the already existing supply chain for it to develop its own. It will, however, have its special requirements and profile. Who then are the key and key players in the cotton by-products utilization development in Zambia?

5.1. Cotton farmers numbering

Cotton farmers numbering Up to 300,000 in Zambia grow the seed cotton by agro business links with the ginning companies. All cotton farmers in Zambia grow cotton only through support from ginning companies in terms of seasonal input loans recoverable from deliveries of seed cotton. The farmers are currently coordinated through the Cotton Association of Zambia (CAZ) which was formed in 2005 under affiliation to the apex Zambian farmer organization, the Zambia National Farmers Union (ZNFU). Both the CAZ and the ZNFU interface with GRZ on matters of policy and legislation. The CAZ have strengthened farmer linkages to the ginners who are the main investors in cotton industry in Zambia and provide the pre-financing needed for every farmer to grow cotton in Zambia. The CAZ also play an advocacy role in the development of cotton in Zambia, particularly, on issues requiring the action of Government. The development and success of the investment is to a large extent determined by the policy framework existing which is put in place by the policy makers.

5.2. The policy makers and legislators

The policy makers are mainly the political leadership in office who use their political party manifestoes to make policy for Government implementation by the various ministries, including, Agriculture, and, Commerce, Trade and Industry (CTI). They also propose and initiate the relevant legislation to provide the necessary legislative environment to support the implementation of their policies. The policy makers work in consultation with the various stakeholders and special interest groups in the cotton value chain and industry to formulate appropriate policy and legislation that can provide a conducive environment for the efficient and sustainable development of the industry. The Parliamentary Committee on Agriculture and the one on CTI, comprising about fifteen members of parliament, hold formal sittings to consult with all key stakeholders and interest groups over every bill related to the their industry before the bill is presented to parliament for passing. At this stage the stakeholders can propose amendments to or even withdrawal of the bill before it is passed into law.

Currently, the policy environment for the development of cotton by-products is inadequate. The development of cotton by-products has no specific mention in any of the key policy documents. There is, therefore, need to sensitize policy makers about the potential value of the cotton by-products. Policies and legislation to strengthen the value chain and support better coordination-and hence better efficiency –among the participants in the value chain are essential for the development of cotton by-products. The policies made by the policy makers are implemented by the various ministries and other organs of Government.

5.3. The Ministry of agriculture, the Ministry of Commerce and industry and the Ministry of finance

The three ministries implement formulated policy within the stipulated mandates of their ministries. These are the ministries responsible for the development of the cotton value chain including cotton by-products. The ministries also prepare legislative bills affecting their ministries for passing by Parliament after consultations with key stakeholders. They are linked to the National Assembly through the Parliamentary Committee on Agriculture, Finance and on Commerce Trade and Industry respectively. The key personnel at the ministries are the Permanent Secretaries (PS) and the Cabinet Ministers. The PSs perform executive duties while the Ministers ensure policy implementation by the ministries. There are also Directors of various departments who execute the various programs and activities of the Ministries. Both the PS's and ministers attend Cabinet Meetings once a week and are a link to the rest of Government, particularly, the Finance Ministry who allocate finances for the

implementation and monitoring of all Government programs and activities. The various policies implemented by Government ministries but particularly the investment policies affect the ultimate success of the investment. The main investors in the cotton industry are the ginning companies.

5.4. The cotton ginning companies

The cotton ginning companies support cotton production through loans and extension services, they buy cotton from cotton farmers at various rural depots scattered throughout the cotton growing areas, transport it to ginneries and gin it. The ginning companies own twenty ginneries scattered around the country with a total capacity of 381,000 metric tons per annum. The cotton lint is transported by road to the ports in South Africa and Mozambique for export to foreign destinations. They are the main investors in the cotton industry having invested in the production, processing plants, and, some in edible oil production. The ginning companies number 10 and are coordinated through the **Zambia Cotton Ginners Association, (ZCGA)**. The following are the ginning companies operating in Zambia:

- NWK Agri-Services
- Cargill (2009) Zambia Ltd
- Grafax Cotton Company
- Africa Cotton Company
- Africa Global Development Corporation (AGDC)
- Ginneries
- Manjeet Cotton Company
- Alliance Ginneries Ltd
- Justina Cotton Company
- Mumbwa Farmers Cotton Ginnery and Oil Crushing Association.

5.5. The cotton sector is regulated by the Cotton Act 2005

This act is enforced by the **Cotton Board of Zambia (CBZ)**. The CBZ enforces legislation on production, marketing, processing and trade in seed cotton. It also arbitrates disputes between and among cotton industry stakeholders. It also proposes legislation to Government on matters affecting the cotton industry after consultations with stakeholders. The CBZ falls under the Ministry of Agriculture and exercises a delegated mandate of the Ministry of Agriculture. There are other special institutions national or specifically created to support the cotton industry. The following institutions support the cotton industry:

5.6. The Seed Control and Certification Institute

About 50,000 metric tons of planting seed is required annually for distribution by the ginning companies to 300,000 cotton farmers throughout the country. The SCCI provides the technical back up and supervision to ensure that all seeds distributed to cotton farmers by the cotton ginning companies is certified and meets the quality requirements of the Seeds Act of Zambia. The SCCI is a department under the Ministry of Agriculture.

5.7. The Cotton Development Trust

Research and development for the cotton industry is under the mandate of the Cotton Development Trust. The CDT was set up in 1999 under a Trust Deed and is governed by an independent Board of Trustees drawn up from the key stakeholders. The Trust develops cotton varieties and other cotton production technology. It also conducts training for cotton farmers and extension staff. The Trust provides foundation seed to cotton ginning companies for all cotton varieties grown in Zambia for further multiplication and distribution to cotton farmers under the supervision of the SCCI. There are now three cotton varieties grown in the various cotton growing areas of Zambia. Zambian cotton varieties have proved resilient and meet the fibre quality requirements on the international cotton

markets. Their ginning out-turn is also good ranging between 41% and 46% and satisfies the ginner's requirements. The fibre length of Zambian cotton varieties ranges between 28mm and 32mm.

Other science and technology generation involved with the cotton industry are the Indaba Agricultural Research Policy Institute (IARPI), the University of Zambia (UNZA), and the Zambia Agricultural Research Institute.

Other Cotton Value Chain Stakeholders

5.8. The textiles industry in Zambia

The textiles industry in Zambia includes the spinners, weavers and knitters, the garment and clothing industries. They are coordinated by the **Textiles Producers Association of Zambia (TPAZ)** and the **Clothing Association of Zambia**. The textiles utilize the cotton lint raw material either produced locally or imported. The textiles and garment industries went through a hard time after 2005 when the MFA came into effect and the sale of second hand clothes boomed in Zambia. Many of them had to close because of low domestic demand for new clothing and stiff competition from South East Asia. A few survived and others are resurfacing. The CAZ has initiated a pilot handloom textiles program for its members aimed at utilizing locally grown cotton for the manufacture of garments utilizing the centuries-old technology. The textiles sector's biggest challenges are the proliferation of second-hand clothes and what is termed as "unfair competition from South East Asia." (E. Fleming, 2002)

The Zambian textiles utilize lint bought locally from ginner or imported and locally spun yarn. They are represented in two groups, the Textiles Association of Zambia and the Clothing Association of Zambia. The textiles industry is supposed to utilize locally produced cotton lint and preferably locally spun yarn. The **lint-to-textiles stake holders** depend on cotton raw materials. The development of the textiles in Zambia is of potential benefit to the development of cotton by-products, since the increased uptake of locally produced cotton by the textiles will contribute to increased raw materials for the cotton by-product value chain.

5.9. The oil crushing industries.

This group includes some ginner running oil crushing plants and some independent oil manufacturing companies. The cotton ginning companies have integrated oil crushing components of business into their firms. The independent edible oil manufacturers are using very little cotton seed (no information on quantity) and depend 90% on imported crude palm oil or on semi processed oil. The following are the oil manufacturing firms:

Oil Manufacturing Firms

1. Zamanita	Independent
2. Mt Meru	Independent
3. Continental Ginneries	Ginner
4. Cargil Cotton	Ginner
5. Chipata Ginneries	Ginner
6. Mulungushi Cotton and Cooking Oil Company	Ginner
7. China Africa Cotton	Ginner
8. African Foods	Independent (using only fuzzy seed)
9. Saka ginneries and Oil Expellers	Ginner
10. Nature Pride	Independent (Livestock driven)

Source: Cotton Board of Zambia

5.10. Stock feeds manufacturers

Cotton seed cake/meal is a good source of protein and energy for livestock especially cattle. Cotton seed cake contains about 40% crude protein. Other cotton products like cotton seed hulls, whole cotton seed are also important livestock feeds. Although the quantities have not been established for this paper, commercial livestock feed producers use considerable amounts of edible oil cake

especially, soya and sunflower because of their availability, in the formulation of their stock feeds. Cotton seed cake is a suitable substitute. Productivity in the small holder (even commercial) beef and dairy industry is low. The increasing of productivity in these sectors is the primary objective of the DAZ and the smallholder dairy cooperatives whose members numbering 50,000 are also cotton growers. One of the strategies for increased productivity in livestock and dairy production is the use of improved livestock feeds including cotton cake. The small scale farmers can also access the commercial feeds or the cotton meal/cake to feed their cattle and cows to improve productivity. The following firms produce commercial stock feeds in Zambia incorporating cotton seed cake/meal:

- i. Olympic Milling
- ii. Tiger Feeds
- iii. Nutri Feeds
- iv. Quality Feeds
- v. National Milling
- vi. Ross Macloude
- vii. ChomaMiling

Both the edible oil and the stock feed manufacturers belong to the **Zambia Association of Manufacturers (ZAM)**. The stock feed manufacturers currently use soy-cake and sunflower cake in the production of stock feeds. Cotton cake from the cotton edible oil manufacturing is a good substitute for soy cake.

5.11. The livestock and dairy industry

The dairy, beef, pork and poultry industries are the prospective stakeholders in the development of the cotton by-products. As stated above the livestock industry was in the nineties and early 2000s the main drivers in the development of the edible oil industry in Zambia due to the high domestic demand for good quality livestock feed (Fleming, 2001). The livestock industry is developing in Zambia and in the neighboring countries and the demand for feed is growing upward. The development of cotton by-products has high potential for use in local livestock feed manufacturing. (MFLD, 2015)

The livestock industry is coordinated by the Zambia National Farmers Union through its commodity committees on dairy, beef, pork and poultry. Each of the four has a producer association with membership. These are the Dairy Association of Zambia, the Beef Producers Association of Zambia, the Pork Producers Association and the Poultry Producers Association of Zambia. The livestock industry falls under the Ministry of Fisheries and Livestock Development (MFLD). The MFLD is also a prospective cotton by-products stakeholder.

The leading beef, pork and dairy processing companies are Zambia Beef Company (ZAMBEEF), Zambia Pork Products Ltd and Parmalat (Zambia) Ltd.

5.12. Banking institutions fall under the Bankers Association of Zambia

The banking institutions provide the much needed capital financing for the setting up and development of industry including the cotton industry. Banks also support the cotton ginning companies in the provision of seasonal funds for the seasonal in-put loans to the cotton farmers (most ginning companies have confirmed this but cannot provide the actual amounts). Ginning companies borrow up to USD 15 million from the banks every year to purchase agricultural inputs for cotton farmers (Tschirley 2009). The smallholder farmer cooperatives are also accessing bank funding to enhance their operations.

There are many commercial, investment and development banks that finance investment and industrial development in Zambia. They include National Commercial Bank, Indo-Zambia Bank, Investbank (Zambia) Ltd, Barclays, etc. they are grouped under the Bankers' Association of Zambia.

5.12.1 The Zambia Development Agency (ZDA)

The ZDA was formed in 2006 following the enactment of the Zambia Investment Act of 2006 to facilitate increased investment in the Zambian economy. The agency processes all formal

requirements for the registration and licensing of new investors. It is also the interface between investors and Government on investment policy and regulation. All new investments in the development of cotton by-products will be handled through the ZDA. The agency also markets Zambia for investment and development.

5.12.2. The Zambia Investment Centre (ZIC)

The ZIC was formed in 1992 by an act of parliament. It is mandated to promote and facilitate investment by focusing on attracting investment and helping investors navigate through the approval and business establishment procedures and processes and lobbying for improvement in the investment climate. The ZIC is represented on the Chamber of Commerce and sits on most Government policy formulation committees.

5.13. Other prospective stakeholders

Other prospective stakeholders are the various players and actors in the **Zambian wood and wood products industry**, particularly, the manufacturers of particle and hard boards used in housing construction who will be the main potential stakeholders in the utilization of cotton stalks development. These are coordinated under the Zambia Building and Construction Association and also the Zambia Association of Manufacturers. The Ministry of Lands and Environment is the line ministry responsible for the utilization and protection of natural resources, including forests. Zambia's deforestation rate is among the highest in the world. Cotton stalk is a good substitute for forest wood in the manufacture of hard and particle boards.

The important wood and wood processing companies operating in Zambia are:

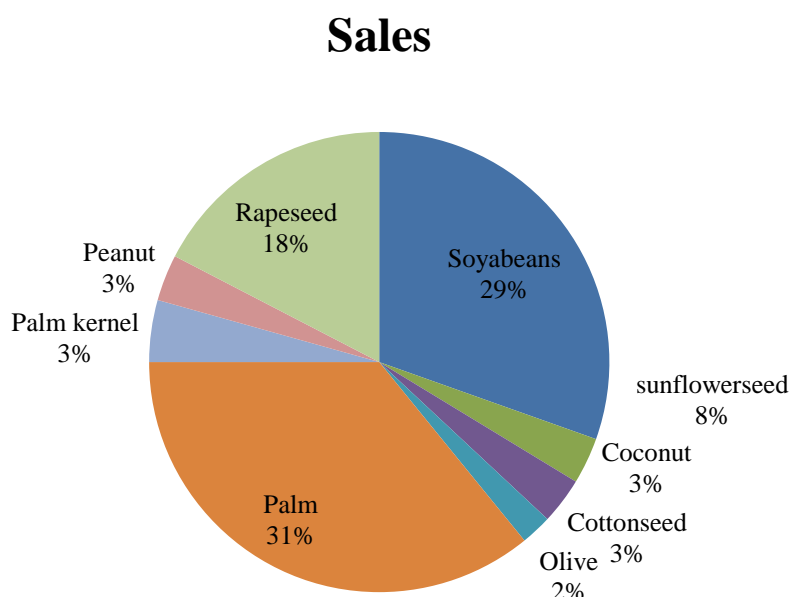
- The SAPCO –Fibreboard and Wood Products Ltd
- Supersonic International(Zambia Ltd)
- Wood Processing Industries
- Zambia Forestry and Forest Industries Corporation (ZAFFICO)

There are many organizations and groups of people with interest in the development of cotton by-products such as traditional leaders, civic leaders, cooperatives, small and medium entrepreneurs and other special interest groups such as youth and women. It would not be possible to list them all here but will be taken into account in all future activities of the Project. Appendix I on Pages 43 and 44 summarises the list of cotton by-products development stakeholders in Zambia.

6.6. Which cotton by-products for Zambia?

World edible oil production and trade is a big industry of which cotton seed oil forms only a small component as illustrated in Fig.5 below:

Figure 5. Proportion of various edible oils in world trade



Source: Author

The most valuable cotton by- product in world trade today is the cotton seed oil. The most important producers of cotton seed oil are India 1,220, 000 metric tons,China-1,142,000 metric tons, Pakistan-476,000 metric tons, Brazil-320,000 metric tons,USA-272,000 metric tons and Uzbekistan -230,000 metric tons.(Figure 5,Table 5). It is estimated by standards worldwide that 20-25%of the total value of seed cotton can come from the cotton by-products (oil, cake). It is estimated that about five million metric tons of cotton seed oil is produced world -wide. That is similar to the production of groundnuts, coconut and palm kernel oil, but well behind palm oil (38 million), soybean oil (37 million) rape seed oil (18 million) and sunflower oil (11 million). A large portion of the four leading oils is traded internationally, whereas only 10% of the cotton seed oil produced is traded internationally. Cotton seed oil trades at between US\$600 and US\$700 per ton. (Tschirley, 2009)

Table 5. World cotton seed oil production 2014/15, consumption and trade in `000 mt

Country	Production	Consumption	Exports	Imports
China	1396	1387	9	0
India	1320	1295	1	0
Turkey	185	155	1	2
U.S.A.	277	193	59	8
E.U	50	43	0	1
Others	1897	1624	76	57
World Total	5125	4511	141	66

Source: CDT

In Africa the leading producers of edible cotton seed oil are Mali-470,000 metric tons, Burkina Faso-360,000 metric tons, Cameroon-290,000 metric tons, Benin-240,000 metric tons, Nigeria-160,000 metric tons, and Ivory Coast at 140,000 metric tons.

Within ESA/SADC the leading producers are Tanzania-60,00metric tons, South Africa-60,000, Zimbabwe-60,000 metric tons, Mozambique and Madagascar both with 50,000 metric tons.

The cotton by-products developed in Zambia must be the ones with potential to contribute significantly to the socio-economic development and GDP of the country, must contribute to industrial development, particularly rural, to employment generation especially for the women and the

youth, increased export earnings (or to reduced imports) and to the increased incomes of cotton farmers. They must also be environmentally friendly and to contribute to the preservation of the environment and natural resources. This is in line with important Government policies alluded to earlier.

The cotton seed edible oil industry clearly exhibits such potential. Furthermore, the development of the cotton edible oil presents opportunities for further downstream value addition in the manufacturing of cotton cake and meal used in the manufacture of stock feeds. Table 6 below illustrates the edible oil potential for Zambia.

Table 6. Imports and exports of edible oils Zambia 2007-2012 in metric tons

Year	Refined oil	Crude Oil in	Exports
2007	29333.64	14804.06	19028.16
2008	13238.12	13702.33	20923.02
2009	24761.48	36290.91	5272.40
2010	17393.01	62892.67	1455.36
2011	7258.70	37456.94	43414.39
2012	10163.85	26530.05	56955.39

Source: IARPI

Although the data on the regional edible oil markets is unavailable and incomplete, the Zambia production and market scenario seems to be similar in most countries in the region. i.e. more imports and refining of crude oil, less local processing of locally produced raw seed materials. The imports of crude oil are increasing (mofya mukuka, 2013).The demand for edible oil is directly related to food consumption and population growth. It is likely that the demand for edible oil can grow marginally on the sole basis of increased population (at 2.94% p.a. 2016 est. ADB) but not on the basis of increased incomes as the GDP growth at (3.7%) is still declining and incomes have drastically reduced and food inflation is high at more than 23%.Despite this the demand is expected to be stable.

6.1.1. Current status of edible oil in Zambia

National edible oils consumption in Zambia is not easy to determine, firstly because data on this is not captured in survey data. Secondly, it is difficult to determine the true consumption levels when there are so many informal and in most cases illegal imports that have not been recorded. Regardless of this, estimates on consumption have been made based on a number of assumptions.

If total domestic production of edible oils in 2012 was 40,096 tons and imports were at 104,383 tons then total supply in 2012 stood at 143, 789 tons. Of the total supply of edible oils, 28.5% is supplied from local production. If Zambia then exported 24,039 tons in 2012, then the nation consumption in that year stood at 120,493 tons of edible oil. This means that of the total requirements 33.27% was locally produced and 66.73 5% was met by imports. On the other hand, it must be noted that the 40,096 tons of locally produced edible oils also consisted of imported raw materials and that only 23,034 tons was manufactured wholly from local products. This means that only 19.12% of the total national consumption is supplied from refined oil manufactured from local raw materials.

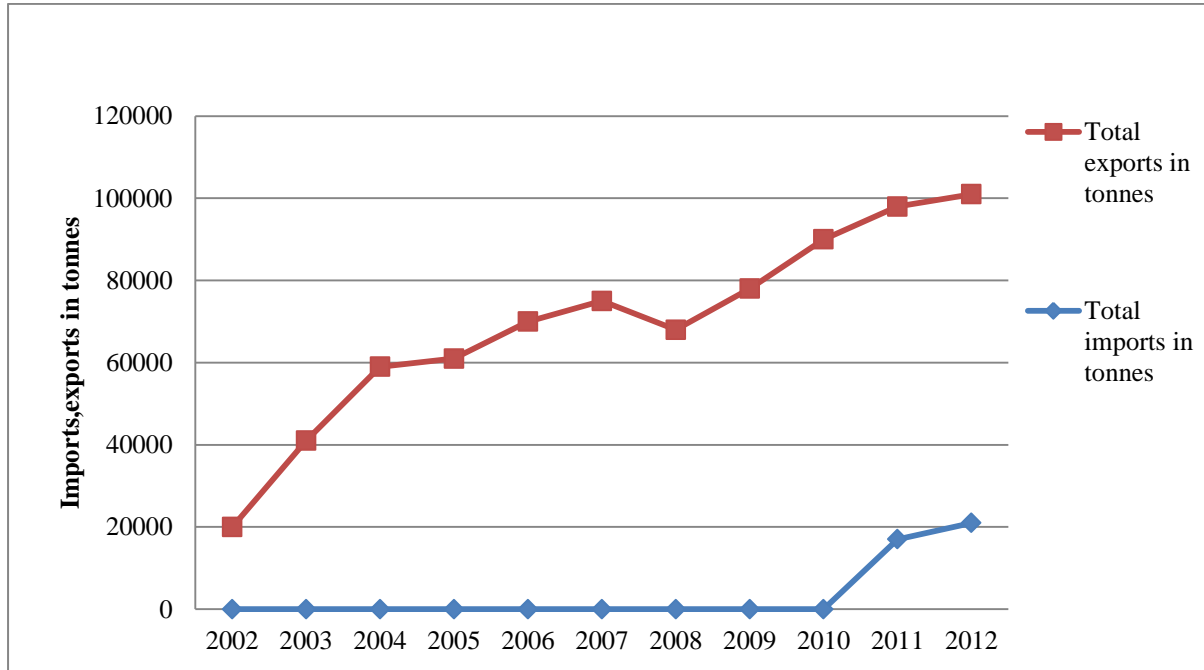
Table 6. Imports, exports and local production/consumption of edible oils in mts

Category	Metric Tons
1. Domestic Edible Oil	40,000
2. Total Imports (semi processed + Refined)	104.38
3. Total National Supply	144.47
4. Total Exports from Zambia	24.03
5. National Requirements	120.39
6. Domestic Supply	33.27
7. Local Oil Seeds	19.12

Source: IAPRI

The national edible oil requirements stand at 120,000 metric tons of which only 40,000 metric tons is locally produced representing about 33% of the national requirements. It could not be established how much out of this constituted cotton oil but if anything it must be negligible. The Figure 6 below illustrates the status portfolio of edible oil in Zambia based on 2012 production data.

Figure 6. Zambia's edible oil imports and exports



Source: Tschely, Kabwe, 2013

The extraction of edible oil from cotton seed presents the best and broadest potential for socio-economic benefits and opportunities for Zambia. There exists relatively better technological and infrastructure base with an already existing processing capacity of 161,000 tons and an enabling investment policy framework for edible oil extraction from cotton seed. There is relatively better general awareness for edible oil extraction than there is for the utilization of cotton stalks into the manufacture of particle boards and for domestic fuel. Potentially Zambia can produce 18,750 metric tons of edible oil from cotton seed per annum. Assuming a national annual seed cotton production of 275,000 metric tons at 57% seed weight, less 20% planting seed and at 15% oil content. The 18,750 metric tons of edible oil is worth US\$ 12,187,500 at US\$650 per metric ton.

Edible oil industry plays an important role in the economy of Zambia. It employs about 20,000 people in the production process. The demand for oilseeds has increased in Zambia over the last ten years (Table 6 and Figure 6 above). This demand is currently being met through imports of palm oil, rather than through domestic production Zambia has the capacity to produce up to 200,000 metric tons of cotton seed per year but currently produces about 98,000 of cotton seed, which if efficiently processed into edible oil can produce about 20,000 metric tons of edible oil. This constitutes about 10% of the national requirements which currently stands at 144,000 metric tons.

6.1.2. National edible oil requirements

The national requirement for edible oils in Zambia on the basis of national consumption estimates is estimated at about 120,000 tons per year. Of this amount, 33% is supplied by domestic production 67% is supplied by imports of refined, semi-processed and crude edible oils. Edible oils manufactured domestically from local raw materials only constitute almost 20% of the national requirement. Despite having a larger proportion of edible oils supplied by imports, Zambia has more than enough installed capacity to supply all its edible oils requirements with its installed processing capacity of more than 161,000 tons of refined edible oils which corresponds with a crushing capacity of 375,000 tons of oilseeds per year.

Actual refined edible oils production only accounts for a paltry 25% of installed capacity and most of the edible oils refined are refined from imported crude oil and semi-processed oil. The actual oilseeds crushed amounts to around 160,000 tons which goes to satisfy demand for both edible oils and stock feed. It appears that oilseed demand for stock feed to supply the rising poultry demand is a major off-taker of oilseeds. Oilseeds demand from the edible oils sector is limited because of imported crude and semi-processed edible oils offering stiff competition to domestically produced edible oils. As a result of imported edible oils, processors have less incentive to utilize local oilseeds in the production process. It is cheaper for them to import crude and semi-processed oils for refining domestically. Further, evidence shows that semi-processed oil imports have escalated surpassing crude oil imports by 2012.

Although the SADC region accounts for a larger share of Zambia’s edible oil imports, trends show a rapid increase in Asian imports most of which are semi-processed and crude oils. The 2013 data already indicates that more imports are originating from Asia.

Illegal edible oils are imported mainly through false declarations, circumvention of border authorities and undervaluing of products. This is as result of weaknesses in the enforcement mechanism of importation regulations. Zampalm a subsidiary company of Zambeef is in the process of establishing a palm oil plantation and a palm oil plantation in Northern Zambia. This is a risk to Zambia edible oil raw seeds including cotton seed as it will increase competition although it may improve efficiency in the sector. Cheap imports of crude palm oil is the biggest risk to the development of cotton seed oil in Zambia.(Chisanga, Sitco) 2013. Zambia s advantage in the promotion of cotton seed oil is its resilient seed cotton production which provides stable supply of raw material. Zambia’s central geographic position and road link to the ESA and SADC regions gives it some logistical advantage. The processing capacity of cotton seed oil is already established (161,000 metric tons).

The development of cotton seed oil utilization should be given first priority because of its potential to offer the best benefits (25% of the cotton production value chain), including downstream value addition in the form of cotton cake. The investment can operate initially at 75% capacity the first year and 80% the second year as personnel are trained on job and at 100% the third year. The cotton cake/meal can follow just after the first year because the two are directly linked.

The establishment of the cotton stalk can be the third because adequate feasibility and viability studies need to be conducted as it is a 100% new industry in Zambia and in the region.

6.2. Cotton seed cake and meal

The most complete data is from 2008/09 when 14.7 million tons was produced worldwide. Cotton seed meal is mainly used in countries cotton is produced. The most important producers are China, India, Pakistan, U.SA, Australia, Brazil and the U.S.A. These countries account for 80% of world production and about 75% of consumption (Table 8 below).Cotton cake is used to feed adult ruminants who are relatively tolerant to gossypol. It can be a good source of protein for monogastrics provided that it is given in tolerable amounts, notably the fibre content and presence of gossypol.

Table 8. World production of cotton seed cake

Country	Production in ‘000 mt
India	3999.0
China	3400.0
Pakistan	1442.0
Brazil	950.0
U.S.A.	812.0
Total	10603.0

Source: Tanksly1990:Chiba2001

The important importers of cotton seed cake are South Africa, 71.2%, South Korea 23.6%, Bangladesh 8.2%, Nepal, Thailand and Mauritius.

In Africa the most important producers are Mali, Burkina Faso, Cote d'Ivoire, Benin, Tanzania and Nigeria.

In East and Southern Africa the most important producers are Tanzania, Uganda, South Africa, Zimbabwe, Mozambique and Madagascar.

6.2.1. *Livestock industry and the cotton by-products*

As stated earlier the domestic demand for cotton seed cake was in the nineties and early 2000s driven by the livestock feed industry. The livestock industry is a US\$1.5 billion major sector of the Zambian economy constituting 35% share of the agriculture share of the GDP. In recent past the sector has been experiencing stable growth of between 7% to 10% annually. In the traditional sector livestock provides 6% of household income and 20% of household assets. The dairy industry is also an important sub-sector of the livestock industry in Zambia producing an average of 65,000 metric tons of milk worth US\$39 million annually. The traditional sector currently produces 80% of national milk production. A big number of milk producers are also cotton farmers (about 50,000). Despite the potential, livestock development is impeded by a number of challenges that limit its development. Poor quality and inadequate stock-feed is among the important impediments to increased productivity in dairy and beef production (MLFLD 2013). Table 9 below compares Zambia with other countries in the region on dairy and beef productivity.

Table 9. Productivity of beef and dairy in Zambia

Country	Beef - Carcass weight	Country	Dairy - Liters/cow/day
S. Africa	265	S. Africa	15.2
Zimbabwe	222	Kenya	15.1
Botswana	190	Botswana	9.6
Zambia	160	Zimbabwe	8.6
Kenya	150	Zambia	8.2

Source: MFLD

The development of cotton seed cake/meal in Zambia is, therefore, inseparable from the development of livestock industry.

We could not be availed adequate data on the production and trade on cotton seed cake in Zambia but estimations can be made from the amount of seed produced. At an annual average national production of 160,000 metric tons of seed cotton Zambia has the potential to produce 72,000 metric tons of cotton seed cake annually.

Risks applying to the development of cotton seed oil in Zambia stated above also apply to the development of cotton seed cake. The main advantage for Zambia's development of cotton seed cake is it a robust livestock sector.

Table 10. Projections of cotton cake/meal yield and value @ 2% annual growth

Year	Yield in MT Seed cotton	Yield of Cotton Seed	Yield Cotton Seed Cake	Value in USD
2017	160,000	96,000	72,000	2,448,000
2018	163,200	97,000	73,440	2,496,960
2019	166,464	99,878	74,908	2,546,872
2020	169,793	101,875	76,407	2,597,838
2021	173,188	103,912	77,935	2,649,790

Source: Author

6.6. *Cotton stalks*

The use of cotton stalks in the manufacture of particle and hard board, pulp and paper offers a new alternative to the use of forest wood which to date has supported the wood and wood products industry (CIRCOT, 2009). As the forest becomes scarce and expensive and more concerns are raised

about the rate of deforestation the use of other raw materials other than wood in the manufacture of the above products becomes not just a choice but a necessity. CIRCOT in India has developed the technology to commercially utilize cotton stalks which have similar properties as forest wood, in the manufacture of particle and hard boards, pulp, corrugated boxes and paper.

6.3.1. Cotton stalks and wood products

Zambia faces a serious problem of deforestation, but, it is ranked No 24 on the world cotton production and trade by the International Cotton Advisory Committee (ICAC). According to the UN FAO between 1990 and 2010, Zambia lost an estimated average of 166,600 ha per year of forest or 0.32% of forests. In total 6.3% of Zambia's forests cover 3,332,000 ha. Since the cotton stalk products are not yet on world production and trade, we may use the current world trade in wood and wood products to illustrate the sector trade dynamism. World trade in particle boards and other wood products is an important one in the world economy and represents a US\$7.88 Billion trade. In 2014, Canada and Germany were the main suppliers of particle board and similar board of wood with combined share of 28% of global exports in physical terms and 26% in value terms. However the fastest growing suppliers from 2007 to 2014 are Romania and Latvia. Austria and France are important suppliers.

In 2014, the U.S and Germany were the leading importers with 18% and 10% market share respectively together making up 42% of global imports in physical terms and 39% in value terms. Italy, Poland and Russia were also important importer of particle wood and similar board s of wood imports.

SADC exports

South Africa dominates the region in terms of exports to all major markets-EU, NAFTA, and East Asia. Mozambique, Tanzania and Madagascar show some potential although they still lag behind South Africa.

Table 11. SADC export of wood products by country (in US\$)

Country	EU,2004 Exports	Growth '00-'04(%)	NAFTA Exports	Growth '00-'04 (%)	East Asia 2004 Exports	Growth '00-'04 (%)	Total Exports
South Africa	127679	21	40146	23	461263	15	627,088
Madagascar	4404	158	287	-8	2716	33	74,401
Mozambique	41072	-32	89	-4	28028	90	32,189
Tanzania	2511	-21	489	-5	14569	-10	17,568
Zimbabwe	717	-54	2925	-14	-	20	3642
Swaziland	517	3	202	-	252	-1	971
Zambia	182	92	762	82	20	-100	964
Total Exports	140,082	168	44,898	74	506,848	48	691,829

Source: UNCTAD/WITTS

SADC wood exports to NAFTA and East Asia seem sustainable because of the regions strong construction and furniture industries. It is evident that SADC's overall export performance is not satisfactory .To increase their wood products exports and be able to access the major international markets successfully these countries have to improve their production capacity improve their infrastructure, improve their production capacity and increase their skills.

The biggest importer of SADC wood products is the East Asia Region with China as the major importer followed by Japan. China also imports wood from SADC for its construction industries. The main competitors with SADC for the Chinese market are the U.S., the EU, Japan and Canada, all major exporters. NAFTA offers potential opportunities for SADC wood exports, however SADC faces potential competition from Canada and Mexico because of their high quality products and are situated much closer to the NAFTA region with resultant lower transport and logistics costs.

6.3.2. Prospects of cotton stalk utilization in Zambia

In Zambia for every hectare of cotton a farmer harvests from the field, three metric tons of cotton stalks are left in the field. (CIRCOT,2005).Despite phytosanitary regulation that requires farmers to clear and burn cotton stalks by 31 October of each year few farmers do so and cotton stalks are left in the field to be heaped and burnt just before the on-set of the rain in November (CDT, 2006). Country wide, it means about 372,000 metric tons of cotton stalks go to waste every year.

India, through the Central Institute for Research on Cotton (CIRCOT) has developed the technology to collect, prepare and process the cotton stalks into paper, particle board, corrugated cases .The studies in India have found that establishing processing plants to manufacture particle board and other products to be feasible. The 20 TPD plant can produce 7,392,000 square feet of board per annum from 6000 hectares of cotton yielding about 1000 kg/ha seed cotton or 9000 tons of cotton stalk. Theoretically assuming that 10% of Zambia's annual cotton stalks of 300,000 hectares,30,000 ha are processed annually into particle board, they will produce 36,9 60,000 square ft. of particle board.

Geographical and logistical factors will decide where and how much cotton stalk can be processed in an economically viable scenario increasing production by 15% every year as personnel are trained on job. The highest concentration of cotton growers in Zambia is in the Eastern Province.

Table 12. Six year annual estimate of production of particleboard production in square feet

Year	Amount of hectares	Amount of particle board in sq.ft.
2019	30,000	36,960,000
2020	30,600	37,699,200
2021	31206	38,445,792
2022	31,830	39,055,410
2023	32,466	39,998,112
2024	33,115	40,792,752

Source: Author

The utilization of cotton stalks for the manufacture of particle boards in Zambia can supplement the low incomes of cotton farmers from the sale of seed cotton to ginning companies. In India farmers are paid US\$13 for one hectare worth of cotton stalk. This can also clear the fields and help enforce the Zambian phytosanitary regulations.

The manufacture of particle boards in Zambia currently depends 100% on forest raw materials which are becoming scarce and expensive with mukwa and rosewood now priced at between USD500 and USD 800 per cubic meter from USD300 in 2010.The utilization of cotton stalks in particle board manufacture will reduce dependence on forest raw materials and help address the environmental and deforestation concerns.

The use of stalks in particle board manufacture will result in the setting up of industries in the rural areas where cotton is grown which will generate jobs for the youth and contribute to skill improvement.

In India the cost of the cotton stalk raw by-product material at US\$ 40 per metric ton has proved to be cost effective comparing better to bagasse at US \$ 64, wood at US\$70 and favorably to rice husk at US\$ 40.Furthermore cotton stalk at only 10% contains less moisture than wood at 40%.This is a desirable parameter in the manufacturing process of particle boards.

6.7. Issues for UNCTAD mission and Zambia cotton by-products stakeholders

Having interacted with some cotton by-product stakeholders in Zambia over this period (August to October, 2016) the following are the most often raised issues and questions asked:

1. The first obstacle that confronts one who develops interest in the development of cotton by-products in Zambia is the general lack of information and data which is inadequate, outdated and difficult to access. What can be done to improve information and data availability? The lack of

information has to a large extent contributed to the general lack of awareness. Improving the information and data collection and availability will improve awareness. Strengthening stakeholder linkages and coordination will also improve information flow. The strengthening of CBZ monitoring and data collection will help improve information availability and flow. The CBZ was mandated to set up a data base on the cotton industry. The CBZ is currently facing funding problems and are struggling to fulfill their mandate. (CBZ, 2016)

2. The current policy on agriculture, on investment and on manufacturing is inadequate for the efficient development of cotton by-products. Whereas the development of cotton production and the cotton-lint-yarn- to- textiles value chains are emphasized and highlighted and specific policy objectives and strategies formulated and are included in important policy documents, the development of cotton by-products is largely missing or covered in general policy provisions (National Agricultural Policy 3004-2014, the Zambian Investment Act 2006, the Commercial Trade and Industrial Policy 2000, the National agricultural Investment Program 2009-2014, the Strategy Paper on Industrialization and Job Creation 2013 etc.). How do we improve the agricultural, investment and manufacturing policies so as to improve the policy framework for the development of cotton by-products in Zambia? The UNCTAD Project on the Development of utilisation of Cotton by-Products in ESA is addressing this problem.

3. The current macro-economic environment in Zambia seems unfavorable for both FDI and domestic investment. Although Zambia has a current ease of doing business rating of 97%, Zambia's competitive index is only 3.60 points and competitive ranking is at 118.0. Zambia's interest rates and deposit interest rates are currently at 15.50% and 8.99% respectively. Inflation rate is currently at 18.90%. These factors, particularly, inflation, make the cost of investment and access to local financing expensive. How do you improve the macro-economic environment or what incentives do you offer to compensate investors? Attracting investment depends on improving the ability to provide favorable investment environment and a competitive factor of production. One of the solutions is to ask for specific incentives and preferential consideration from the Ministry of Finance and the Ministry of Commerce, Trade and Industry. Also to utilize the Multi-Economic Facility Zone which offers certain allowances?

4. How do you insure stable and increased supply of raw materials? At present accessing raw materials (cotton seed, cotton seed cake) by local non-ginner edible oil processors and livestock manufacturers is a problem. Most of them import crude oil from the Far East (100,000 metric tons) and all utilize soya beans and sunflower seed as all three considered cheaper (Mofya Mukuka, 2014). Personal communication with oil and stock feed manufacturing firms has revealed that the cotton seed from ginner obtained locally is overpriced at more than USD250 per ton. (It is exported to South Africa and Botswana). But the ginner own almost all the cotton seed in Zambia. How do we improve the availability of locally produced cotton seed to local edible oil and stock feed manufacturing mills so that they can be value added locally to maximize benefits to the domestic industry and economy? This is both a policy and sector coordination issue and can be addressed both ways through policy and legislative measures, and, by the stakeholders involved through negotiations and improved linkages and coordination.

5. According to oil manufacturers in Zambia, locally produced edible oil competes unfavorably with imported and smuggled edible oil which is cheaper on the Zambian market. This is the major disincentive to local oil pressing firms (Mofya Mukuka, 2014) who are compelled to import crude oil raw materials from the Far East (100,000 metric tons). For the local oil industry to develop, the unfair competition has to be addressed in order to protect the local oil industry. The tariffs on imported edibles oil and VAT can be examined.

6. The national production of seed cotton has over the last decade remained between 110,000 metric tons and 168,000 metric tons, the number of farmers has also lingered around 300,000, the farmer average yield per hectare has also remained around 750kg/ha. Although relative stability has been maintained in the production of seed cotton during the last four seasons, the levels of production averaging about 115,000 mt tons per year are not adequate to insure sustainability of locally based cotton by-product industries. How do you stimulate the increased production of seed cotton so as to insure adequate supply of raw materials to cotton by-products to industries? a) by increasing productivity of cotton farmers through improved farm skills and market incentives b) by attracting more farmers to production. Again by providing incentives to new farmers.

But what else can you do because these are the two strategies we have used during the last two decades with very limited results? The enhanced farmer participation in downstream value addition may be part of a solution.

7. Among the weaknesses in the cotton value chain are the poor coordination within the stake holder organizations and among the various players in the value chain. Relative harmony is essential for the efficient development of the sector. Weakness in one part of the value chain affects the viability of the whole value chain. The rampant side-buying of cotton in the Zambian industry is partly a result of poor coordination among the cotton ginners in Zambia. Up to 15% of cotton is side marketed every year (CDT 2011). The other example is the large discrepancies in content in the in-put package given to farmers and big differences in price and interest on credit every year. How do you improve linkages and coordination within the value chain?

8. There is inadequate enforcement of existing regulatory framework of the cotton sector particularly on honoring of contracts. Currently the Credit Act and the Cotton Act 2005 regulate the cotton industry. Failure by farmers to pay back crop loans by side selling their seed cotton produced with credit support of ginning companies poses a serious threat to the sustainability of the cotton value chain. The law of ratooning of cotton is poorly enforced leading to an increase in bollworm pests which in turn leads to increase in the cost of cotton pest control. The export of cotton products is poorly managed. (CBZ, 2016) In addressing this, we may suggest the following: a) Improve inter-stakeholder consultations through improved linkages and coordination. The Cotton Board should play a leading and facilitating role; .b) Strengthen the capacity of regulatory enforcement agencies especially the Cotton Board of Zambia.

9. Farmers have cynically asked “why should we support efforts which in the end only benefit the ginners”. Cotton farmers feel aggrieved with the low benefits they get from cotton production and are even more aggrieved by the perceived lucrative benefits the cotton ginners get from the cotton processing and trade. Many economists have looked at this issue and have made the following observations. Low productivity is quoted as the main cause of low benefits of cotton farmers from their efforts. At yields less than 600kg/ha farmers will make losses if they cost their labor. A small hectares cultivated by majority of cotton farmers cannot offer substantial benefits. At a yield of 600kg/ha farmers have to plant at least one hectare or more to make a profit. The issue is how else do we increase the benefit of farmers from the value chain and what incentives do we provide to cotton farmers who are the majority in the value chain?

10. High cost of finance in Zambia. This is mainly the high interest and deposits rates at 15.50% and 8.99% respectively. These are high compared to other countries in the region. Ginning companies borrow from banks every season to finance the input credit to the cotton farmers. The high interest rates limit the amount they can borrow and this leads to reduced number of farmers supported and reduces the content of the support package to farmers leading to compromised crop husbandry and ultimately to poor yields. This was clearly demonstrated in the 2007 when production fell drastically from the previous 137,000metric tons to about 65,000 metric tons as a result of reduced credit to cotton farmers by the cotton ginners.

11. Some unfavorable investment conditions. The Zambia Development Agency Act of 2006 has what some call discriminatory clauses for would be investors. The act provides for screening of investors. The Act also has some restrictions on employment of foreign nationals and on the acquiring of land.

12. The UNCTAD Project on the Utilization of Cotton by-Products in ESA has no face in Zambia. Make it visible.

Appendix I. Summary table for cotton by-products stakeholders in Zambia

1.0.0.Legislators/ policy makers	2.0.0.FarmersOrganisations	3.0.0.Ginning Companies	4.0.0.Textiles and Garments	5.0.0.Edible Oil Firms	6.0.0.Wood Industry
1.0.0. National Assembly	2.0.0.Zambia National Farmers Union(ZNFU)	3.0.0.Zambia Cotton Ginners Association	4.0.0.Zambia Association of Manufacturers(ZAM)	5.0.0.Edible Oil manufacturing Companies	6.0.0.Wood Industry Products Main Firms
1.1.0 Parliamentary Committees	2.0.1.Cotton Association of Zambia(CAZ)	3.0.1.NWK Agribusiness	4.0.0.Textiles Producers Association of Zambia and Clothing Association of Zambia	5.0.1.Zamanita	6.0.1.SAPCO Fibre Board and Wood Products Ltd
1.1.1.Agriculture	2.0.2.Dairy Association of Zambia(DAZ)	3.0.2.Cargill Cotton	4.0.1.Mukuba Textiles	5.0.2.Mt. Meru	6.0.2.Supersonic International (Z)Ltd
1.1.2.Finance	2.0.3.Beef Producers Association of Zambia	3.0.3.Grafax Cotton	4.0.2.Kays Textiles	5.0.3.Continental Ginneries	6.0.3.Wood Processing Industries
1.1.3.Livestock	2.0.4.Poultry Producers Association of Zambia	3.0.4. Africa Cotton Company	4.0.3.Mulungushi Textiles (Z) Ltd	5.0.4.Cargil Cotton	6.0.4.Zambia Forestry and Forest Industries Corporation (ZAFFICO)
1.1.4.Commerce, Trade &Industry	2.1.0.Smallholder Dairy Cooperatives	3.0.5.Africa Global Development Corporation (AGDC)	4.0.4.Unity Garments	5.0.5.Chipata Cotton Ginneries	
1.1.5.Lands and Environment	2.1.1.Magoye	3.0.6.Continental Ginneries	4.0.5.HandloomTextiles Technology Association of Zambia(HATTAZ)	5.0.6.China Africa Cotton	
1.2 Ministries	2.1.2.Mpongwe	3.0.7.Manjeet Cotton Company		5.0.7.African Foods	
1.2.1.Agriculture	2.1.3.Mapepe	3.0.8.Alliance Ginneries		5.0.8.Saka Ginneries and Oil Expellers	
1.2.2.Finance	2.1.4.Monze	3.0.9.Justina Cotton Company		5.0.9.Nature Pride	
1.2.3.Livestock	2.2.0.Processing Firms	3.0.10.Mumbwa Farmers Cotton Ginnery &Crushing Association			
1.2.4.Commerce, Trade &Industry	2.2.1.Parmalat (Z) Ltd				
1.2.5.Lands and Environment	2.2.2.Zambeef(Z)Ltd				
	2.2.3.Zambia Pork Products				

Continued Appendix I

7.0. Stockfeed Manufacturers	8.0. Regulatory/Coordination/ Research & Development	9.0. Banking Institutions	10.0. Investment Agencies	11.0. Others
7.0.0. Stockfeeds manufacturing Firms	8.0.1. Cotton Board of Zambia (CBZ)	9.0.0. Bankers Association of Zambia	10.0.1. Zambia Development Agency (ZDA)	11.0.1. Citizens Empowerment Fund (CEEF),
7.0.1. Olympic Milling	8.0.2. Cotton Development Trust	9.0.1. Development Bank of Zambia	10.0.2. Zambia Investment Centre (ZIC)	11.0.2. Small and Medium Sized Enterprises (SMSES),
7.0.2. Tiger Feeds	(CDT)	9.0.2. Investrust Bank (Z) Ltd		11.0.3. Non-Governmental Organisations (NGOs) e.g. World Vision, SNV
7.0.3. Nutri Feeds	8.0.3. Seed Control and Certification Institute (SCCI)	9.0.3. Indo-Zambia Bank		11.0.4. Donor Agencies
7.0.4. Quality Feeds	8.0.4. Indaba Agricultural Policy Research Institute (IAPRI)	9.0.4. Zambia National Commercial Bank		
7.0.5. National Milling	8.0.5. University of Zambia (UNZA)	9.0.5. Barclays Bank (Z) Ltd		
7.0.6. Rod Macloude	8.0.6. Zambia Agricultural Research Institute (ZARI)	9.0.6. Standard Chartered Bank		
7.0.7. Choma Milling				

References

1. Cotton Production Handbook for Zambia, Cotton Development Trust, 2005. By West K. Chitah
2. Cotton News. Cotton Development Trust 2007, 2008.
3. Cotton-Textiles Apparel Value Chain Report Zambia, 2003, RATES, rates@ratescentre.org
4. Cotton Board of Zambia, 2015, Taking the Cotton Industry Forward.
5. A Case Study of Regulations in Zambia's Cotton Sector. FSRP Working Paper No 45. April, 2010
By David Tschirley and Steven Kabwe
6. Utilisation of Cottonseed By-Products. CIRCOT, Matunga, Mumbai-400 019. R.H. Balasubramanya and A.J. Shaikh.
7. Conservation Farming Adoption among Small holder Cotton Farmers in Zambia 2002-2010, by Steven Kabwe, Phillip P. Grabowski, Steven Haggblade and Gelson Tembo. IAPRI, 2014, Policy Brief No.64, Lusaka, Zambia. <http://www.iapri.org.zm>
8. Utilisation of Cotton Stalk in Production of Particle Boards. A.J. Shaikh, R.M. Gurjar, R.H. Balasubramanya and P.V. Varataraga
9. Impacts of Government Maize Support on Smallholder Cotton Production in Zambia. By Joseph Christopher Goeb. 2011
10. Causes and Consequences of Low Prices in the Cotton Sector. By Aluisio de Lima, Economic Advisor, Embassy of Brasil, Washington, 2002. Conference on Cotton and Global Trade Negotiations.
11. Utilisation of Cotton by-Products for Value Added Products. A Project Paper for the Cotton By-Product Utilisation prepared by the Central Institute for Research on Cotton Technology (CIRCOT), Mumbai, India.
12. Improving Africa Cotton Quality. ITC. Technical Paper, 2013 ix Doc No. MAR-13-230-E
13. Technical Efficiency: Are Zambian Farmers Lagging Behind? By Steven Kabwe, Thelma Namonje and Brian Chisanga. Working Paper No.111, IAPRI, Lusaka, Zambia (File working paper 111)
14. Farm Productivity and Market Structure –Evidence for Cotton Reforms in Zambia. By Irene Brambila and Guido G. Porto, July 2005, Center Discussion Paper No.919, Economic Growth Centre, Yale University.
15. Brian Chisanga and Nicholas J. Sitco –The National Consumption Requirement Study for Edible Oils in Zambia, IAPRI, 2013.
14. Livestock Sector Brief, UN-FAO, 200615-Profile of the South African Cotton Value, Directorate Marketing, Department of Agriculture, Forestry and Fisheries, 2011, www.daff.gov.za.
16. Rhoda Mofya-Mukuka, Brian Chisanga and Mary Lubungu. Bridging the Edible Oil Gap, IAPRI, 2014.
17. Herbert Jauch and Rudolf Traub-The Textiles and Clothing in Zambia, Bonn: Friedrich-Ebert-Stiftung-2006.
18. E. Fleming, 2001, The Zambian Cotton Sector in Early Post Reform Period 1994-2002.