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Cottonseed, oil, and cake: Co-products or by-products in the C-4 cotton sectors?

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Title

Cottonseed, oil, and cake: Co-products or by-products in the C-4 cotton sectors?

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Table of Contents

List of Tables	iii
List of Figures	iv
List of Boxes	iv
List of Acronyms	v
Forward	vii
Executive Summary	x
Acknowledgements	xvi
1. Context: Adapting to change in the C-4	1
2. Objectives, research questions, and hypotheses	6
2.1. Objectives.....	6
2.2. Research questions and hypotheses	7
3. Conceptual framework and methods	9
4. Comparative overview of C-4 cotton sector structures and performance indicators	13
4.1. Farm	13
4.2. Ginning level.....	14
4.3. Crushing level	15
4.3.1. Structure, capacity and ownership patterns by country	16
4.3.2. By-product markets.....	18
4.3.3. Policy environment	19
4.3.4. Performance indicators.....	21
5. Overview of C-4 cotton pricing mechanisms	23
5.1. Salient characteristics of the C-4 pricing mechanisms	23
5.1.1. Putting mechanisms in place.....	23
5.1.2. Base prices.....	24
5.1.3. Final reference price and calculation of supplementary payments	26
5.1.4. By-product valuation	28
5.2. Cross-country comparison of C-4 producer prices	28
6. Diagnostics: Are by-product price signals well reflected in the producer prices set by pricing mechanism?	31
6.1. Parity Price Analysis.....	32
6.1.1. Data considerations.....	34
6.1.2. Interpreting the results	35
6.2. Implied Profit Margin Analysis	38
6.2.1. Overview and definitions	38
6.3. Calculating the Marketing Margins.....	41
6.3.1. Interpretation of Marketing Margins	44
7. Price Mechanism Simulations	47
7.1. General Approach.....	47
7.2. Discrepancies between the simulated base case and actual realized producer prices	47
7.3. Country Specific Methods and Results.....	48

7.3.1. Mali.....	48
7.3.2. Chad.....	50
7.3.3. Developing a Lint Reference Price for Benin and Burkina Faso.....	52
7.3.4. Benin.....	53
7.3.5. Burkina Faso.....	55
7.4. Summary of Simulation Findings.....	57
8. Conclusions.....	61
8.1. Summary of key findings.....	61
8.2. Recommendations.....	64
References Cited.....	66
Appendices.....	68
Appendix 1: Characteristics of the cotton farming sector in the C-4.....	68
Appendix 2: Characteristics of the ginning sector in the C-4.....	70
Appendix 3: Characteristics of the oil processing sectors in the C-4.....	72
Appendix 4: Characteristics of seed cotton price mechanisms in the C-4 countries.....	79

List of Tables

Table 1.	Area planted in cotton by C-4 countries	13
Table 2.	Numbers of cotton farms and population dependent on cotton production	13
Table 3.	Selected performance indicators of C-4 oil seed crushing firms	22
Table 4.	Evolution of the Cotlook A index in U.S. cents and FCFA	26
Table 5.	Diagnostic Tool 1: Local Cotton Parity Prices	33
Table 6.	Summary of costs used for parity prices: Burkina and Mali.....	34
Table 7.	Summary of costs used for parity prices: Chad and Benin.....	35
Table 8.	Results from Equation (1): Seed cotton LPP using ginner cottonseed sales price as reference price.....	37
Table 9.	Results from Equation (2):Oil and cotton cake prices used as reference price for estimating LPP of cottonseed.....	37
Table 10.	Method 2: Cottonseed LPP used as Reference Price for seed cotton LPP	38
Table 11.	Diagnostic Tool 2: “Implied” profit margins analysis	39
Table 12.	Average contribution of cotton end products to the synthetic margin: 1999/00 to 2008/09.....	46
Table 13.	Parameters Used for the Final Producer Price (“ <i>rémunération finale</i> ”) in Mali	48
Table 14.	Mali simulation results	50
Table 15.	Parameters Used to Calculate the Final Producer Price in Chad	51
Table 16.	Chad simulation results.....	52
Table 17.	Parameters used to calculate the base price (<i>prix d’acompte</i>) in Benin.....	53
Table 18.	Simulation results for Benin.....	55
Table 19.	Parameters used to calculate the floor price (<i>prix plancher</i>) in Burkina Faso.....	55
Table 20.	Simulation results for Burkina Faso using 95% tunnel value	56
Table 21.	Cross-country comparison of selected simulation results.	58

List of Figures

Figure 1.	Cotton lint to oil price ratios: 1960 - 2008.....	1
Figure 2.	Seed cotton production in the C-4.....	2
Figure 3.	Area planted to cotton in the C-4	2
Figure 4.	Seed cotton yields in the C-4.....	3
Figure 5.	World trends in cotton yields (lint equivalents)	3
Figure 6.	Cotton Sector price transmission process.....	10
Figure 7.	Nominal price trends for C-4 cottonseed	20
Figure 8.	Cross-country comparisons of nominal prices for seed cotton.....	30
Figure 9.	Nominal price trends for by-products in FCFA/kg: 1999/00 to 2008/09.....	43
Figure 10.	Marketing margins for C-4 cottonseed crushing operations.....	44
Figure 11.	Ginner and synthetic margins for the C-4	45

List of Boxes

Box 1.	Highlights of Benin's Price Mechanism Formula	25
Box 2.	Highlights of Burkina Faso's Price Mechanism Formula	25
Box 3.	Highlights of Chad's Price Mechanism Formula	27
Box 4.	Highlights of Mali's Price Mechanism Formula.....	27
Box 5.	Estimating Returns to Processors	35
Box 6.	Average Total Cost and Economies of Scale	40
Box 7.	Calculation of marketing margins from three different perspectives.....	41
Box 8.	Calculations for a 3-year centered moving average lint forecast price.....	53

List of Acronyms

AIC	<i>Association Interprofessionnelle de Coton (Benin)</i>
AICB	<i>Association Interprofessionnelle du Coton du Burkina Faso</i>
AIFO	<i>Association des Industries des filières oléagineuses</i> operating in the UEOMA (WAEMU) trade zone
C-4	Cotton 4 (Benin, Burkina Faso, Chad, Mali) ; the four countries that joined Brazil in filing a complaint against the United States and the European Union for unfair cotton subsidy policies.
CEDEAO	<i>Communauté Économique des États de l'Afrique de l'Ouest</i> (Chad is a member) ECOWAS: Economic Community of West African States
CIF	Cost, insurance, and freight
CMDT	<i>Compagnie Malienne de développement des textiles</i>
CNPC	<i>Conseil National des producteurs de coton (Benin)</i>
CV	Coefficient of variation
DHS	<i>Direction de l'huilerie savonnerie</i> (a subdivision of Cotontchad responsible for cotton oil production)
ESA	East and Southern Africa
FCFA	The currency used in the C-4 (actual meaning of acronym has changed over time)
FOB	Free on board
FUPRO	<i>Fédération des Unions des Producteurs (Benin)</i>
GDP	Gross domestic product
GOB	Government of Benin
GOBF	Government of Burkina Faso
GOC	Government of Chad
GOM	Government of Mali
G-TRI	A crusher's association in Benin
HUICOMA	<i>(Huilerie cotonnière du Mali)</i> Mali's largest cottonseed processing firm (formerly a parastatal)
IA	Interprofessional association (used as general term, not a particular national association)
IBCG	<i>Industries Béninoises des Corps Gras</i>
ICAC	International Cotton Advisory Committee
LPP	Local parity price
OANADA	Name of a website that offers currency exchange data
PTC	Processing technical coefficient (e.g., rate of oil extraction from cottonseed)
SBC1	Simulation base case 1 (for Burkina Faso)
SBC2	Simulation base case 2 (for Burkina Faso)
SHB	<i>Société Huilerie du Bénin</i>
SHSB	<i>Société Huilerie Savonnerie du Burkina</i> (privatized in 1995 as SN-CITEC)
SOCOMA	<i>Société Cotonnière du Gourma</i> (one of three ginners operating in Burkina)
SODECO	<i>Société de Développement du Coton (Benin)</i>

SOFIB	<i>Société Industrielle Barro et Frères-SOFIB Huileries</i> (one of Burkina's industrial sized crushing firms)
SOFITEX	<i>Société des Fibres et Textiles du Burkina</i> (largest ginner in Burkina)
SONACEB	<i>Société Nationale de Commerce et d'Exportation du Bénin</i>
SONAPRA	<i>Société Nationale pour la Promotion Agricole</i> (former Benin parastatal involved in cotton exports; has become SODECO).
UEMOA	<i>Union Économique et Monétaire Ouest Africain</i> (Mali, Burkina, and Benin are members)
UN-SCPC	<i>Union Nationale des Sociétés Coopératives des Producteurs de Coton du Mali</i>
UNPC/B	<i>Union Nationale des Producteurs de Coton/Burkina</i>
UNPCT	<i>Union Nationale des Producteurs de Coton du Tchad</i>
USAID	United States Agency for International Development
USD	U. S. Dollar
WACIP	West African Cotton Improvement Program
WAEMU	West African Economic and Monetary Union (<i>UEMOA</i>)
WCA	West and Central Africa

Forward

During the recent past, world prices of agricultural products and their by-products have experienced substantial volatility. This was particularly noticeable for the price of cotton lint, but since 2007 the world has also witnessed a similar fluctuation in the prices of cotton by-products such as cotton oil, cotton cake, and substitutes for these products such as Asian palm oil. Given that lint prices and those of other products derived from seed cotton have a tendency to move in opposite directions, cotton producers in the C-4 countries (Benin, Burkina Faso, Mali, and Chad) are asking if the existing price mechanisms that set producer cotton prices in their countries are taking into account the true contribution of cotton by-products to the total value of the seed cotton sold by farmers. A parallel question raised by many actors concerns the differences in the prices offered to farmers from one country to the next in the C-4 region. Sometimes these differences cannot be explained by differences in production and transport costs, leading one to ask if the producer prices are really tied to price movements in world markets where all the C-4 countries are selling their cotton lint.

Given the interest of the C-4 countries in these questions, the West African Cotton Improvement Program (WACIP), financed by the United States Agency for International Development (USAID) undertook a study on the role of cotton by-products (referred to as “co-products” in some countries that believe their importance should be elevated) in the cotton sector in general and in the pricing mechanisms in particular.

- A comparative analysis of price mechanisms currently in use and related policies (e.g., subsidies, taxes, etc.);
- A comparative analysis of the organizational and institutional structure of the sectors (production, processing, and marketing) and the by-product subsectors;
- An analysis of the possibilities available to reduce the dependence of the cotton sector on the instability of cotton lint prices via changes in the way that by-products such as cotton seed, oil, and cake are incorporated in the pricing mechanisms that set producer seed cotton prices.

To respond to the questions raised above, researchers from Michigan State University (MSU), in collaboration with national consultants in each country, put in place a research program in June 2009 to identify the appropriate types of analysis, collect the necessary data and test the analytical methods selected with the available data.

The first stage of the work involved the preparation of a national situation report by the consultants in each C-4 country. The consultants’ objectives were the collection and preliminary analysis of information needed to evaluate the hypothesis that a better integration of cotton by-products into the pricing mechanisms would reinforce the sector financially and diminish the risks associated with fluctuations in the world market prices of cotton lint. More precisely, the national studies were to accomplish the following:

- Describe the currently applied price mechanism, significant changes that had taken place in the mechanism since 2000, and the effects of the mechanism on the Government budget, the income of ginners and the incomes of producers.
- Identify and describe (1) current government policies related to the price mechanisms (for example, subsidies, taxes, investments) that affect the costs of production and the incomes of the principal actors (producers and ginners), (2) the evolution of these policies since 2000, and (3) their effects on the government budget, ginners, and farmers.

- Describe (1) the evolution and the size (quantity of products processed, consumed, etc.), (2) the organization (number of actors, vertical and horizontal relations among actors), and (3) the performance of the cotton by-product markets (cotton seed, oil, and cake) from 2000 to the present.
- Identify the constraints to the development of these by-product markets and the types of institutional, political, and technological changes needed to improve the development of these markets.
- Collect and analyze the evolution of prices for cotton lint and by-products since 2000.

The consultants collected information and drafted preliminary reports that were presented at a regional consultants' workshop organized in August of 2009. The major objective of the workshop was to ensure that the work across the four countries was well coordinated and to discuss various options for additional analyses of the data that would be undertaken by researchers at MSU. The four country studies have been completed and will be available as separate documents at <http://www.aec.msu.edu/fs2/cotton/index.htm>:

Ahohounkpanzon, M. and Y. Zakari Allou. 2010. *La prise en compte des co-produits du coton dans le mécanisme de fixation du prix de coton graine au Bénin*. Consulting report prepared for Michigan State University/WACIP.

Bayoulou, J. 2010. *La prise en compte des co-produits du coton dans le mécanisme de fixation du prix de coton graine au Burkina Faso*. Consulting report prepared for Michigan State University/WACIP.

Diakité, Lamissa. 2010. *La prise en compte des co-produits du coton dans le mécanisme de fixation du prix de coton graine au Mali*. Consulting report prepared for Michigan State University/WACIP.

Padacké, Fauba. 2010. *La prise en compte des co-produits du coton dans le mécanisme de fixation du prix de coton graine au Tchad*. Consulting report prepared for Michigan State University/WACIP.

This regional report (also available at <http://www.aec.msu.edu/fs2/cotton/index.htm>) builds on the work of the national consultants by synthesizing some of their key findings about the structure and performance of the cotton lint and by-product sectors and by conducting a variety of analyses to describe (1) the actual role that by-products play in determining seed cotton prices for farmers in the C-4 and (2) the opportunities that exist to improve or stabilize producer seed cotton prices through adjustments in the valuation of by-products. The objectives of the regional report are to:

- Summarize the similarities and differences that exist among the C-4 countries in their price mechanisms and in the organization and performance of their by-product subsectors;
- Present the results of supplementary diagnostic analyses and simulations that were conducted by MSU (1) to evaluate the role played by cotton by-products in prevailing pricing mechanisms and (2) to assess the potential impacts on producer prices for seed cotton if selected changes in the manner in which by-products are handled in the pricing mechanisms were to be implemented.

In January and February 2010, WACIP organized a national workshop in each C-4 country to present the results of the national studies and the preliminary results from the MSU cross-country syntheses, analyses, and simulations. The objective of the workshops was to get stakeholder feedback on the choices the research team had made about data used for various

analyses (i.e., were there areas needing improvement) and on the team's interpretation of the results and their implications. The Benin, Chad, and Mali national reports include summaries of the major topics of discussion at the workshops and recommendations for improvements in the reports, analyses, and national approaches to by-product subsector development. For a variety of reasons, the scheduled workshop in Burkina Faso did not take place. As a result, this report presents the MSU analyses for Burkina Faso with feedback from the national consultant but no feedback from a broader group of stakeholders. All other national reports include an appendix that summarizes the highlights of workshop discussions and recommendations. Feedback from these workshops has been incorporated into this report. In many instances the analytical results presented in this report differ somewhat from those presented at the workshops because we were able to improve the underlying database with assistance from workshop participants.

Three major analytical tools were developed by MSU for the conduct of the diagnostic analyses and simulations. These were developed in Excel so that they would be easily accessible to policy analysts and stakeholders in each country. The tools were also designed in a manner to facilitate future updating and use as new data become available. National consultants were trained in the use of the tools. We did not have time to train other key actors (e.g., members of the cotton sector inter-professional associations, producer organizations, or ginners and crushers), but believe it would be useful for this to happen as they are the stakeholders who have the most interest in using these tools and updating them from year to year.

Executive Summary

Study objectives

This study represents a first step in exploring the hypotheses that the incorporation of the value of cotton by-products in the pricing mechanisms of the C-4 countries of West and Central Africa (Benin, Burkina Faso, Chad, and Mali)¹ (1) improves the transmission of market signals to farmers and (2) contributes to a reduction in the inter-annual variability of producer prices. The study objectives are to:

- Describe the size, organization, strengths, weaknesses, and constraints of the major cotton by-product subsectors in each C-4 country and what this implies for increasing cotton by-product value added;
- Describe and compare the cotton pricing mechanisms and accompanying policies (e.g., subsidies, taxes) currently used by each C-4 country and their impacts on producer prices;
- Assess the extent to which current price mechanisms incorporate the value of by-products;
- Evaluate how different ways of incorporating the value of by-products in the pricing mechanisms affects the level and variability of producer cotton incomes.

By-product sector organization and performance

Key findings concerning the organization and performance of the by-product sectors include:

- Cottonseed crushing industries are liberalized and privatized in all countries but Chad, where an internal department of the parastatal Cotontchad processes the by-products.
 - Benin's licensing regulations have kept the crushing industry small (3 actors)
 - 30 to 60 firms produce cotton oil and cake in Burkina Faso and Mali.
- In all countries with liberalized crushing sectors,
 - the industrial sized firms are under financial pressure due to declining supplies and rising prices of cottonseed;
 - several firms stopped operations during the recent past.
- In all countries but Mali, there is tension between ginners and crushers over seed exports;
 - ginners believe they can sell seed at a higher price if they export,
 - crushers believe government should mandate that ginners sell only to local industries at prices they can afford.
- There is tension between the industrial sized firms and others in Mali and Burkina
 - industrial firms accuse others of not meeting health and environmental standards as well as unscrupulous business practices.

¹The "C-4" label is applied to the four African countries that joined Brazil in filing a complaint against the United States and European Union for unfair trade practices associated with subsidies offered to their cotton farmers.

Price mechanisms in place

The “C-4” label is applied to the four African countries that joined Brazil in filing a complaint against the United States and European Union for unfair trade practices associated with subsidies offered to their cotton farmers.

Key findings concerning price mechanisms and implementation procedures currently in place include:

- All countries have published formulae recommended for use in establishing final reference prices that determine total seed cotton payments (base price plus supplements) due to farmers at the end of the export marketing campaign.
- All formulae but those for Benin avoid using parameters based on actual ginning sector costs or performance, relying instead on prescribed ginning output ratios and average lint reference prices; this is meant to make payments to farmers independent of the processing and marketing performance of the ginners.
- Base prices announced at planting tend to be determined through negotiations among the key stakeholders (farmers, ginners, input suppliers, and government) in all countries but Burkina, which has applied their formula strictly since 2006.
- During the past ten years, the negotiated base prices have tended to be higher than the formula-derived end of season reference prices, leaving ginners in a position of having to pay farmers above the prevailing market rates.
- All price mechanisms include provisions to help ginners make higher payments to farmers when world market prices fall below base prices:
 - In Chad, the government provides the funding
 - In Mali, there is a support fund managed by farmers; government frequently provides additional support;
 - In Benin, there is a plan for a support fund but it has never been funded and government has been covering sector deficits;
 - In Burkina, there is a smoothing fund that was created in 2006, funded in 2007; it is currently depleted.
- All countries but Burkina already have some means of accounting for the value of cotton by-products in their pricing mechanism:
 - Chad adds a fixed amount of 5 FCFA/kg of seed cotton to their formula (equivalent to 9-10 FCFA/kg of cottonseed actually produced).
 - Benin includes the average sales price of cottonseed from the previous (t-1) campaign and multiplies this by the farmers’ variable share of total sector benefits
 - Mali includes the average sales price of cottonseed for the current campaign in the calculation of the final reference price; this is multiplied by 0.60 (the producer share of sector revenues).

There are large cross-country differences in prices paid to farmers (both the base and the final prices) that cannot be fully explained by differences in production and transport costs, nor by differences in input subsidies used to compensate for low producer prices in some countries, suggesting that non-market considerations continue to play an important role in seed cotton pricing outcomes in the C-4.

Analyses of by-product valuation in pricing mechanisms

Conceptualizing the problem

Because the C-4 cotton price discovery systems are a combination of market forces (observed primarily in markets for cotton oil and cake, and increasingly in cottonseed sales) and administered prices (observed primarily in setting prices for seed cotton sold by farmers), the study's analytical approach is eclectic, using various market analyses to assess the "true" value of the by-products and using the seed cotton pricing mechanisms in place to assess the extent to which changes in the value of the by-products have been reflected in seed cotton prices offered to farmers. The analytical challenge is determining to what extent the administered pricing mechanisms used to set prices at the very end of the lint and by-product price transmission process are able to pick up and incorporate the various market signals for the by-products.

In a world where prices were entirely determined by market forces and well communicated from one point in the value chain to another, the expectation is that the prices paid for seed cotton end products will be transmitted back to the cotton farmer, albeit in an indirect manner. For example, if demand for oil and cake increases (as it has recently in several C-4 countries), this would put upward pressure on oil and cake prices. This upward price pressure would provide incentives for oil crushers to increase production and they would be willing to pay more for their cottonseed.

The willingness on the part of some crushers to pay more for their cottonseed would stimulate competition among all purchasers of cottonseed and would push up the price for cottonseed sold by ginners. For countries where exporting cottonseed to Europe without processing is an option, the European prices also play a role in the price formation, often putting upward pressure on domestic cottonseed prices. Assuming the markets are working well enough for all these by-product signals to get back to the ginners, they should be increasing their asking price for cottonseed, earning more profits from cottonseed sales, and in a position to pass some of these increased profits back to farmers in the form of higher seed cotton prices. If the price signals do not get back to the ginner or there are structural and institutional factors that prevent ginners from responding to the signals (the general case at present in the C-4) the process is blocked at a level that prevents farmers from benefiting (or suffering) from changes in the by-product prices.

In reality, there are three key actors in the sector with three different objective functions and a variety of C-4 institutional settings that affect each actor's ability to pursue hypothesized objectives.

Farmers are unable to maximize returns to lint and cottonseed separately, so their objective function is one of maximizing returns to seed cotton production by minimizing costs of production per kilogram of seed cotton. These decisions are made in a multi-crop context whereby cotton area and production will decline when seed cotton prices decline or costs of production increase relative to other crop options. To the extent that seed cotton prices are based entirely on the value of lint, they may not be sending the appropriate production signals to farmers. At present, farmers' primary recourse to ensuring a price that reflects both lint and cottonseed values is through the process of negotiations associated with the adoption and implementation of the seed cotton pricing mechanisms; but information available to farmers on wholesale and retail by-product prices, processor margins, and costs of processing (both ginning and crushing) is limited.

Ginners, who previously operated with an objective of maximizing returns to lint only, may now be trying to maximize returns to both lint and cottonseed. Ginners are price takers in the lint markets, but not necessarily in the cottonseed markets. In Mali and Chad, ginning is performed by monopoly firms, which theoretically have the market power to demand high prices for the cottonseed. This has not happened, although now that the crushing sector in Mali has been liberalized there is some sign of rising cottonseed prices. In Benin and Burkina cottonseed is sold by a number of different ginners, but because of government policies limiting exports or favoring the development of local crushing industries, cottonseed price movements are not fully determined by markets and single prices tend to be set for all sales during a given season—removing the possibility of determining cottonseed prices through competitive negotiations among multiple crushers and multiple ginners.

Crushers in the liberalized sectors will be making decisions based on maximizing returns. The level of returns attainable is shaped by the type of processing equipment (industrial, semi-industrial, artisanal) and profit maximization is accomplished through choices made about the relative shares and quality of different products (unrefined oil, refined oil, animal feed, cotton meal or cake, etc.) produced from a given quantity of cottonseed, and cost minimization (often through high capacity utilization). The major cost for crushers is the price they pay for the cottonseed, so it is in their interests to negotiate the lowest possible prices. In the current context of declining cottonseed supplies due to declining cotton production by farmers, there has been a tendency for the cottonseed price to rise to a point that seems to be beyond the break-even point of many crushers (the situation in Benin in 2010 when crushers refused to accept the prices offered by the ginners).

Given this context, the study uses parity price and marketing margin analyses to diagnose the extent to which the values of the principal by-products (cottonseed, oil, and cake) have been incorporated in the final payments to cotton producers. This “diagnostic” analysis is supplemented with a variety of simulations to examine the potential impact on seed cotton prices of marginal changes in the manner in which cotton by-products are incorporated in the mechanisms.

Results of the diagnostic analyses

Parity price analyses of cottonseed and seed cotton for 2007/08 showed that:

- The cottonseed parity price was greater than the ginner sales price of cottonseed in all countries but Chad, suggesting that crushers realized returns on their oil and cake permitting them to pay more (26-38 FCFA/kg, depending on country) for cottonseed.
- Only Burkina exhibited a seed cotton parity price greater (by 4 FCFA/kg) than actual payments made to farmers when estimates of actual 2007/08 ginning costs (higher than what would be obtained with most efficient operating levels) were considered;
- The parity price for seed cotton is greater than the final payment (including subsidy value) to farmers in all countries but Chad when low ginning costs representing efficient capacity utilization are taken into account; this suggests that there are opportunities to increase producer prices of seed cotton through increased ginning efficiency.

A key factor in the high processing costs of 2007/08 was the low ginning capacity utilization due to sharply reduced cotton production, raising the question of whether ginners alone should shoulder the burden of increased processing costs when the increases are in large part a result of production choices made by farmers.

These results underscore a need to monitor parity prices over time (particularly the impact of changes in processing costs), and for the sector as a whole to find ways of reducing costs.

The implied margins analysis, which looked at changes in marketing margins and their key components (profits and processing costs) for 1999/00 to 2007/08 showed that:

- Only Burkina exhibited an upward trend in the crusher marketing margin, influenced largely by 2007/08 and 2008/09 increases in the margin. Since these increases took place during a period of very low cotton production, the rising margins are thought to reflect rising production costs rather than rising profits;
- Only Mali showed an upward trend in the ginner and synthetic margins, which increased from 2005/06 through 2007/08 and then declined slightly. During this period, cotton production declined from over 500 thousand metric tons to under 200 thousand, thus the rising margins through 2007/08 are more likely to have been associated with increasing processing costs than increasing profits;
- A breakdown of the contribution to the marketing margins made by the different cotton end products confirmed the predominant role played by lint (80-85% of the margins on average from 1999/00 through 2008/09), but also revealed the beginning of what might be a downward trend in the lint contribution with numbers for 2007 and beyond generally falling below 80% across all countries;
- The contribution of oil averaged 10-15% (highest in Burkina where technical processing coefficients are strongest);
- The contribution of cake averaged 1-6% (highest in Mali where cake prices are high due to strong demand).

Results of simulations on by-product values and price mechanism formulae

Simulations of different scenario for cottonseed values in C-4 pricing mechanisms revealed that:

- Moving from zero valuation of seed to the prevailing methods of seed valuation resulted in average 1999/00 – 2007/08 seed cotton price changes ranging from 1 to 7%, depending on country;
- Simulated increases of 100% in the ginner sales price of cottonseed (over annual levels prevailing from 2000-2008) yielded producer price increases also ranging from 1 to 7%;
- Changing the producers' share of the cottonseed value from current shares (usually 50-60%) to 100% yielded producer price increases ranging from 4 to 5%;
- By contrast, a relatively small 10% increase in the value of cotton lint yields an increase in the producer price of seed cotton of almost the same magnitude (9.4-9.9 %); underscoring the point that lint does play the dominant role in determining the overall value of seed cotton.

Inclusion of cottonseed values in the pricing formula produces mixed results in terms of reducing inter-annual price variability. The general tendencies were as expected (the larger the role played by cottonseed in the simulation, the lower the CV for the overall average seed cotton price), but the size of the changes were generally very small. Burkina and Benin are the only countries exhibiting a sizable reduction in the CV when comparing a situation of no cottonseed valorization with one of valorization). Valuing cottonseed at prevailing prices led to a reduction in CV of 4.5% in Benin and 11.9% in Burkina.

Overall conclusions and recommendations

Given the results to date, it appears useful to include by-product valuation in the pricing formula not only because it makes a small contribution to increasing producer prices and reducing inter-annual price variability, but also because it contributes to greater transparency in the search for an equitable way of dividing up the sector's income among the various actors. In setting up a systematic way of taking into account both fiber and by-product price variability over time, the C-4 countries can position themselves to take better advantage of the variety of market movements that influence the demand and supply of the full set of cotton end products. That said, it is obvious that a lot of time and resources should not be devoted to lengthy negotiations on exactly how this is done because the net contribution of by-product valuation is relatively small and there is more for farmers to gain by having the sector focus on improvements in yields or in lint quality that will result in quality premiums for exported lint.

One method of accomplishing this would be to focus on cottonseed valuation (rather than dealing with the full range of by-products) and truly liberalize the market for cottonseed so that it reflects the end values of other by-products. At present, the cottonseed markets in the C-4 are lacking in transparency and not fully reflective of demand and supply forces. Improving the cottonseed market would mean that (1) ginner sales prices of cottonseed were determined in the context of national, regional, and international price movements for cottonseed and (2) firms buying the seed would need to compete with all other firms (national, regional, and international) on the basis of what they could afford to pay and remain profitable. Such an approach could contribute to a movement toward the creation of more efficient operators at the national level, and possibly even at the regional level with a better distribution of oil crushing facilities across the West African region. For such a liberalized market approach to work without unanticipated negative effects it would need to be accompanied by reinforcement of the C-4 capacity for food safety monitoring and enforcement and some efforts to equalize the playing field between formal sector firms (who pay taxes) and the informal sector (who generally do not pay taxes). In addition, there is a need to address the issue of fraudulent imports of competing oil from Asia that escape regional import duties, making local cotton oil uncompetitive in countries such as Benin.

Recognizing that there is a legitimate "infant industry" argument in terms of supporting national and/or regional oil crushing industries, C-4 governments (individually as well as regionally through their trade organizations) need to develop transparent policies in this respect with a clear, multi-year program of support to local vs. international cottonseed sales based on more solid economic analyses of the job creation and indirect economic benefits of protecting the sector than what is currently available. Any policies developed to protect domestic crushing sectors should be limited in time and designed to encourage the development of profitable firms able to compete in regional and international markets.

There are many problems facing the C-4 cotton sectors and improvements in the way by-products are handled will represent only a small contribution to improving overall subsector performance. Cotton lint will continue to represent the bulk of the value added in the C-4 cotton sectors and a failure to address the problems directly related to seed cotton production, cotton ginning and lint marketing will severely constrain the development of the by-product subsectors. This has been amply illustrated by the growing crisis in the cotton oil crushing sectors of the C-4 due to declining cotton production and cottonseed supply. Nevertheless, the predominant role played by lint in the overall creation of sector value added should not lead cotton sector analysts and strategists to ignore the potential contribution of the by-products and their relationship to a well functioning farm and ginning sector.

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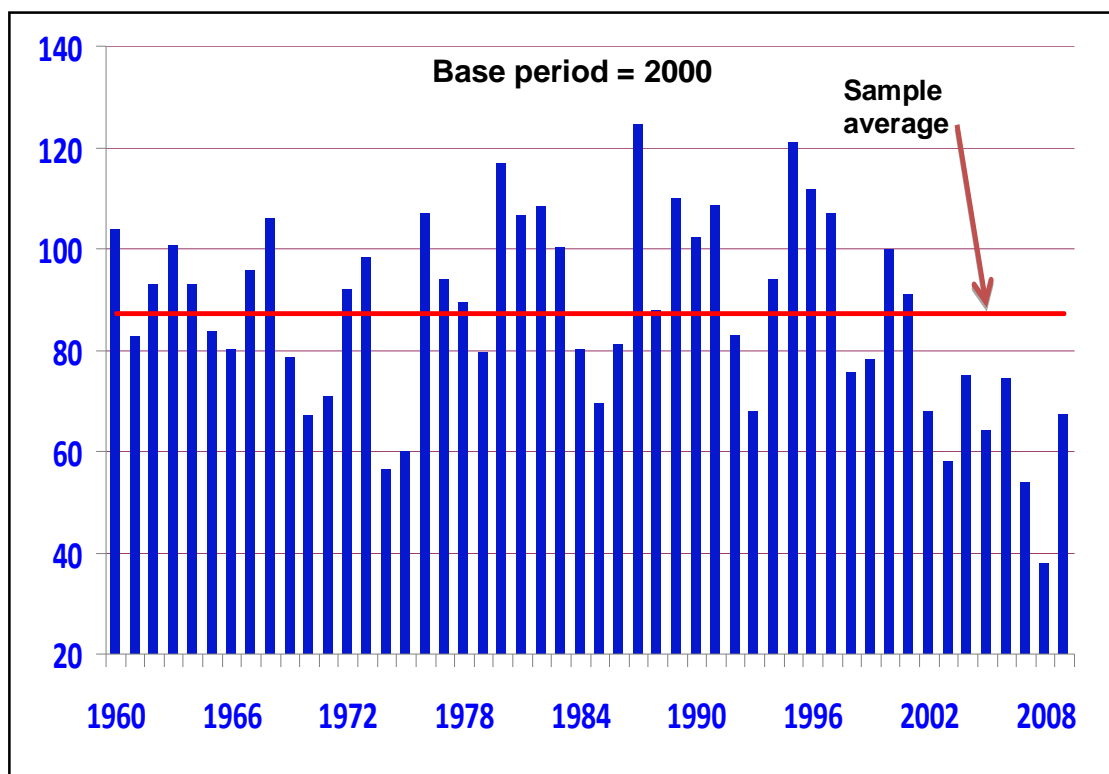
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1. Context: Adapting to change in the C-4

Cotton production in the C-4 countries of Benin, Burkina Faso, Chad, and Mali is not only an important source of foreign exchange but also the cornerstone of rural livelihoods in many of the cotton-producing zones. Over the course of the past ten years, two very different stories have played out for the two principal components of seed cotton marketed by C-4 producers: lint and seed. Since the 1990s, low and volatile world lint prices have fueled an ongoing debate at the international level about their causes and consequences (Thirteen WNET 2009, Watkins 2002, Baden 2004, Araujo-Bonjean and Brun, 2000). Discussions about commodity price booms and busts for commodity-dependent developing countries has a long history (see for example Maizels 1992 and 1994), but this time around there is a new element for the C-4. At the same time that lint prices were declining or stagnant, prices for the derivatives of cottonseed, including vegetable oil and concentrated animal feeds, were increasing.² Figure 1 illustrates part of the story by comparing world market price trends for cotton lint and oil in real terms using the ratio of lint to oil prices from 1960 to 2008. Although there is substantial inter-annual variability in the ratio, the general tendency is a decline since 2000, indicating a rise in oil prices relative to fiber prices. Another part of the story for the C-4 is the rising demand (and prices) in the rapidly expanding dairy and animal fattening sectors of the C-4 for cotton cake used as livestock feed. This rising demand is particularly pronounced in the Sahelian countries (Mali, Burkina Faso, and Chad).

Figure 1. Cotton lint to oil price ratios: 1960 - 2008

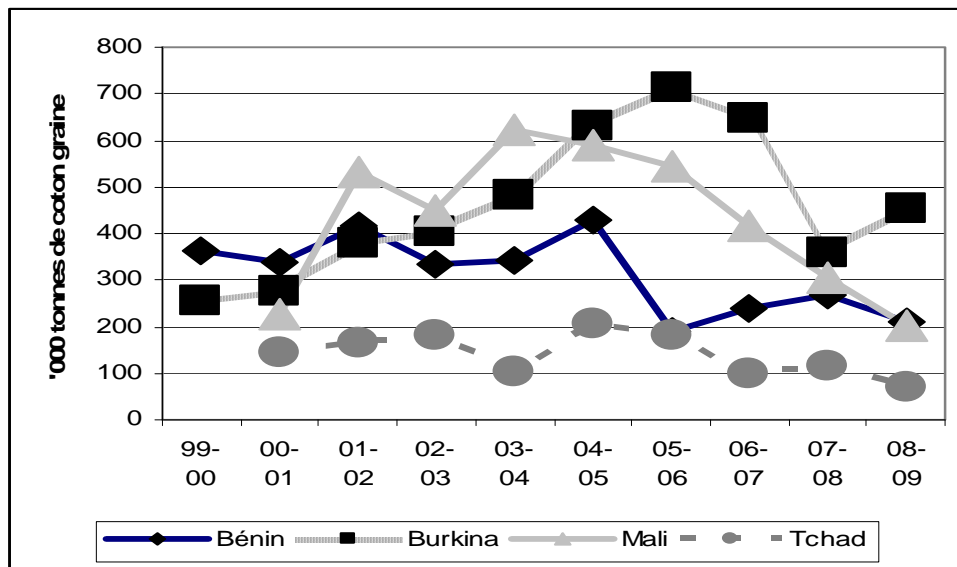


Source: World Bank data and graph from Baffes, May 2010.

² See Baffes (May 2010) for a thorough analysis of general agricultural commodity price trends and how they relate to trends for cotton lint and by-products.

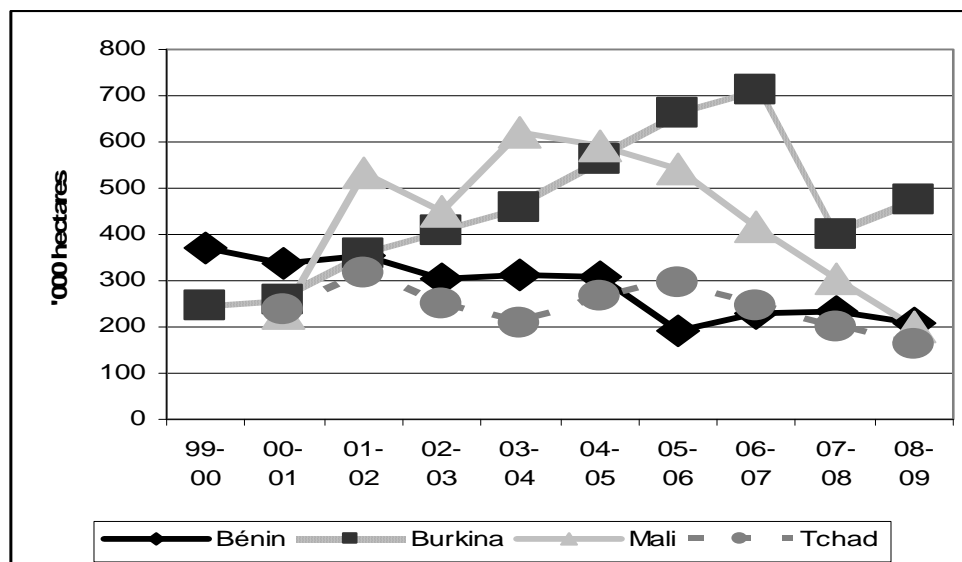
Declining cotton lint prices have been accompanied by a general decline in C-4 cotton production and area planted since the highs reached between 2003 and 2005 (Figures 2 and 3), and by declining yields (Figure 4). Burkina Faso, however, remained an outlier among the C-4 countries until 2007/08 when a steady upward trend in seed cotton production (despite declining prices) came to an end.

Figure 2. Seed cotton production in the C-4



Source: Compiled from data collected by the study team.

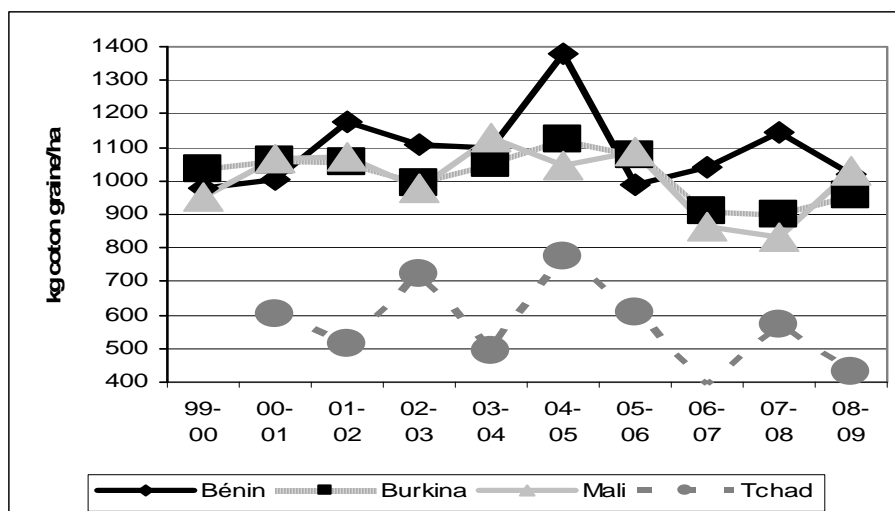
Figure 3. Area planted to cotton in the C-4



Source: Compiled from data collected by the study team.

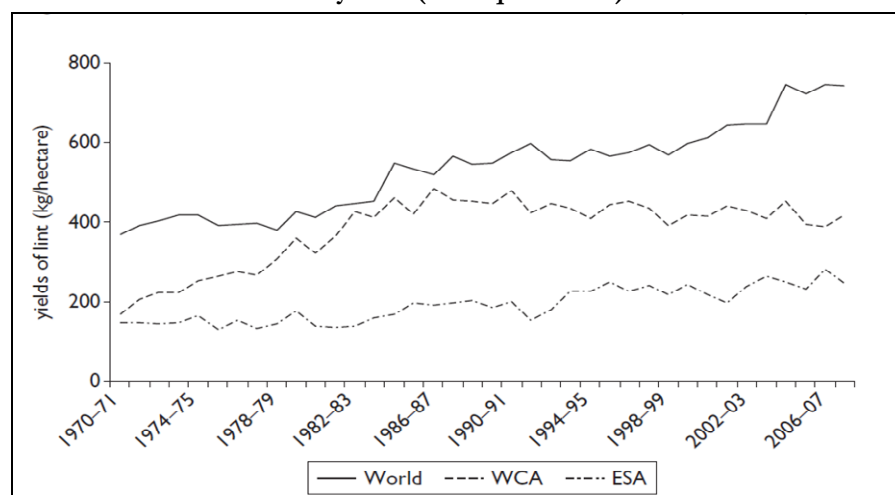
The declining yields across the C-4 zone are particularly worrisome from a productivity perspective given that yields have been rising in the rest of the world as well as in East and Southern Africa (ESA) (Figure 5).

Figure 4. Seed cotton yields in the C-4



Source: Compiled from data collected by the study team.

Figure 5. World trends in cotton yields (lint equivalents)



Source: Tschirley, Poulton, Labaste 2009.

The growing disincentives to produce cotton are hypothesized to stem, in part, from the current farm-gate price discovery mechanisms in place—which are thought to not sufficiently respond to current market realities (i.e. world prices, production costs and derived demand for seed). As early as 2001, Fok and Barbier signaled potential issues with by-product valuation in the C-4 cotton systems. In 2008, Chaudry again called attention to the issue when he observed that West African cottonseed prices were among the world’s lowest, suggesting that the C-4 may not be realizing the full potential of by-product value added, much less passing it on to producers. Growing demand for cotton by-products such as cottonseed, cotton cake, and cotton oil suggest additional potential for increasing the income generating capacity of the sector, but the extent of this potential—particularly its contribution to increasing the value of the seed cotton produced by farmers and the value of cottonseed sold by the ginners is poorly understood.

This paper seeks to determine the extent to which adjustments to existing price discovery mechanisms could provide producers with payments that better reflect the value of all the

economically important components of seed cotton while also reducing the inter-annual variability in prices. Getting the market signals for the various cotton sector end products communicated to farmers and processors (ginners, crushers, animal feed manufacturers, etc.) is a challenge in the C-4 countries, which are characterized by vertically integrated, generally monopsonistic cotton ginning sectors (*filières intégrées*) that have long depended on a system of administered prices to divide sector profits (and deficits) among the various actors. The salient characteristics of the administered pricing systems include:

- a single, pan-territorial seed cotton price throughout the country;
- minimum guaranteed seed cotton prices announced at planting time;
- guaranteed purchase at the minimum price of all seed cotton produced;
- maintenance of a fund on which ginners can draw if the minimum price announced exceeds what they can be expected to pay given world reference prices during the marketing season;
- sharing of profits if the ginners' net revenues exceed what is needed to pay the minimum price to producers.

Rising prices for cotton by-products (many of which are purchased and consumed by farmers) have raised questions about whether the pricing mechanisms in effect adequately account for the value of by-products when determining the seed cotton prices paid to farmers and whether income earned by ginners from cottonseed sales are adequately taken into account when determining how sector profits are calculated and shared. A related question is whether the incentives in the system (including government taxes and export policies) encourage ginners and oil crushers to maximize income from by-products, so that there is more value added to be shared with the farmers who are producing the seed cotton. Interest in this topic has been fueled by farmers having observed sharp increases in prices of by-products accompanied by relatively stagnant producer prices and subsector deficits. The rising by-product prices led a number of C-4 farmer organizations to propose the term “cotton co-products” as an alternative to the term “cotton by-products” in an effort to highlight the potential of these products to contribute to overall cotton sector value added.

In the current era of market liberalization and structural reforms, the mere existence of a monopoly system with administered prices seems an anachronism; however, a review of the historical evolution of these sectors *vis-à-vis* alternative models in Africa illustrates why the C-4 have been reluctant to abandon administered prices. From independence to the mid-1990s, the *filière intégrée* approach to cotton sector organization in Francophone West and Central Africa (WCA) was cited in the development literature as a success story (World Bank 1981, Lele 1991). The defining characteristic of the *filière intégrée* is the single-channel relationship between producers and a monopoly cotton company that vertically integrates the diverse functions associated with cotton production, processing, and exporting, thereby reducing transactions costs and risks. Several analysts (Fok 2009, for example) have noted that what has become known as the *filière intégrée* approach:

- provided access to extension services, inputs, and credit (with high repayment rates) for a broad range of farmers who realized increases in yields and incomes that contributed to poverty reduction;
- helped create farmer organizations and build their capacity;

- guaranteed an output market and stable cotton prices, hence reliable incomes for farmers;
- developed effective technical packages through regional sharing of research;
- created jobs both upstream (input supply and extension) and downstream (ginning);
- supplied tax revenues to support national budgets, and, in some cases,
- invested in economic and social infrastructure in the cotton producing zones.

As recently as 2009, a comparative study of nine African cotton sectors noted that the driving force behind the WCA and ESA yield differences was the greater willingness and ability of the WCA monopoly systems to invest in varietal development, input supply and credit, quality extension services, and logistical support. The report notes the important role played in this case by “the lagged impact of past performance” referring to major investments made in WCA well before 2000. These investments are most likely responsible for the inter-country yield differences apparent today (Tschirley, Poulton, Labaste 2009).

Despite much praise for their past performance, the C-4 have had an increasingly difficult time adapting their administered pricing systems to the growing volatility in global markets and the complexities introduced by expanding markets for cotton by-products. The recent rise in overall subsector deficits attests to the magnitude of the problem (Hanson 2008 and 2009).

Yet, there is a strong reluctance in the C-4 to do away with the pillars of the *filieres intégrées* system. Thus, the question is whether the incentives transmitted through these pricing mechanisms and accompanying measures that shape the performance of the overall sector can elicit production and investment decisions on the part of the diverse actors (farmers, ginners, crushers, input suppliers) that maximize the value added of both the lint and by-products.

As a first step toward a better understanding of the potential of by-products to contribute to the overall performance of the WCA cotton sectors, the West African Cotton Improvement Program (WACIP), funded by the United States Agency for International Development, agreed to support a regional study of the role of by-products in the pricing mechanisms used by the C-4 countries. The study was designed by Michigan State University and conducted in collaboration with consultants from each of the C-4 countries. The overall study involved the production of four country reports prepared by national consultants and this cross-country synthesis paper prepared by MSU using information provided by the consultants.

2. Objectives, research questions, and hypotheses

2.1. Objectives

The problem the study addresses is whether the price formation processes that set producer prices in the C-4 are adjusting to the current context of rising demand for by-products, stagnant demand for cotton lint, and increases in the volatility of prices for both lint and by-products. In many countries, the cotton sector is structured in a manner that permits farmers to retain ownership of both the lint and the seed until it is sold, thereby eliminating the problem of making sure there is an equitable distribution of the benefits of the by-products between farmers and processors. This is not the case in the C-4 where ginners purchase seed cotton from farmers and have exclusive rights to sell or process the cottonseed (with some obligation, however, to provide farmers with seed for the following season). Given this transfer of ownership to a ginner and the reliance on administered prices, producer organizations and cotton sector analysts have expressed concern that the rising value of the by-products may not be adequately transmitted back to farmers.

The debate about valuation of by-products has focused primarily on equity issues and whether farmers are getting their fair share of the cotton seed value added, but there is also the issue of whether the current mechanisms are providing the price incentives needed to stimulate a level of supply response that meets the needs of ginners and crushers. Past studies of supply response in African cotton production have suggested that farmers are not very responsive to price. A review of supply elasticity estimates for cotton producing countries worldwide showed most estimates of the elasticity of cotton supply for the C-4 falling below 0.5 and many below 0.2 (Shepherd and Delpuech 2007, citing among others Sumner 2003, Araujo-Bonjean *et al.* 2006, Shepherd 2006). Yet the cotton boycott of 2000/01 in Mali and the drastic reduction in Burkina's production in 2007/08 suggest that as farmers become more accustomed to producing for the market and better able to diversify production, the level at which the producer price of cotton is set will play a greater role in shaping aggregate supply than it has in the past.

While it is important to recognize that lint accounts for as much as 75% of the end value of all cotton products (Tschirley, Poulton, Labaste 2009), a failure to adequately account for the value of the by-products in the pricing formula could unnecessarily reduce producer prices and farmers' incentives to grow cotton. To the extent that supply response is suppressed by low producer prices, there is potential for negative impacts throughout the sector as both ginners and oil crushing firms operate under capacity and supplies of high quality animal feed and vegetable oils are reduced, putting further upward pressure on prices.

On the other hand, if the farmers' share of the value added is set too high, the sector generates deficits and its long-run sustainability is threatened. To date, there has been very little analysis of the magnitude of the potential problems described above and no comparative studies of how each of the C-4 countries handles the issue, despite an International Cotton Advisory Council (ICAC) report indicating that Africa in general was performing poorly in terms of valorization of their cottonseed (Chaudry 2008).

This study is a first step in exploring the hypothesis that the incorporation of the value of cotton by-products in the pricing mechanisms of the C-4 can improve the transmission of market signals to farmers and contribute to a reduction in the inter-annual variability of producer prices. The specific objectives of this study are to:

- describe the size, organization, strengths, weaknesses, and constraints of the major by-product subsectors in each C-4 country and what this implies for increasing cotton by-product value added;
- describe and compare the cotton pricing mechanisms and accompanying policies (e.g., subsidies, taxes) currently used by each C-4 country;
- assess the extent to which current approaches adequately incorporate the value of by-products in the price setting mechanisms;
- evaluate the role that incorporating the value of by-products into the pricing mechanisms plays in changing the level of producer prices or reducing inter-annual fluctuations in producer prices.

Although the study looks carefully at the role of pricing mechanisms in addressing the issue of by-product valuation, it is NOT a study of pricing mechanisms *per se*. There is no intention to evaluate or redesign the entire pricing system and the various types of stabilization funds established to support those pricing systems. There are many reports of this nature by experts in the field (Goreux, Estur, Waddell, etc.) and the study makes frequent references to them. The objective is one of better understanding the role that by-products can play in the sector. Looking at how small adjustments in the way pricing mechanisms handle cottonseed valuation is one aspect of understanding these dynamics and addressing concerns expressed by farmers.

There are many problems facing the C-4 and improvements in the way by-products are handled can make only a small contribution to improving overall subsector performance. Cotton lint will continue to represent the bulk of the value added in the C-4 cotton sectors and a failure to address the problems directly related to lint production and marketing will severely constrain the development of the by-product subsectors. This reality should not, however, lead cotton sector analysts and strategists to ignore the potential contribution of the by-products.

2.2. Research questions and hypotheses

Three realities suggest that the price discovery mechanisms in place have difficulty responding to current market conditions: (1) large differences in the farm-gate prices for seed cotton across C-4 countries; (2) very low cottonseed prices in West Africa compared to other cotton producing countries and regions; and (3) widespread decisions by farmers to move away from cotton and toward staple food and alternative cash-crop production (Hanson 2008 and 2009). In addition, there are concerns that these price discovery mechanisms do not equitably distribute the value-added among value-chain participants. Specifically, there is concern that ginners are essentially “getting something for nothing” in that they do not pay farmers for the market-value of the cottonseed and then either (a) turn around to sell it to an oilseed crushing company, generating important revenues, or (b) crush the seeds themselves for sale as cottonseed oil or meal through “downstream” vertical integration. The ginners, on the other hand, argue that farmers are already benefiting from a variety of subsidies (e.g., free or subsidized cottonseed) whose value more than surpasses that of any lost income from undervaluation of by-products in the price mechanism. This research systematically examines the various arguments by asking the following questions:

- To what extent do prices in the C-4 reflect world market conditions for lint and by-products?
- How are the returns to the value chain for both lint and by-products distributed among the actors?

- What are the strengths, weaknesses, and constraints to increased value added for the by-product subsectors?

The hypotheses considered include:

- Current pricing mechanisms do not adequately account for the value of by-products;
- Processor margins have increased over time more than producer prices;
- The inclusion of by-product values in pricing mechanisms can reduce inter-annual variability in producer prices.

3. Conceptual framework and methods

The study examines the issue of cotton by-product valuation using a “joint-product” and “derived demand” framework. Seed cotton, from which two products (lint and cottonseed) are produced in a fixed ratio, is a classic example of a product which is joint in output (Debertin1986). Moving further down the value chain, one encounters another joint-product as the cottonseed can be transformed into multiple products such as oil, meal, cake, linters, and hulls. During the early years of cotton production and processing in the C-4 (as well as in most other cotton producing countries), cottonseed was assigned no value and in some cases represented a cost associated with its disposal. It is only at the point in time when cottonseed crushing industries were introduced and operating in a relatively competitive market environment that the joint-product framework becomes non-trivial and useful in terms of valuing cottonseed.

In the C-4, oil crushing was initially introduced through firms that were vertically integrated with the ginning companies. This remains the current situation in Chad, while in Benin crushing was liberalized in the mid-1990s and in the mid-2000s in Mali, and Burkina Faso. Prior to liberalization, cottonseed passed from ginner to crusher using administratively determined values with no relationship to the market value of final outputs. Since liberalization, cottonseed values are theoretically determined by demand and supply, with crushers determining the price they are willing to pay for cottonseed through a “derived demand” analysis which takes into account their estimates of the wholesale prices they can obtain for the joint products (primarily oil and cake) and their costs of processing. Other institutional factors come into play in C-4 price determination such as export bans on seed to promote local crushing industries and the monopoly position of the ginning companies in Mali and Chad.

The problem of correctly valuing cottonseed and equitably distributing its value among different actors is relatively new to the C-4 because of the recent evolution of the crushing sector, but the following quote illustrates that U.S. cotton producers were asking the same types of questions that C-4 farmers are now asking following a price spike in cotton oil and meal in the 1970s:

Economic events since the 1972-73 crop year have generated much interest in cottonseed prices. Cotton producers, observing a doubling of wholesale prices of cottonseed oil and meal during the last three years, have wondered whether they are getting an equitable share of this increased income. (Ethridge 1975a).

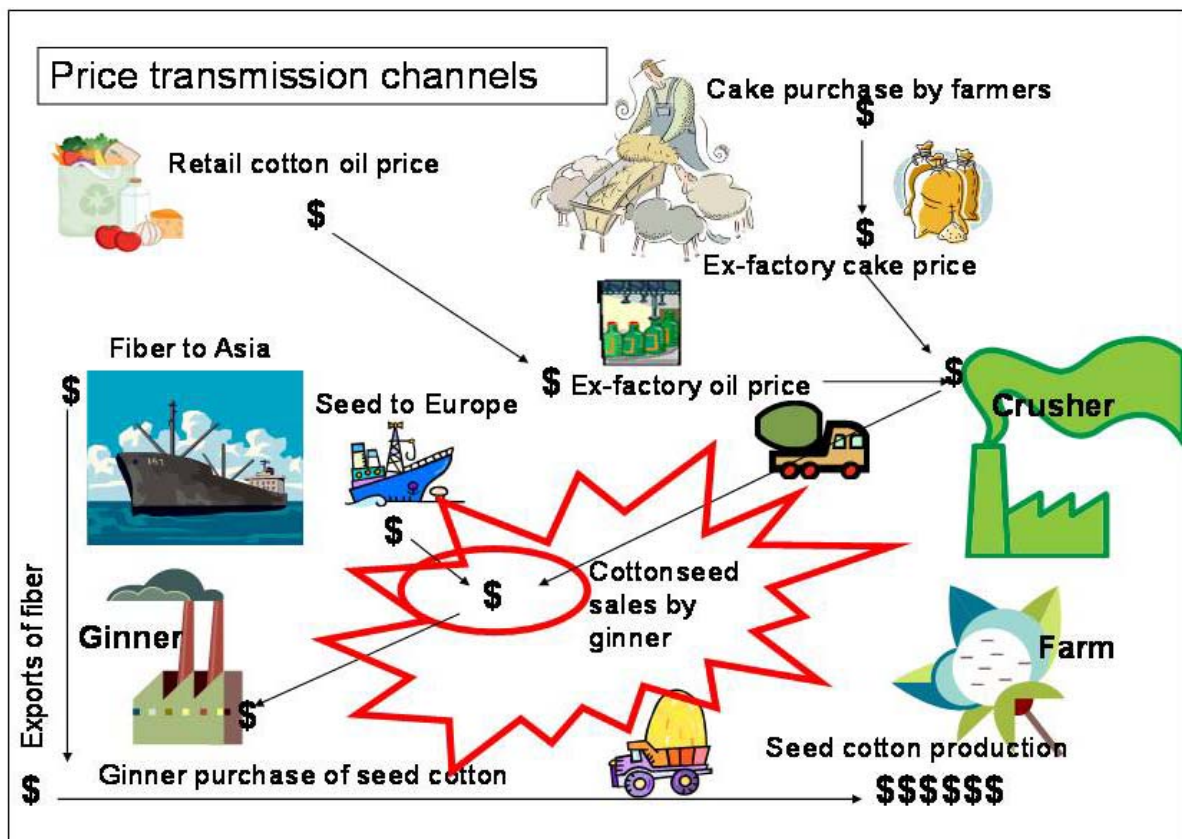
The approach to determining whether U.S. farmers were being paid adequately for the cottonseed was based on demand theory which states that demand at farm level is derived from wholesale demand, which in turn is derived from consumer demand. Thus, *if the market is free to operate*, farm cottonseed prices are expected to be a direct function of wholesale values of cottonseed products, with some delay in the process of price transmission that might allow for temporary spikes in wholesale margins (Ethridge 1975a). U.S. analysts in the 1970s used a variety of methods to examine wholesale marketing margins and their relationship to farm level payments for cottonseed, determining that temporary margin increases did occur that were not passed back to farmers, in large part because the increases introduced uncertainty into the markets and ginners were not willing to rapidly change pricing structures (Ethridge 1975b).

While the underlying economic theory of demand used to evaluate the U.S. situation in the 1970s is pertinent to the C-4 situation today, the analytical methods are not always easy to adapt to the C-4 situation because of major institutional and structural differences between the U.S. and the C-4 cotton sectors. In the U.S. of the 1970s, cottonseed and seed cotton were valued separately and prices of each product were largely determined by market forces making the price discovery

process relatively transparent to all actors. In the C-4 today, farmers sell their seed cotton as a single product with no open/transparent system for separately valuing the lint and the seed. In short, farmers have no leverage for obtaining higher cottonseed prices because they relinquish ownership of the seed at the time they sell their seed cotton. Further complicating the situation is the fact that the C-4 countries continue to apply administratively determined prices rather than using the give and take of markets to determine seed cotton prices. This can benefit farmers to the extent that the administered prices protect them from world market lint price volatility, but it can also make the pricing system sluggish and unable to respond to new situations such as the rising value of by-products.

Because the C-4 cotton price discovery systems are a combination of market forces (observed primarily in markets for cotton oil and cake, and increasingly in cottonseed sales) and administered prices (observed primarily in setting prices for seed cotton sold by farmers), our analytical approach is eclectic, using various market analyses to assess the “true” value of the by-products and using the seed cotton pricing mechanisms in place to assess the extent to which changes in the value of the by-products have been reflected in seed cotton prices offered to farmers. The analytical challenge is determining to what extent the administered pricing mechanisms used to set prices at the very end of the lint and by-product price transmission process are able to pick up and incorporate the various market signals for the by-products. Figure 6 illustrates some of the key nodes in the typical C-4 price transmission process, focusing on the factors shaping domestic prices of cotton by-products but also indicating that some by-product prices are affected by international markets (e.g., demand for cottonseed as dairy feed in Spain, which has stimulated substantial seed exports from Benin).

Figure 6. Cotton Sector price transmission process



In a world where prices were entirely determined by market forces and well communicated from one point in the value chain to another, the expectation is that the prices paid for seed cotton end products will be transmitted back to the cotton farmer, albeit in an indirect manner. For example, if demand for oil and cake increases (as it has recently in several C-4 countries) this would put upward pressure on oil and cake prices. This upward price pressure would provide incentives for oil crushers to increase production and they would be willing to pay more for their cottonseed.

The willingness on the part of some crushers to pay more for their cottonseed would stimulate competition among all purchasers of cottonseed and would push up the price for cottonseed sold by ginners. For countries where exporting cottonseed to Europe without processing is an option, the European prices also play a role in the price formation, resulting in additional upward pressure on cottonseed prices if prices net of export costs are greater than what a ginner can earn in domestic markets. Assuming the markets are working well enough for all these by-product signals to get back to the ginners, they should be increasing their asking price for cottonseed, earning more profits from cottonseed sales, and in a position to pass some of these increased profits back to farmers in the form of higher seed cotton prices. If the price signals do not get back to the ginner or there are structural and institutional factors that prevent ginners from responding to the signals, the process is blocked at a level that prevents farmers from benefiting (or suffering) from changes in the by-product prices.

In reality, there are three key actors in the sector with three different objective functions and a variety of C-4 institutional settings that affect each actor's ability to pursue hypothesized objectives.

- Farmers are unable to maximize returns to lint and cottonseed separately, so their objective function is one of maximizing returns to seed cotton production by minimizing costs of production per kilogram of seed cotton. These decisions are made in a multi-crop context whereby cotton area and production will decline when seed cotton prices decline or costs of production increase relative to other crop options. To the extent that seed cotton prices are based entirely on the value of lint, they may not be sending the appropriate production signals to farmers. At present, farmers' primary recourse to ensuring a price that reflects both lint and cottonseed values is through the process of negotiations associated with the adoption and implementation of the seed cotton pricing mechanisms; but information available to farmers on wholesale and retail by-product prices, processor margins, and costs of processing (both ginning and crushing) is limited.
- Ginners, who previously operated with an objective of maximizing returns to lint only, may now be trying to maximize returns to both lint and cottonseed. Ginners are price takers in the lint markets, but not necessarily in the cottonseed markets. In Mali and Chad, ginning is performed by monopoly firms, which theoretically have the market power to demand high prices for the cottonseed. This has not happened, although now that the crushing sector in Mali has been liberalized there is some sign of rising cottonseed prices. In Benin and Burkina, cottonseed is sold by a number of different ginners, but because of government policies limiting exports or favoring the development of local crushing industries, cottonseed price movements are not fully determined by markets and single prices tend to be set for all sales during a given season—removing the give and take of competitive bidding among multiple crushers and multiple ginners.
- Crushers in the liberalized sectors will be making decisions based on maximizing returns. The level of returns attainable is shaped by the type of processing equipment (industrial,

semi-industrial, artisanal) and profit maximization is accomplished through choices made about the relative shares and quality of different products (unrefined oil, refined oil, animal feed, cotton meal or cake, etc.) produced from a given quantity of cottonseed, and cost minimization (often through high capacity utilization). The major cost for crushers is the price they pay for the cottonseed, so it is in their interests to negotiate the lowest possible prices. In the current context of declining cottonseed supplies due to declining cotton production by farmers, there has been a tendency for the cottonseed price to rise to a point that seems to be beyond the break-even point of many crushers (the situation in Benin in 2010 when crushers refused to accept the prices offered by the ginners).

Given this context, the study uses the following methods to meet its objectives and answer the research questions:

- Descriptive analysis of C-4 cotton and by-product sectors with a focus on sector structure and the characteristics of the price mechanisms in place.
- Parity price and marketing margin analyses as diagnostic tools to ascertain the extent to which prices of cotton by-products are being transmitted back to the farm gate.
- Price mechanism simulations to examine the potential impact on seed cotton prices of marginal changes in the manner in which cotton by-products are incorporated in the mechanisms.

4. Comparative overview of C-4 cotton sector structures and performance indicators

Although all C-4 cotton sectors are similar in terms of the historical organization of their ginning activities (government-run monopsonies, vertically integrated into farm-level input supply and lint export activities), efforts to liberalize the sectors during the past two decades have resulted in some important differences across countries, not only with respect to ginning but also in the development of the cottonseed processing sector and the changing structure and role of cotton producer organizations. The next several pages highlight the cross-country similarities and differences of most importance to the analysis of by-product valuation, drawing on Appendices 1-3, which contain detailed tabular summaries of the salient structural characteristics and performance indicators for the three functional areas of the C-4 cotton sectors described below: farm production, ginning, and crushing.³

4.1. Farm

Area planted to cotton and production levels are important differentiating factors when comparing C-4 countries as they provide information on the relative importance of the sector in the national economy. As shown by Table 1, cotton area in Burkina Faso and Mali has been much more important than in Benin and Chad since 2000, but with Mali ceding the position of lead producer to Burkina during the past five years.

Table 1. Area planted in cotton by C-4 countries

Period	Benin	Burkina Faso	Mali	Chad
	(Average hectares planted in cotton per year)			
2000-2004	323,000	410,000	465,000	256,000
2005-2008	216,000	563,000	367,000	227,000

Source: Appendix 1.

The relative importance of the cotton sector in each country is also illustrated by various statistics concerning the number of farm households involved and the number of individuals earning income in the cotton sector. Because of different ways of defining “cotton farms” and “population dependent on cotton income”, cross-country comparisons are difficult to make with precision, but it appears that Chad has the largest number of producers and the greatest number of people dependent on the cotton sector despite much smaller aggregate cotton area planted.

Table 2. Numbers of cotton farms and population dependent on cotton production

	Benin	Burkina Faso	Mali	Chad
Farms directly involved in cotton production	300,000	172,000	170,000	350,000
Population dependent on cotton for income	Not avail.	2,064,000	1,700,000	3,000,000

Source: Appendix 1.

Liberalization of the cotton sector has been accompanied by the creation of Interprofessional Associations (IA), which have been given broad management responsibilities for many of the functions previously performed by government parastatals. The IA consists of representatives of key stakeholder groups such as government, farmers, ginners, and input suppliers. Because representatives of producer organizations are members of the IA and serve as a conduit for

³ Readers possessing general knowledge of the structure of the C-4 cotton production, ginning and crushing sectors may want to skip this section and move directly to the discussion of pricing mechanisms in Section 5.

promoting farmers' interests in each country, there tends to have been more rapid and solid development of farmer organizations in Benin and Burkina, which liberalized earlier than Mali and Chad.

The *Union Nationale des Producteurs de Coton au Burkina* (UNPCB) has been the most actively involved in cotton sector decision making. Farmer representatives hold half of the seats on the AICB (*Association Interprofessionnelle du Coton du Burkina Faso*) and have traditionally held the presidency of that body. The UNPCB owns shares in each of the ginning companies (with a 30% share in SOFITEX since 1998), which further improves their access to management information about the sector and their ability to influence decisions.

After many years representing cotton farmers in Benin, the *Fédération des Unions des Producteurs* began to have problems holding their members together. Following the creation of multiple off-shoot organizations, the Government created the *Conseil National des producteurs de coton* and declared it the only organization with the legal right to represent cotton farmers in cotton sector discussions and on the AIC (*Association Interprofessionnelle de Coton*).

As preparation for the privatization of its cotton company, the Government of Mali has supported the creation of the *Union Nationale des Sociétés Coopératives des Producteurs de Coton du Mali* (UN-SCPC). This has involved replacing a structure based on village associations with a cooperative structure having several layers of representation (local, regional, national). It is hoped that the cooperative structure will be able to take over the input supply functions that have traditionally been provided by the cotton company.

Chad has a national producer organization (*Union Nationale des Producteurs de Coton du Tchad* – UNPCT) created in 2007 but only authorized to function as the official representative of cotton farmers in 2009. Representatives participate in policy discussions involving the sector, including discussions about setting prices.

There are important cross-country differences among the C-4 in terms of services provided to farmers by the IA and/or government. Cotontchad, often assisted by Government subsidies, theoretically provides all the typical services associated with the traditional *filière intégrée* model (input supply and credit, extension, collect and transport of seed cotton). In reality, the economic situation of Cotontchad is such that many of these functions are not being adequately performed (particularly input supply). In Benin, the IA is charged with covering the costs for what are called *fonctions critiques*, which include costs of research, extension, seed production, quality controls, and road maintenance. These costs are covered by a supplement to the producer price of cotton, which is paid by ginners to the Inteprofessional. Recently, the funds received from the ginners have been inadequate and the Government has been making contributions for certain functions.

There appears to be a marked difference in the level of subsector support to extension services between Mali (1 agent for 350 hectares of cotton) and Burkina (1 agent for 1000 agents). Both sectors have reduced their support to road maintenance, and discontinued seed conditioning and many other services traditionally provided by the *filière intégrée*.

4.2. Ginning level

The ginning sectors in the C-4 are varied in terms of structure, ownership, and ginning capacity.

Chad retains the traditional *filière intégrée* structure described earlier. The national parastatal, Cotontchad operates 9 gins with an annual capacity of 250-260,000 metric tons. Capacity utilization since 2000 has ranged from 50 to 67% due to low production as well as an inability to

keep all of the gins in running condition. The Government owns 75% of the shares in Cotontchad, Geocoton 19%, and the rest belongs to Chadian banks.

Up to this year (2010) Mali's parastatal CMDT has also operated as a traditional *filière intégrée* sector, but with activities under way in preparation for the transition to a system of four privately owned regional monopolies. The regional monopoly model preserves many of the very popular characteristics of the *filière intégrée* model (no competition among seed cotton purchasers, relatively closed system permitting input credit to be recovered when seed cotton is marketed, guaranteed minimum prices for farmers announced at planting, guaranteed purchase of all production), but it reduces the role of the government in decision making and increases the amount of capital held by private firms. The CMDT owns 18 gins with a capacity of 500,000 metric tons per year. Capacity utilization has declined from 100% in 2004/05 to 83% in 2005/06 and an average of 45% for 2007/08 and 2008/09. Ownership on the eve of privatization is held by the Malian government (98%) and Geocoton (2%). Formerly, Geocoton (or its predecessor companies) held up to 40% of the stocks, but having chosen to not participate in several of the more recent recapitalization efforts its ownership share has declined. The privatization process calls for 61% of shares to be held by private ginning firms, 20% by producer organizations, 2% by employees of the CMDT, and 17% by the Government.

Burkina Faso privatized their sector in 2004, creating three regional monopolies. The former parastatal, SOFITEX, became the largest actor (450,000 tons capacity) followed by SOCOMA (100,000 tons) and FASOCoton (45,000 tons). In 2007 SOFITEX and SOCOMA were operating at capacity with FASOCoton using about 75% of their capacity. In 1998, well before privatization, the government transferred a 30% ownership share in the parastatal SOFITEX to the cotton producers' organization. Following privatization, the producers' organization continues to own 30% of SOFITEX, with the Government owning 35%, Geocoton 34% and banks 1%. The UNPCB also owns shares in SOCOMA (20%) along with Geocoton (51%) and other private ginning companies and banks (29%). FASOCoton shares are held by a private international investor (31%), investors from Burkina and from Côte d'Ivoire (40%), a regional input supply firm (10%) and the UNPCB (10%).

Benin developed what has been described as a hybrid ginning structure (Tschirley, Poulton, and Labaste, 2009). There are many ginning firms (9 at last count) but no competition among the ginners because the IA sets pan-territorial prices for seed cotton and attributes purchasing quotas to each firm based on estimates of production. Until 2009, the ginning sector was dominated by the former parastatal, SONAPRA (which has become SODECO). SODECO was officially privatized with the majority of shares now owned by a firm that has controlling interest in five other ginning firms and in the major input supply firm. The lack of competition would suggest that the traditional approach to input credit and repayment would still be operable, but Benin has opted for a system of input supply that is not vertically integrated with ginning activities. Private sector input suppliers are licensed by the government and assigned quotas for supplying cotton farmers; one large firm tends to dominate the import market, with smaller firms taking care of distribution. Increasing levels of concentration of private ownership in both ginning and input supply operations are raising questions about the benefits of privatization and its ability to improve subsector performance through competition.

4.3. Crushing level

This section describes the structure, capacity and ownership of the C-4 crushing sector as well as the policy environment and other factors that influence their performance. The description draws on a variety of related studies funded by WACIP (Holtzman 2007, Sidibé 2007,

Ouédraogo 2007, and Sewadé 2007, Bayoulou 2010, Ahohounkpanzon and Zakari Allou 2010, Padacké 2010, Diakité 2010).

Despite numerous cross-country differences, one can generally characterize the C-4 oil crushing sectors as follows:

- Generally liberalized with firms privately owned (Chad is the exception);
- Poorly integrated into the cotton sector (crushing firms are not members of cotton interprofessional organizations);
- Ownership is by a mix of local, regional and foreign investors;
- Variety of processing technologies employed, with semi-industrial and artisanal firms common in Mali and Burkina but not present in Chad or Benin;
- Weak enforcement of food safety norms (particularly for semi-industrial and artisanal firms in Mali and Burkina) creates unfair competition between industrial firms and others;
- Serious problems of over-investment and over-capacity exacerbated by declining cottonseed supplies;
- Serious questions about competitiveness of the sector:
 - Firms unable to pay for cottonseed at prices competitive with seed exported to Europe;
 - Firms unable to compete with imports (primarily a problem in Benin);
 - High levels of indebtedness by crushers who face difficulties obtaining credit for seed purchases;
- All firms operating in a context of rising consumer demand for comestible oils and rising demand for animal feeds by dairy, livestock, and poultry sectors;
- All subject to regional trade regulations which set import duties at the regional level leaving little flexibility for unilateral tax policies to protect new industries (UEMOA (WAEMU–West African Economic and Monetary Union)for Mali, Burkina, and Benin and CEDEAO (ECOWAS–Economic Community of West African States)for Chad).
- All arguing that the sector merits government assistance because of its important contribution to job creation and import substitution.

4.3.1. Structure, capacity and ownership patterns by country

In terms of structure, Chad retains the traditional model of oil crushing operations being vertically integrated into ginning operations and controlled by an internal department of Cotontchad referred to as the DHS (*Direction de l'huilerie savonnerie*), which was created in 1997. Chad privatized the oil crushing operation briefly in the early 2000s, but the private firm failed to perform as anticipated and it was dissolved. DHS has the capacity to process 100,000 metric tons of cottonseed annually. From 2000 to 2008 DHS permanent employees ranged from 183 to 266 and seasonal employees from zero to 104.

Benin has a concentrated sector with three industrial sized firms. The sector was privatized in the mid 1990s following the devaluation of the CFA franc. This timing gave the sector a boost in terms of price competitiveness with imports. FLUDOR was the first firm established (1996) with

a crushing capacity of 90,000 metric tons of cottonseed. SHB (*Société Huilerie du Bénin*) was created in 1997, taking over most of the facilities of the former parastatal. The firm's processing capacity is 120,000 metric tons of cottonseed per year. The third firm, which by some accounts has never actually processed cottonseed, is IBCG (*Industries Béninoises des Corps Gras*), created in 1997. The cottonseed crushing capacity is unknown. The firm also owns palm oil processing facilities, but has not operated since 2006.

Total crushing capacity for Benin is roughly 250,000 metric tons, from which 40,000 tons of cotton oil and 95,000 tons of cotton cake can be produced annually. Entry into the sector is strictly controlled by the Government, which issues licenses to approved firms. These controls have kept the growth of the sector more manageable than what one observes in Mali and Burkina Faso. In terms of employment generation, SHB and Fludor combined reported as many as 360 permanent employees and 370 seasonal ones. A crusher's association, G-TRI, was formed by the two leading firms in an effort to strengthen the sector's negotiating position *vis-à-vis* the ginners. G-TRI has asked to join AIC. Cotton farmers have opposed the request, not wanting to increase the number of industrial actors with whom they need to negotiate. SHB is a member of AIFO (*Association des Industries des filières oléagineuses*), which brings together representatives of the comestible oil sector operating in the UEOMA trade zone.

Burkina and Mali have similar oil crushing sectors characterized by a limited number of industrial processors, a few semi-industrial, and a multiplicity of artisanal processors that are difficult to count and regulate. Both sectors began as vertically integrated parastatals.

In Burkina the parastatal SHSB (*Société Huilerie Savonnerie du Burkina*) was privatized in 1995 and has since operated as SN-CITEC, which is owned by Geocoton (46%), SOFITEX (35%), and a number of smaller firms. CITEC has facilities to process all types of oil seeds, including 120,000 tons per year of cottonseed. SOFIB was created in 1984 by a Burkinabe investor with a capacity of 49-90,000 tons; but it has not functioned during the past two years. Jossira was created in 1998. Jossira's capacity has varied from 35-66,000 tons, but it also is no longer operating. In addition to the industrial firms, there are (1) approximately 30 semi-industrial processors that lack the capacity to produce refined oil but focus on partially refined (neutralized) oil and cotton cake and (2) approximately 30 artisanal processors that produce unrefined oil and soap. Expansion of the semi-industrial and artisanal sectors got a boost from the repatriation of many Burkinabe who had been in Côte d'Ivoire and were looking for a way to earn income back in Burkina. The 2007/2008 price hikes in cotton oil (47% rise over previous year) and cotton cake (100% increase) plus speculation about Asia shifting from vegetable oils to biofuels also stimulated investment. Given the large number of firms operating in Burkina, it is difficult to accurately estimate its employment generation. A 2007 estimate covering all firms with a capacity of 40,000 MT or more reported approximately 2770 jobs created (full-time and part-time/temporary combined) (Ouédraogo 2007). Burkina's oil sector has a large number of professional associations. One organization groups the three industrial processors and SN-CITEC is a member of UEMOA's AIFO. Four other organizations have been created primarily to meet the needs of smaller processors for a joint effort in negotiating reasonable cottonseed prices.⁴

Mali retained its parastatal oil crushing firm as a vertically integrated part of the cotton sector until 2005 when it was privatized. As early as 2003, however, the sector was liberalized and the

⁴ The organizations include GPI (*Groupement Professionnel*) for the industrial operators, *Association des Producteurs d'Huile du Burkina* (APHB), *GIE des transformateurs de produits oléagineux du Burkina* (GTPOB), *Groupement des Huiliers du Houet* (GHH), and *Coopérative des Producteurs de Produits Oléagineux et Divers* (CPPOD)

first private investor, *Société des Oléagineux du Mali*, began operations in Koutiala with an estimated capacity of about 50,000 tons. There are currently 3 other registered firms of industrial capacity, HUICOMA, the privatized parastatal, with a capacity of 345,000 tons, Abou Woro with a capacity of 60,000 tons, and Huicosi with a capacity of 52,000 tons. In addition, there is a varying number of smaller firms and artisanal processors operating (ranging from 30-50, depending on the year and the ability of the regulatory services to close down firms with substandard production processes). The processors are scattered widely in terms of location, with recent reports showing Koutiala and Sikasso (both in the heart of the cotton zone) having 11 and 4 crushers, respectively; Bamako 6, and Ségou 3. The reported capacity of the 34 processors authorized by the Government to operate in 2008/09 was 997,100 MT—this represents a capacity that is approximately 10 times greater than the cottonseed available during the past couple of years, raising serious questions about the level of investment in the sector. Employment created in 2008/09 by the three largest firms was 1143 jobs (all types combined), with total employment reported by all firms licensed in 2008/09 to be 2960.

Most of the medium to large oil crushers are members of the Malian Chamber of Commerce and Industry and in 2008 the Ministry of Industry and Commerce assisted with the creation of an oil crushers' association.

4.3.2. By-product markets

Although many cotton by-products are marketed in the C-4, this study focuses on the markets for cotton oil, cotton cake, and various other cottonseed-based animal feeds as these are the principal products adding value in the C-4.

Estimates of annual demand for comestible oils range from 7 to 9 kg/capita in Benin, Burkina, and Mali; for Chad the estimate is 2.7 kg/capita. For the 2000-2006 period, it was estimated that local production in Benin, Burkina, and Mali could cover from 50-60% of demand (Holtzman, 2007). Chad has produced less than 20% of its needs since 2003/04. C-4 wholesale and retail markets for oil are generally liberalized and competitive with prices varying spatially and seasonally, but there can be some government intervention to temporarily control or subsidize prices during periods of unusual price spikes (e.g., the situation in 2007/08). Most of the local oil production in Burkina and Mali is sold in the domestic market, with small quantities being exported to neighboring countries. DHS in Chad manages sales to licensed wholesalers but has no other market role. Frequent price spikes during the rainy season have led some to accuse wholesalers of hoarding and forcing prices up unnecessarily when rural areas become inaccessible because of the rains. Traders are also tempted to export local production to Nigeria where they can frequently get better prices. Benin is the only country that faces serious constraints in the local market with about 90% of the production being exported to Nigeria and Cameroon. Processors claim that their products, which are subject to an 18% value added tax, cannot compete with fraudulent imports from Asia that escape UEMOA import duties.

Cotton-seed based animal feeds are in strongest demand in Mali which has a large livestock sector and a growing dairy and poultry sector. Price competition can be strong (70 FCFA/kg for the industrial unit HUICOMA compared to 50-60 FCFA/kg for sales by smaller operators who often sell products with a greater share of hulls than HUICOMA. At peak periods, prices can go as high as 200 FCFA/kg. It has been observed that small scale producers who do not achieve high oil extraction rates can still earn excellent profits by focusing on production and sale of cotton cake and animal feed during the peak periods of demand (Sidibé 2007). Cotton cake produced by SN-CITEC in Burkina is generally sold locally, but with the excess thought to end up in Mali where the demand is higher. SN-CITEC uses cotton hulls as fuel for running their equipment, so they do not generally produce types of animal feed that include hulls. Chad has a

strong demand for cotton cake and other livestock feeds from January to May when pastures are not adequate. Traders purchasing cake, seed, and other products from DHS sell both locally and in Cameroon and Nigeria. There are also Nigerian traders who come to Chad for supplies. There have been timid efforts by Chadian livestock herder associations to develop livestock feed distribution chains, but nothing significant has developed to date. Benin has a very small livestock sector compared to the other C-4 countries and therefore exports most of its cotton cake and feed by-products to South Africa and Nigeria. In general, the markets for these products in all countries are poorly understood and prices are poorly documented.

Soaps are also produced and sold by some oil crushing firms in the C-4 (DHS in Chad and HUICOMA and small scale processors in Mali, for example).

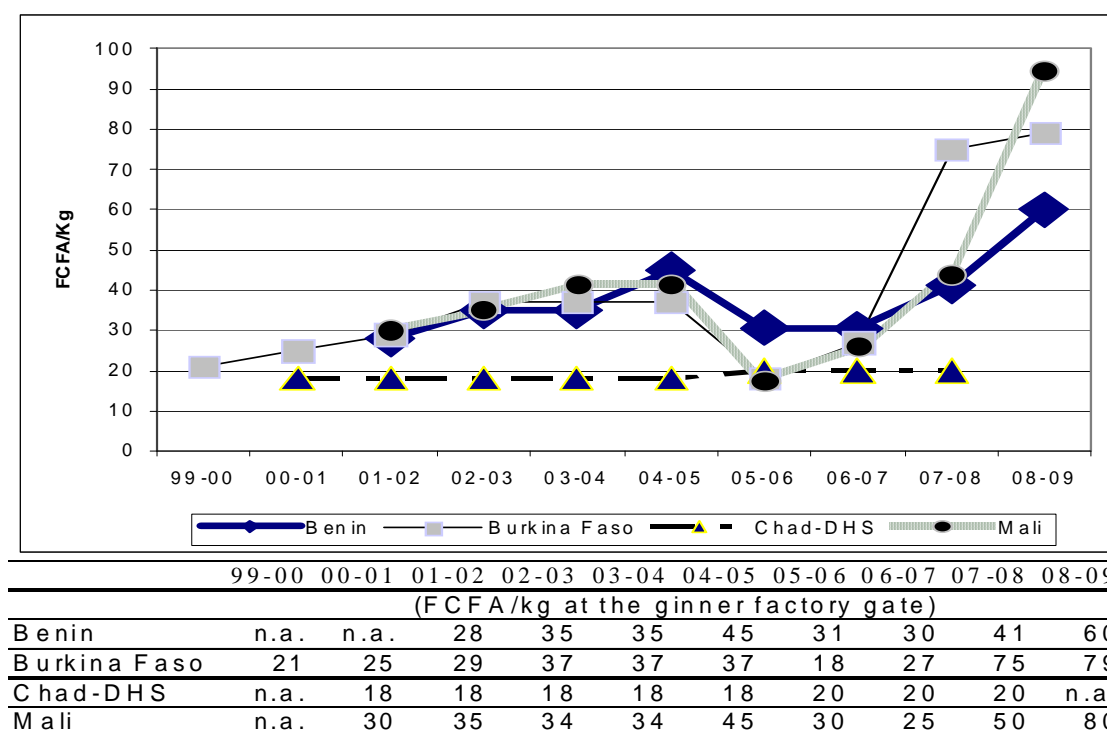
4.3.3. Policy environment

Policies that shape the producer prices of seed cotton, cottonseed sold by ginners, and the prices of end products such as oil and cotton cake affect the performance of the sector. Tax and or trade policies that impose taxes on by-products sold either domestically or in export markets affect the competitiveness of the sector. Finally regulatory policies and enforcement capacity for monitoring the safety and quality of cotton by-products produced for human and/or animal consumption can affect demand and supply of by-products.

From the perspective of seed cotton price policy, Burkina Faso is the only C-4 country that does not include some attempt to value by-products in their seed cotton pricing mechanisms (more on the details of price mechanisms in the next section).

From the perspective of cottonseed pricing procedures, the role played by demand and supply factors appears to have increased in the recent past. Figure 7 illustrates the trend. Seed prices in three of the four countries climbed gradually to 2004 and then declined the next year following the bumper harvests of 2004 and 2005. From 2006 to present they experienced a much steeper climb as reductions in seed cotton production curtailed the supply of cottonseed forcing those having invested in processing equipment to compete for seed supplies to keep their processing units operating. Chad is an exception to the general pattern in that its cottonseed prices for transfers from Cotontchad to DHS remained relatively flat during the entire period.

Figure 7. Nominal price trends for C-4 cottonseed



Source: Data collected by the study team.

Note: These are pre-tax, ginner factory-gate prices

In Benin, for example, the crushers propose a uniform price to the ginners and the debate begins. There is usually an agreement between the two groups on a uniform price, but this agreement does not ensure that the ginners will respect that price for all sales and not take advantage of higher prices available through exporting a significant share of the seed to Europe (generally for the dairy industry in Spain). Government has frequently intervened by imposing cottonseed export bans, but customs data suggest poor enforcement of the ban.

In Burkina, the largest (and now the only functioning) crusher negotiates with the ginners to establish a price that then serves as a benchmark for prices offered to other crushers. Burkina ginners, like those in Benin, have not been shy about exporting seed when it is in their economic interests to do so, leaving local crushers with inadequate supplies. The ginners argue that in addition to the better prices offered by European buyers, they pay cash upfront; this is seldom the case with local buyers, many of whom rely on credit from the ginners.

The question of exports does not appear to be an issue in Mali, where the CMDT, being a government owned firm, is expected to serve the local market.⁵ Because HUICOMA dominates the market in terms of capacity, it is most likely that prices are set through CMDT/HUICOMA negotiations and then applied to other firms, but neither CMDT nor HUICOMA confirmed this. There also appears to be some pressure from Government (motivated by job creation objectives?) to ensure that CMDT distributes available seed among all the processors so that HUICOMA does not capture the entire market.

⁵ There was a situation several years ago when two CMDT agents sold seed to Senegalese operators and were severely sanctioned with prison sentences for this misstep.

In Chad, the vertical integration of the ginning and oil sectors results in moving seeds from the ginning operation to the crushing operation using administratively determined prices that are significantly lower than prices observed elsewhere in the C-4. This vertical integration, however, has not precluded some cottonseed exports to other countries in the region (e.g., Nigeria) and some domestic sales for animal feed; but in 2008/09, following a sharp decline in seed supplied to DHS in 2007/08, the government banned exports of cottonseed by Cotontchad.

In terms of trade policies, all C-4 countries are members of regional trade organizations that impose relatively homogeneous import duties on vegetable oils. Despite some variability due to country specific exclusions of certain products from the VAT (e.g., cottonseed), the general rules are similar and an 18% VAT is applied to most cotton by-products (oil, cake, animal feed, etc.). More variability tends to be introduced at the level of enforcement (particularly for import duties), given the difficulty of controlling cross-border road traffic. Benin oil processors have faced the greatest problems from tax and trade policies. The imposition of the 18% VAT on oil makes domestic production unable to compete with low priced imports of palm oil from Asia that enter the country illegally without payment of the import tax. The government attempted to ban oil imports coming by road from neighboring countries, but this was ruled illegal by UEMOA. The net result is that a large share of Benin's oil and cotton cake production appears to be exported to South Africa, Nigeria, and Cameroon—transactions for which the VAT is generally not applied. Both Mali and Chad have placed quotas or other types of restrictions on sales of some by-products. In the past HUICOMA was required to sell prescribed amounts of animal feed to cotton farmers, herders, and government services but this was discontinued several years ago. In Chad, DHS can sell oil only to licensed wholesalers (about 65 exist) for whom quotas are established by DHS. There is no DHS distribution network. All sales are made from the DHS factory in Moundou; cotton cake and other products can be sold to anyone—again from the Moundou factory.

There is no particular body of regulatory law that applies to only the oil processing sector in the C-4, however, existing regulations in the area of food safety, environment, public health, competition, and packaging all apply in one way or another to the oil crushing sector. Regulatory issues are seldom raised in Chad and Benin where the number of crushers is limited and they are all using industrial level technologies. On the other hand, the Malian and Burkinabe industrial and semi-industrial firms, with relatively large investments in processing equipment, have been vocal about the lack of regulatory control over artisanal processors as well as some mid-sized processors. A primary concern is the production of cotton oil with gossypol content that can lead to sterility in men (Malian newspapers have published numerous articles about this issue during the past several years). It appears that none of the C-4 has the capacity to test cotton oil for gossypol locally. Aflatoxin contamination is another issue, but it gets less attention than gossypol. The industrial producers in Burkina also complain about small scale producers who are selling substandard products and packaging them in containers carrying the labels of the industrial firms (a violation of competition laws). Thus far, regulatory services in both Mali (primarily in 2008/09) and Burkina (primarily in 2005) have responded by inspecting some firms and revoking licenses, but the efforts are deemed inadequate and the same firms are often operating again the following year. Another issue raised by some is the environmental hazard associated with the incorrect disposal of processing wastes, but this is rarely mentioned by actors in the sector and applies to industrial as well as smaller firms (Ouédraogo 2007).

4.3.4. Performance indicators

All of the industrial-level oil crushing operations in the C-4 currently show signs of stress. Capacity utilization is low, raising per unit costs of production and reducing competitiveness. With the exception of Burkina's industrial firms, cotton oil extraction rates are also low

compared to the potential. In Benin, the largest crusher ceased operations in January 2010 and the second largest was ready to follow due to accumulated debt associated with high cottonseed prices and inadequate supplies. In Burkina, SN-CITEC is the only industrial firm operating this year. While the smaller processors in Mali continue to operate, their oil yields are extremely low (8-10% compared to a 20% oil content in Mali's cottonseed), resulting in a value added to cottonseed that is significantly below its potential. Even at the industrial level, Mali realizes only 16-17% of the 20% oil content of cottonseeds. Table 3 presents some performance indicators for the C-4 oil crushers.

Table 3. Selected performance indicators of C-4 oil seed crushing firms

	Benin	Burkina Faso	Mali	Chad
Refined oil yield	14 to 17% of 20% available	18% for industrial; 9-11% for small, artisanal firms of 21% available	16-17% for industrial; 10-12% for semi-ind.; 8-10% for artisanal ; of 20% available	16-17% of 20% available
Cotton cake yield	2001-05: range of 38-48% with an average of 42%	52%	40%	40%
Capacity utilization	2000-08 avg: 71%; 2006:43% 2007: 52% 2009: 60%	2006/07-07/08: SN-CITEC 72-78%	Cottonseed available represents only 11% of national processing capacity in 2008/09	Average of 40% since 2000/01
Financial situation of industrial firms	None operating in 2010 due to high cost of cottonseed and inadequate supply; some converting to soy and other types of oil.	1 of 3 still operating in 2008/09	No information on stoppages	Running annual deficits of 1.7 billion CFAF from 2002/03-2007/08; DHS received a total of 22 billion CFAF in government subsidies from 2006/07 through 2007/08

Source: Appendix 3

The table reveals that there is room for improvement in terms of refined oil extraction rates across all countries. In addition, it reveals a pattern of poor capacity utilization and financial performance for the majority of industrial firms. The extent to which the poor financial performance is structural or the result of poor management rather than a result of the recent decline in cotton sector performance on which firms depend for their raw materials is difficult to evaluate; but the overall picture is not one that suggests there are currently large profits being made through oil crushing activities that can be passed back to farmers.

An important gap in our understanding of the sector concerns the relative economic performance of the different types of processing operations found in Mali and Burkina (large industrial, mid- and small-sized industrial, and artisanal processors). Although it is generally agreed that the technical performance of the large industrial firms is superior to that of the other operators, there is a lack of information to assess the relative economic performance. A recent report has suggested that in Africa in general, the large industrial firms may be less efficient economically than their smaller competitors (Baffes 2010). This is an area that requires further analysis not only to adequately compare the economic performance of different types of firms, but also the indirect economic benefits to the broader economy in terms of job creation and value added by different scales of processing. Several C-4 governments have taken policy positions favoring domestic over export markets for cottonseed and enforced licensing requirements that favor large scale over smaller scale processors without having access to adequate information on the economic consequences of these decisions for the overall economy.

5. Overview of C-4 cotton pricing mechanisms

Although each country's pricing mechanism has its own particularities, there are a number of common attributes:

- Determination of a “base” producer price announced at planting and paid when the cotton company collects seed cotton from farmers after harvest;
- Determination of a “final” reference price for lint which:
 - takes into account world market price movements during the marketing season;
 - determines amounts to be contributed to (case of subsector profits) or drawn down from (case of subsector deficits) a stabilization or price smoothing fund;
 - is used to determine if a supplementary payment will be made to producers⁶.

The four companion papers to this regional summary describe the evolution of the pricing mechanisms for each country, a discussion of how they have been implemented, and the impacts of the mechanisms on the cotton sector in general as well as on different actors.⁷ Appendix 4 presents a cross-country comparison of the pricing mechanisms in a synthetic form, covering the following topics:

- Important dates in the evolution of the pricing mechanisms;
- Minimum guaranteed prices for farmers;
- “Base” prices announced at planting time;
- “Final” reference prices used to determine complementary payments to farmers and contributions to or drawdowns from cotton funds;
- Characteristics of cotton sector support or smoothing funds;
- Rules for determining the farmers' share of income from lint sales;
- Methods used for taking into account the value of cotton by-products;
- Implementation issues.

The following discussion highlights similarities and differences among the C-4 price mechanisms and then moves on to a cross-country comparison of the prices established by these mechanisms for the 2000 to 2008 period.

5.1. Salient characteristics of the C-4 pricing mechanisms

5.1.1. Putting mechanisms in place

From an historical perspective, Chad stands out as the only country that has been operating under the same mechanism for more than 10 years, having put in place their current mechanism in 1997. In Benin, cotton prices were managed by a national stabilization board covering all

⁶ This supplementary payment is often referred to as the “*ristourne*” in French, but it is important to note that the term “*ristourne*” is also used to designate the combined value of the top-up of the producer price and the contribution to the cotton sector support fund, i.e., the full difference between the base price and the final price which is then allocated to these two uses.

⁷ See Ahohounkpanzon and Zakari Allou for Benin, Bayoulou for Burkina Faso, Padacké for Chad, and Diakitè for Mali (all reports are dated 2010).

crops until 2000 when what has become known as the Waddell Method (named after the consultant who proposed the initial mechanism) was put in place; these formulae have been revised twice (2004, 2006), but the revisions have not been implemented. Burkina Faso has gone through two major periods, one from 2000 to 2005 based on a support fund (*fonds de soutien*) and one based on a smoothing fund (*fonds de lissage*), which was put in place in 2006 but not actually funded that year. Mali moved toward a formula-based system in 2002 with an *Arrêté Interministériel* that contained guidelines for setting cotton prices. This was replaced in 2005 by a *Protocole d'Accord* (valid until 2008) between the government, the parastatal ginner, and the producers' organization. In 2008 and again in 2009, most of the clauses of the 2005 protocol remained in effect but amid quite a bit of confusion as the protocol had officially expired before any announcements were made about updated versions.

5.1.2. Base prices

For the determination of the base price announced at planting, the salient cross-country differences include:

- Manner in which the price is to be determined:
 - by formula (Burkina and Benin),
 - by negotiations between ginners and producers, often with government involvement (Mali and Chad);
- Manner in which the price is actually determined:
 - by formula (Burkina),
 - by negotiations (Benin, Mali, and Chad);
- Factors theoretically taken into account in the existing formula (see Boxes 1 and 2 for details of the Benin and Burkina formula):
 - An estimate of FOB value of lint for the coming season (Independent expert's calculation in Benin); 5-year average for Burkina;
 - Normative ginning ratio;
 - Share of lint value attributable to producers vs. ginners (variable in Benin, fixed at 60% in Burkina since 1990s);
 - Coefficient of prudence (Benin uses 0.9 of FOB and Burkina either 0.92 or 0.95 depending on the situation of the smoothing fund);
 - Coefficient to adjust FOB price for taxes paid by the ginner (Benin only);
 - Adjustment for value of cottonseed (Benin only).
- Factors taken into account when negotiations prevail (Benin, Mali and Chad):
 - Farmers' costs of production (adjusting for input subsidies);
 - Ginners' costs of processing;
 - Some estimate of FOB lint prices (Chad uses ICAC forecasts and different assumptions about exchange rates setting a range within which producers and ginners negotiate).

**Box 1. Highlights of Benin's Price Mechanism Formula
(2006 version for the base price)**

This is the mechanism agreed to in 2006 but not yet implemented because of delays in establishing the support fund designed to go with. The base price is referred to as the “*prix d'acompte*” (PdA).

$$\text{PdA} = \text{Coeff_P} * \text{Part_Prod} * [\text{Valeur_fi} * (1-\text{Taxe}) + \text{Valeur_gr}(t-1) \text{ HT} * \text{Poids_rel}] * \text{Ref_f}$$

Risk coefficient	Coeff_P	0.9
Farmer's share of FOB fiber production costs	Part_prod	Varies
Estimate of world lint price trends for the upcoming season	Valeur_fi	Varies
Export tax on lint	Tax	1.03%
Average pre-tax sales price of cottonseed for previous year (t-1)	Valeur_gr (t-1) HT	Varies
Ratio of norms for cottonseed/lint yields (Ref_g/Ref_f)	Poids_rel	1.29
National norm for lint processing yield	Ref_f	0.42
National norm for cottonseed processing yield	Ref_g	0.54

The producers' share of the FOB price is based on an estimate of the anticipated harvest and the impact that the harvest will have on ginning costs per kilogram of seed cotton. The estimated CIF value of the lint for the coming marketing period is to be provided by an independent expert and transformed to FOB equivalent using a fixed amount of 32.5 FCFA/kg that takes into account both freight costs and a quality premium. The expert is to take into account the normal seasonality of Benin lint sales in estimating the CIF value. The valuation of cottonseed is based on ginner sales prices of cottonseed for the previous year (t-1).

The same formula is used to estimate the final price, but the Valeur_fi is based on the Cotlook A values for March of year t through April of year t+1 instead of the expert estimates of market tendencies; the same assumptions of seasonality used for the base price must be used for the final price. The Part_prod is calculated using information on actual ginner costs and seed cotton production levels rather than projections.

Source: Abobounkpanzon and Zakari Allou 2010.

**Box 2. Highlights of Burkina Faso's Price Mechanism Formula
(base price operational since 2006)**

The Burkina formula is: **Prix Plancher = [Prix_Tendance * Part_Prod_f * Tunnel% * ReF]**

Estimated FOB lint price trend for coming season (FCFA/kg fibre)	Prix_tendance	5-7 yr Cotlook avg
Producer share of lint value	Part_Prod_f	60%
Prudence factor establishing a smoothing tunnel	Tunnel%	92 or 95%
Lint yield norm for ginners	ReF	42%

The estimate for the FOB price was initially set at a 7-year moving average, centered on the year in progress. Recently a 5-year moving average has been used; it includes 2 observations based on historical trends, one on near-term projections for the current year prices, and 2 observations based on longer-term estimates. ICAC is the primary source for projections.

The difference between the base price and the final price is calculated in two different ways, depending on whether the actual Cotlook values for the marketing season (April of year t through March of year t+1) fall within the 92-95% “tunnel” (no contribution is made to the smoothing fund but farmers receive a supplementary payment equal to the difference between the base price and the average index) or above the tunnel ceiling (farmers get the first supplementary payment plus a second payment after adjustments are made to the fund).

Source: Bayoulou 2010.

In Mali and Chad base prices have been established annually through negotiations between ginners and producers with participation by input suppliers and government. Benin had a formula that it applied from 2000 to 2003, but it has relied on negotiations since, largely because revised versions of the formula call for the establishment of a support fund, which has yet to see the light of day. In all three countries, political considerations often shape outcomes when the subsector actors are unable to resolve their differences and the government is called on as an arbitrator.

Since 2006, Burkina has followed a system that uses five to seven year average FOB lint prices and three parameters:

- A 0.42 normative ginning lint output ratio,
- A 0.60 pre-established producer share of lint value, and
- A smoothing tunnel coefficient that reduces price risk (.92 or .95 of the FOB value).

A general observation is that procedures for establishing base prices in three of the C-4 countries do not include a systematic assessment of projected market trends. Even in the case of Burkina, the effort to forecast market prices at the time base prices must be announced has not produced base prices that are close approximations to the actual market prices experienced by the ginners. Forecasting cotton prices in the C-4 requires not only predicting what will happen to the cotton price index, which is denominated in US dollars, but also what will happen to the U.S. dollar-Euro exchange rate. Table 4 illustrates not only the volatility of the Cotlook A index from 2001 to 2007, but also the important role played by the exchange rate in shaping the prices that are offered to C-4 farmers. While the U.S. dollar seed cotton price was consistently above the 2001/02 rate through 2008/09, the FCFA equivalent fell below the initial rate in 4 of the 7 years covered.

Table 4. Evolution of the Cotlook A index in U.S. cents and FCFA

	2001/02	2002/03	2003/04	2004/05	2005/06	2006/07	2007/08(est)
US cents/lb							
% variation (year t divided by year 2001)	43.9	51.2	67.4	55.0	56.7	58.7	68.0
		16.6%	53.5	23.3	29.2	33.7	54.9
FCFA/kg							
% variation (year t divided by year 2001)	719	746	831	634	674	663	693
		3.8	15.5	-11.8	-6.3	-7.9	-3.7

Source: Estur 2007, Tables 9 and 10.

5.1.3. Final reference price and calculation of supplementary payments

For the determination of the final reference price and the supplement that can be paid to producers, the official procedures in each country call for the use of a formula (see boxes 3 and 4 illustrating the Chad and Mali cases) that takes into account the following factors:

- Actual world market lint prices during the marketing season (12-13 month average FOB prices for periods from approximately March in year t to April in year t+1 for all countries but Chad where the reference price is CIF and based on a 16 month period (January of year t through April t+1);

- Share of FOB lint value attributable to producers vs. ginner (variable in Benin, fixed at 60% in Burkina since 1990s and at 60% in Mali); Chad uses 19.3% of the CIF value rather than a percent of the FOB value;

Box 3. Highlights of Chad's Price Mechanism Formula (final price)

This formula has been used since 1997/98 with no revisions to any of the parameters.

$$PE = 19.3\% \times [\text{Cotlook A CIF}_{t \text{ to } t+1}] + [V_gr]$$

Effective final price	PE	Varies
Producer's share of Cotlook value	PP	19,3%
16-month Cotlook average (t to t+1) CIF price in FCFA	Cotlook A	Varies
Fixed value for cottonseed in FCFA/kg seed cotton	V_gr	5FCFA/kg

The 19.3% farmers' share is based on parameters from the 1997/98 campaign that took into account a number of factors that tend to be shown more explicitly in the formulae for other countries: 40.5% lint yield, estimated annual production of 230 thousand tons of seed cotton, an average ginning cost of 384 FCFA/kg of lint (excluding purchase cost of seed cotton), and an average lint sales price of 875 FCFA/kg. The analysis determined that if farmers were paid 19.3% of the CIF lint value in 1997/98, the ginner would be able to cover their costs.

Source: Padacké 2010.

Box 4. Highlights of Mali's Price Mechanism Formula (final price)

The Malian formula is:

$$RFP_{CG} = A * [[IC_{FE-FOB} - (1-Y)*Z] * RD_{Fi} + PV_{Gr} * RD_{Gr} * PCO_{Gr}]$$

Final producer price (FCFA/kg of seed cotton)	RFP_{CG}	Varies
Share of lint value allocated to producers	A	60%
Cotlook Index A in FCFA/kg of lint FOB	IC_{FE-FOB}	Varies
Percent of lint exported	Y	98%
Costs of placing lint in FOB position (FCFA/kg lint)	Z	76 FCFA
Lint yield norms under good performance	RD_{Fi}	42%
Average price of cottonseed sold during season (FCFA/kg)	PV_{Gr}	Varies
Cottonseed yield norms under good performance	RD_{Gr}	52.5%
Percent of cottonseed marketed	PCO_{Gr}	93%

The period covered for establishing the value of the Cotlook index is April of year t through March of year t+1. Supplementary payments, if warranted, are made to farmers in June/July of year t+1. The choice of a 60% share of the lint value to be allocated to farmers is not documented, but appears to draw on the Burkina choice of 60%. If the final reference price minus contributions to the support fund is greater than the base price, farmers receive a supplementary payment equal to the difference. If the final price is less than the base price, the cotton company has the right to draw on the support fund to cover the amount that they "overpaid" farmers.

Source: Diakité 2010.

- Actual ginning costs not including seed cotton purchase price (Benin only; used to determine farmers share of total cotton lint production costs);
- Value of the base price paid to farmers at harvest (subtracted from the FOB value to determine if there is a "surplus" or "deficit");

- Situation of the cotton sector support fund (when fund is low, some surplus goes to fund rather than all to farmers).

Although the procedures employed at the end of the marketing season to determine the market value of the lint produced are more clearly defined than the procedures for setting base prices (all make some use of the Cotlook A index), there is considerable variability across countries in the time period used for estimating the market value and in the criteria used for netting out ginner costs and allocating value shares to farmers and ginners. There has been a general tendency to move toward reliance on Cotlook A averages for a valuation that is independent of the performance of the ginner; Benin is the only country that explicitly considers ginning costs (particularly changes associated with different levels of capacity utilization) when determining the surplus available for farmers.

5.1.4. By-product valuation

Given our focus on cotton by-products, it is important to note that three of the C-4 countries theoretically take the value of cottonseed into account in setting the base price and this is carried over into the calculations for the final reference price.

Since the late 1990s, Chad has added a fixed value of 5 FCFA/kg of seed cotton to the formula-determined payment based on the CIF value of lint sales. Given ginning ratios (42% for lint and 55% for cottonseed), this amounts to approximately 9 FCFA/kg of cottonseed produced or 12 F/kg of lint produced.

Benin's formula calls for valuing the cottonseed at the average value of prior year sales, but given that the formula has not been applied for a number of years, it is difficult to know to what extent by-products have been taken into account during negotiations. Mali has used the average annual sales price of cottonseed sold by its only ginner in the estimates of the final payment to farmers since the mid-2000s. One problem in using the average ginner sales price for cottonseed in the pricing mechanism is that the markets for cottonseed appear to be influenced by a variety of factors other than market forces (e.g., government concerns for developing local industries and creating jobs).

Burkina is the only C-4 country that has opted to focus on lint valuation only.

5.2. Cross-country comparison of C-4 producer prices

The vastly different base prices announced for the 2007/08 season (ranging from 145 FCFA/kg in Burkina to 170 FCFA/kg in Benin) prompted farmers as well as policy analysts to ask how countries in the same region could be competing in the same market yet offering such different prices to their farmers. The 145 FCFA/kg Burkina price represented just 85% of the highest C-4 price for that year, but the disparities were even greater in 2000 when the lowest price (150 FCFA/kg in Mali) represented just 75% of the highest price (200 FCFA/kg in Benin). Economic logic does suggest that cross-country differences in producer prices of the C-4 might be affected by geography through differences in transport costs. Chad, for example, being farthest from ports, might be expected to offer lower producer prices than Benin which has its own port and should have fewer costs to net out of lint sales revenue.

A review of the base prices set since 2000/01 in the four countries (top frame of Figure 8) reveals significant cross-country variation in prices that cannot be explained entirely by transport costs. This variation was highest from 2000/01 through 2003/04 (CV on mean C-4 annual base prices averaged 0.11) and then declined from 2004/05 through 2008/09 (average CV of 0.06

range). Correlation coefficients for the country level base price series and the Cotlook Index A for 2000-2008 showed no statistically significant correlation either across countries or between individual countries and the Cotlook Index. In addition, the hypothesis that Benin would be able to offer farmers higher prices and Chad forced to pay lower prices is not systematically supported by the data. Benin's prices were highest in only five of the nine years covered; similarly, Chad's prices were lowest in only five of the nine years. The outlier tends to be Mali, which had the highest base price in three years and tied with Benin for the highest base price in two of those years.

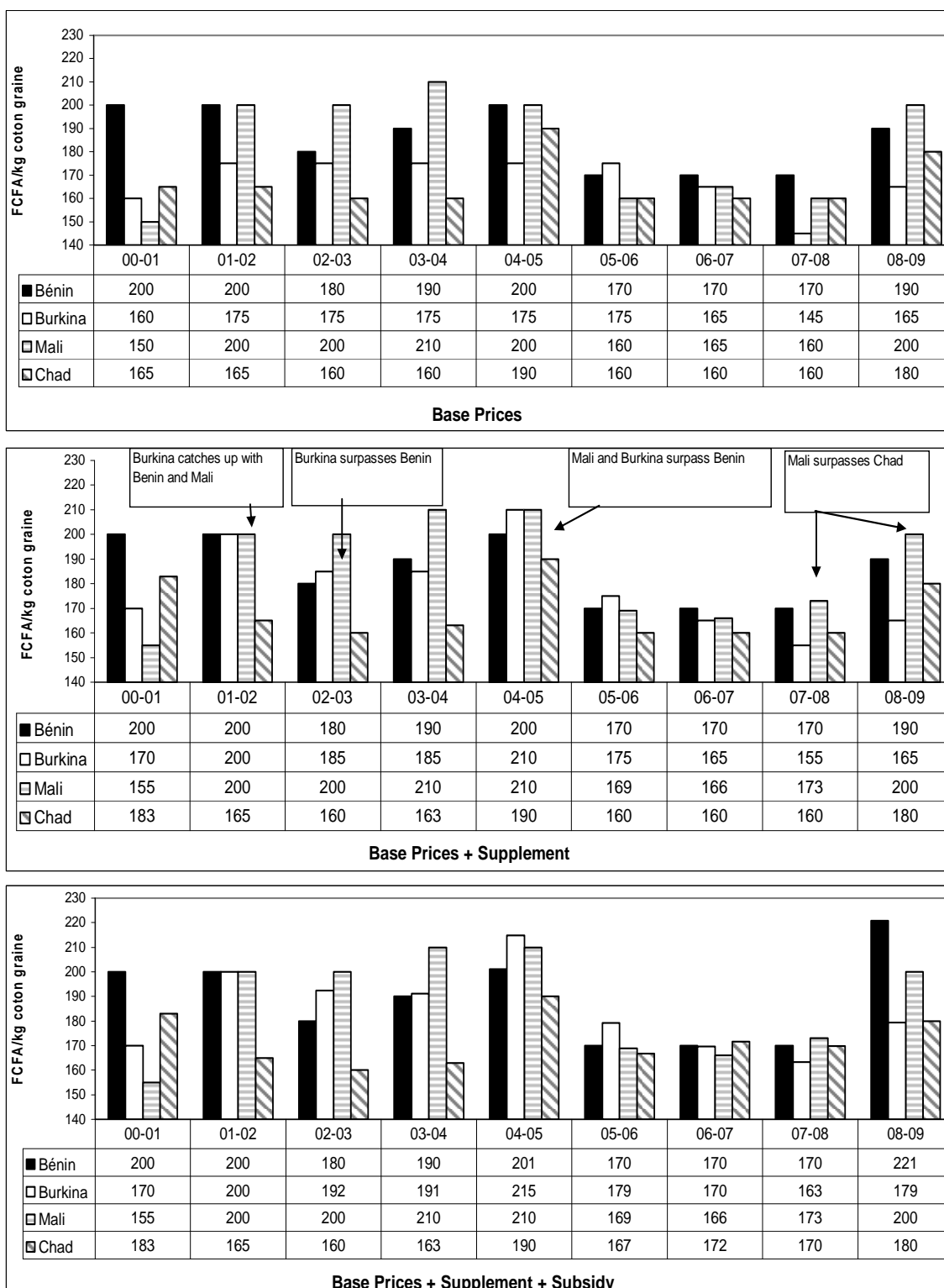
The final payment (center portion of Figure 8) shows almost as much variability across countries as did the base payment (CV of 0.10 for 2000/01 through 2003/04 and 0.05 for 2004/05 and beyond), but with some changes in the ranking by country. The most striking changes in a country's rank when moving from the base to the final price are indicated in the central frame of Figure 8. For example, Mali and Chad had the same base prices for 2007/08 but Mali's final price was 17 FCFA/kg higher than that of Chad. Another hypothesis for explaining the producer price differences across the C-4 is that input subsidies are taken into account. For example, a country that offers lower producer prices might be expected to subsidize inputs such as fertilizers, pesticides, and extension support services at a higher rate than its neighbors.

Taking subsidies into account (by adding the value of the subsidies per kilogram of seed cotton to the final producer price⁸) did not smooth the net values received by producers across countries (the coefficient of variation is the same as that for the base price plus supplementary payment without subsidies); but it did change the ranking of countries by total farmer benefits per kilogram of seed cotton. For example, in comparing the right side of central and bottom portions of Figure 8, one observes that by adding in subsidies, Benin moved from second highest to highest in 08/09, Chad moved from last place to highest in 06/07, Burkina moved ahead of Mali in 04/05 and ahead of Benin in 03/04.

In sum, although the C-4 pricing mechanisms have many commonalities in terms of factors taken into account and procedures used to set prices, including efforts to make prices more reflective of world market trends, the different base prices announced each year as well as the direction of the price movements from year to year suggest that the administered prices are being influenced by factors other than world market prices and differences among the C-4 in transportation costs. Factors possibly playing a role include differences in services provided by ginners to farmers that are not captured by the subsidy, processing costs (ginning efficiency as well as costs of energy), marketing skills of the exporters, and political considerations (a desire to keep producer prices high during election years, for example).

⁸ The value of seed inputs provided for free is not included as that was a practice across all countries during the period covered.

Figure 8. Cross-country comparisons of nominal prices for seed cotton



Source: Compiled from price data provided by study team.

6. Diagnostics: Are by-product price signals well reflected in the producer prices set by pricing mechanism?

Section 3 reviewed some of the underlying assumptions about how prices are transmitted through a sector like cotton, which is characterized by multi-component products. Information available on cotton sectors in general suggests that approximately 75% of the value added from seed cotton comes from the lint and 25% or less from all the by-products (Tschirley, Poulton, Labaste 2009). The actual contribution of cottonseed sales to the ginner's bottom line is not insignificant, but it is relatively small compared to the income from lint because most of the by-product value added is accruing to other actors in the value chain. In the case of a ginning sector that is realizing profits (not the case currently for the C-4), an increase in the sales price of cottonseed (all else equal) would increase profits and put the ginner in a position to pass some of this increased profit back to farmers through a higher price for seed cotton. Higher seed cotton prices would also be expected to stimulate more cotton production, but the evidence available suggests that West African farmers' responsiveness to world cotton prices is not strong. As noted earlier, a review of supply elasticity estimates for cotton producing countries worldwide showed most estimates for the C-4 falling below 0.5 and many below 0.2 (Shepherd and Delpeuch 2007, citing among others Sumner 2003, Araujo-Bonjean *et al.* 2006, Shepherd 2006).

Unfortunately, in the C-4 situation, all else is not equal. Lint prices have been unusually low during most of the past decade and increasingly variable from year to year. Further complicating the analysis of by-product price transmission is the fact that lint and by-product prices often go in the opposite direction so an observed increase in cotton by-product retail prices does not necessarily mean an increase in ginner net revenue. Also, the manner in which base prices for producers (those announced at planting time) are determined in the C-4 has resulted in a pattern of producer payments that frequently exceed the income earned from actual lint sales. While increased profits from selling cottonseed at a higher price can dampen the negative impacts of declining lint prices, the relative size of the two revenue streams is such that the impact on farm incomes—even if fully passed on to farmers—is likely to be quite small. That said, it is important for the C-4 cotton sectors to better understand the relationships between cotton by-products and cotton lint and what the implications are for the development of both sectors in terms of job creation, industry development, contribution to GNP, and for the equitable distribution of the returns to all the actors in the sector.

The diagnostics presented below are a first step in assessing the extent to which farmers are receiving a seed cotton price that reflects world market prices of lint plus the value of cotton by-products derived from cottonseed and sold primarily in domestic markets. The first step is a “parity price” analysis applied to 2007/08. This is followed by an “implied profit margins” analysis which uses observed marketing margins as a very rough proxy for crusher and ginner profit margins during the 2000-2008 period.

The parity price analysis is static, looking only at the situation in 2007/08—a year during which there was a significant rise in the prices of by-products and unusually low seed cotton production. Unlike the margins analysis, it does take into account estimated ginner and crusher costs of processing, providing a better picture of what value there is left in the value chain to be passed back to farmers.

The margins analysis is a bit more dynamic in that it looks at the inter-annual changes in marketing margins for the principal by-products during the entire 2000-2008 period in an effort to detect any trend or pattern which might suggest the possibility of profits being realized by ginner and/or crushers and not being passed back to farmers. Explicit tests of whether market

power is being exercised by ginners in the C-4 would require the use of econometric methods to analyze the determinants of the farm to retail (or factory gate) price spread and the effects of both monopoly and monopsony power as well as firms' cost structure (see Shroeter and Azzam 1990). Unfortunately, such tests were not possible in the present analysis given data limitations. The alternative approach used is an analysis of the "implied profit margins" of the cotton value chains as an upper bound estimate of profitability in the marketing channel and an evaluation of whether the farm to factory gate price spread has indeed grown over the past decade.

The weakness in this approach is that it really looks at marketing margins rather than at profit margins (profit margins = marketing margins minus costs) because annual data on costs of processing are not available. Assumptions about inter-annual changes in processing costs based on the likely under-utilization of processing facilities when seed cotton production is low are used to interpret the likely share of costs and profits in the marketing margins.

Given the complexities of the price transmission process described in Section 3, and the relatively poor quality of the data that we have to undertake the analysis, results are presented more as illustrations of the types of analyses that could be undertaken in the future with better quality data. Results here should not be interpreted as definitive answers to the question of how well prices have been transmitted in the recent past.

6.1. Parity Price Analysis

A parity price is a reference price used to evaluate how well a commodity price in a market under study reflects price levels in other markets. When there is some question about how well the commodity prices prevailing in a particular market (e.g., farm gate seed cotton prices in C-4 countries) reflect prevailing demand and supply in other markets (national, regional, or world), it is common to look for reference prices for that commodity from other sources or locations and to adjust them so that they are "on par" or "equal to" the situation in the market and location under study. This is accomplished by subtracting out (or adding in) payments for taxes (in the case of financial analyses like those used for this study), transportation, insurance, and processing. After these adjustments, the "parity price" derived from the reference price is on an equal basis with the commodity price in the location under study. The most common types of parity price estimates are import and export parity prices used to determine if a particular commodity produced domestically can be competitive with imports or if it can be sold locally at a price that is as remunerative as selling in an export market would be.

Our analysis is designed to provide an understanding of the difference in price incentives farmers face given the status quo versus a case when the price of seed cotton is based on the local parity prices of its components (cottonseed and lint). The analysis can help detect unfair commodity pricing practices. In the C-4, cotton lint is exported, seed cotton is ginned locally and cotton by-products are generally processed and consumed locally. This set of market factors suggests that a combination of international export prices for lint and domestic wholesale prices for cotton oil and cake provide an appropriate reference price for evaluating the extent to which administratively determined seed cotton prices in the C-4 reflect market realities. More specifically, the analysis estimates a "parity price" that reflects the value of cottonseed and incorporates that value into a seed cotton parity price at the farm level given what is known about the processing and transport costs and sales prices of cotton lint, cottonseed, and the principal by-products produced in the C-4: cotton oil and cotton cake. This represents a "local" parity price because the reference prices for cottonseed are observed in the domestic markets of the C-4 countries as opposed to regional or world markets. The use of local prices is also

motivated by the thinness of the export markets and price data availability for cotton by-products, which tend to be marketed domestically in most cotton producing countries.⁹

The analysis focuses on the 2007/08 cotton production and marketing season, but has also been applied to earlier years when data were available. The analysis uses financial (i.e., market) rather than economic or social prices (i.e., prices adjusted to account for various types of market distortions associated with taxes, subsidies, and overvalued exchange rates). Table 5 describes the parity price approach, laying out the issues that it addresses, the specific methods employed, and the challenges encountered.

Table 5. Diagnostic Tool 1: Local Cotton Parity Prices

Issue	The questions to address are: (1) What would the local price of cottonseed and seed cotton be if they were based on the derived demand of their components? (2) How well do prices paid to farmers reflect recent changes in demand for both cotton lint and by-products? (3) What is the difference between seed cotton parity prices and prevailing C-4 seed cotton prices? (4) What is the difference between cottonseed parity prices and prevailing C-4 cottonseed sales by ginners? (5) What do the differences between parity and prevailing prices imply about price transmission and pricing efficiency?
Methods	“Local” parity price (LPP) calculations for cottonseed and seed cotton at the factory and farm gate, respectively, using financial prices. Sensitivity analyses on the parity prices with respect to both processing costs (ginning and crushing) and assumed reference prices.
Challenges	Difficulties identifying (1) appropriate reference prices and (2) cost data of both ginning and crushing firms (marketing & processing costs).

This diagnostic tool provides some very rough guidelines about what prices “would have been” for the 2007/08 cotton growing and marketing season if they reflected the derived demand for cotton by-products. Our interest in using this approach was to have a point of reference for the current discussion in the C-4 about whether there is a need to improve the valuation of the by-products in the value chain.

For each country, parity prices are examined from two perspectives:

- Using the ginner factory gate sales price of cottonseed as the reference price for the by-products portion of the price paid to farmers for their seed cotton;
- Using the local retail prices (pre-tax) of the end-use by-products (oil and cotton cake) to estimate the cottonseed reference price for the by-product portion of the seed cotton.

Each method has its strengths and weaknesses. For the former, data needs are less as estimates of oil crushers’ processing costs are not used; but earlier discussion of cottonseed price movements in the C-4 (Section 4) suggests that there are considerable distortions in these markets, implying that reliance on local prices may not be an accurate reflection of the true value of the cottonseed. For the latter approach, the challenge is getting reliable information about crusher processing costs; but the positive side is that markets for the end products appear to be subject to fewer distortions than those for cottonseed.

⁹ In 2007/08 there were virtually no cottonseed exports from the C-4 to Europe, but in earlier years, Benin exported as much as 50% of their cottonseed to Europe and Burkina also exported to Europe several times but to a lesser degree than Benin.

6.1.1. Data considerations

The local parity prices (LPP) builds on the average reported pre-tax factory gate prices of principal by-products during the 2007/08 production and marketing season, weighted by the country-specific conversion coefficient for each by-product per kilogram of seed cotton or cottonseed. Although these weights differ a bit depending on varieties and processing efficiency, they are fairly similar across the C-4.¹⁰ Adjustments to the reported prices include (1) subtracting estimated average processing costs (ginning only in the first method, both ginning and crushing in the second), transportation costs between stages of the market chain and (2) adding in an estimate of reasonable returns to processors.

A complicating factor is that processing costs per kilogram of seed cotton or cottonseed can vary significantly from one year to the next due to capacity utilization issues, so efforts to conduct a semblance of a multi-year analysis by adjusting the 2007/08 costs for inflation to obtain estimates of parity prices for earlier years ends up providing insights about how the parity price would change given percentage changes in costs but ignores the issue of capacity utilization. Tables 6 and 7 present cross-country comparisons of the key cost factors taken into account for the analysis.

For Burkina and Mali, the two cost columns reported in Table 6.2 for lint represent the “prescriptive prices” (what the processors costs “should” be for an efficient firm), followed by what the costs actually were in 2007/08. The crushing costs for Mali represent two conflicting estimates, both thought to represent costs for 2007/08. The 21 FCFA cottonseed transport cost for Mali assumes moving seed from the production zone to Bamako while the 3 FCFA cost for Burkina assumes moving seed within the same town. In both countries, there is substantial variability in terms of distances between ginners and crushers.

Table 6. Summary of costs used for parity prices: Burkina and Mali

Cost Category	Burkina		Mali	
	Low Price Scenario	High Price Scenario	Low Price Scenario	High Price Scenario
Lint production costs	(FCFA/kg of lint)			
Collect/transport seed cotton	13	14	13	na
Ginning	91	109	96	141
Moving lint to FOB	65	77	77	77
Oil/cake production costs	(FCFA/kg of cottonseed)			
Seed transport from ginner to crusher	3	na	21	na
Processing seed	73	na	30	75

Source: Data provided by study team.

For Chad the first column of Table 6.3 represents costs for 2007/08 and the second those for 2006/07. For Benin, lint production costs are based on a study of the 2003/04 campaign (first column) and adjusted for inflation to reflect 2007/08 (second column); crushing costs are based on average costs for 2001-2005 reported by the largest processor (first column) and adjusted for inflation to reflect 2007/08 (second column).¹¹

¹⁰ Extraction rates are approximately 42% for lint and 52-56% for cottonseed per unit of seed cotton; 14-18% for refined oil and 40-52% for cotton cake per unit of cottonseed. Burkina has the highest oil and cotton cake extraction rates.

¹¹ Adjusting costs for inflation fails to take into account changes in capacity utilization, which can play a much larger role in shaping costs than inflation (the two years of data available for Chad illustrate this well).

Table 7. Summary of costs used for parity prices: Chad and Benin

Cost Category	Chad		Benin	
	Low Price Scenario	High Price Scenario	Low Price Scenario	High Price Scenario
Lint production costs	(FCFA/kg of lint)			
Collect/transport seed cotton	16	17	17	19
Ginning	73	59	87	97
Moving lint to FOB	109	138	18	19
Oil/cake production costs	(FCFA/kg of cottonseed)			
Seed transport from ginner to crusher	12	12	11	11
Processing seed	79	54	53	58

Source: Data provided by study team.

The differences between the “prescriptive” and actual costs for Mali and Burkina were substantial. For Mali the actual cost of ginning was 1.5 times the prescribed. In Burkina, the actuals were just under 1.2 times greater than the prescribed norms.

Box 5 describes procedures used to estimate returns to investment for both ginners and crushers. These estimates can be improved in the future by using more country-specific data on processor investment capital and interest rates.

Box 5. Estimating Returns to Processors

In order to generate an estimate of a reasonable rate of return on capital for ginners we used data available from SOFITEX in Burkina—the only ginning company for which we had data permitting an estimate.

We first estimated the capital investment on the part of the ginning firm. From the cost data we subtracted the cost of labor and other costs associated with the firm’s “accompanying services” to the value chain in order to estimate the relative importance of working capital to the overall cost structure. From the cost data for the 2007/08 season, this was 64 FCFA/kg of seed cotton. We then multiplied that value by our estimated opportunity cost of capital, 5%. We then used $64 \text{ FCFA} \times 5\% = 3.2 \text{ FCFA/kg}$ of seed cotton as our estimate of returns on capital investment for ginners, applying the estimate for all countries.

For the crushing sector we used information about the crushing sector in Benin (Sewadé 2007) and followed a similar approach to our estimates of returns on ginner investment. We determined that a “reasonable” level of return in crusher investment is 1.85 FCFA/kg of crushed cottonseed. That estimate was applied to all countries.

The assumption of a 5% opportunity cost of capital can be adjusted in future county level analyses if it is deemed too high or too low.

6.1.2. Interpreting the results

If there is a wedge (either positive or negative) between the price paid to farmers and the estimated parity price at the farm-gate, this suggests that current payments to farmers do not accurately reflect the derived demand for both lint and by-products. The analysis does not provide any information on the reasons for the wedge. A possible explanation for a parity price greater than the prevailing price is the failure of those administering the pricing mechanisms to have access to or take into account accurate information about by-product prices and oil processor margins. Another explanation might be non-competitive behavior in procedures used to determine the ginner sale price of cottonseed. Undervaluation of the seed when sold by the ginner then results in undervaluation of the seed when its sales value is taken into account in the price mechanisms. When the prevailing price is higher than the parity price it can be due to a failure to set the producer price announced at the beginning of the planting season at a level that is consistent with world market prices during the marketing season.

On the other hand, if the actual price paid to farmers and parity prices are close, it suggests that farmers are being paid for the multiple components of their seed cotton, though perhaps not in a manner that is transparent to them. As noted above, the sensitivity of the results to assumptions about processing and transport costs must be taken into account in the interpretation. For example, the parity price may approximate the payment currently made to farmers yet be much lower than it could be were processing costs reduced. Sensitivity analyses explore the extent to which changes in processing and transport costs change the results.

For the first approach using the price of cottonseed sold at the ginner factory gate, (1) all prices are expressed per kilogram, pre-tax and at the factory gate, (2) all weights reflect the conversion coefficient in relation to a kilogram of seed cotton, and (3) ginning costs, returns to ginners and transportation costs are expressed per kg of seed cotton such that:

Equation (1) Seed Cotton LPP at the farm gate (FCFA/kg) using cottonseed sales price:

$$\begin{aligned}
 & (\text{Lint weight per kg of seed cotton}) * \text{lint price/kg} \\
 & + (\text{Cottonseed weight per kg of seed cotton}) * \text{cottonseed price/kg} \\
 & - \text{Average total processing (ginning) costs/kg of seed cotton} \\
 & - \text{Returns on capital for ginners/kg of seed cotton} \\
 & - \text{Average total transportation costs (farm – factory) / kg of seed cotton} \\
 & = \text{Seed cotton LPP at the farm gate (FCFA/kg)}
 \end{aligned}$$

The 2007/08 results by country are summarized in Table 6.4, using the prescriptive (lower) costs reported in Tables 6.2 and 6.3 above when there was a choice. The results are clear for the Benin and Chad cases: the parity price of seed cotton based on the ginners' average sales price of cottonseed is lower than the prevailing payment to farmers (farm gate base price + supplementary payment + the value or input subsidies). The negative wedge in Chad is greatest (-26 FCFA/kg of seed cotton) and consistent with the need for substantial government subsidies to keep the cotton parastatal afloat. These two analyses provide no justification for paying farmers an additional premium for 2007/08. Given the established sales price of the cottonseed and the cost structure of the ginning sector, the ginners were not in a position to pay higher prices and may well have lost money with the payment that was made. For Chad, it would take a 20% reduction in ginning and transport costs across the board for the parity price and the payment to producers to be approximately equal. In Benin, a 5% cost reduction would equalize the parity price and the producer payment while a 10% reduction would set the parity price about 5 FCFA higher than the producer payment.

For Mali and Burkina, the prescriptive costs result in parity prices that are well above the payment made to farmers: 11 FCFA/kg for Burkina and 20 FCFA/kg for Mali. In other words, if prescribed costs had prevailed in 2007/08, there would have been some additional value added in the system that could be used to increase payments to farmers. These two results change dramatically, however, when actual ginning costs rather than the prescribed costs were used: the Burkina parity price declines to 15 FCFA less than payments already made and the Malian parity price to 25 FCFA less. In both cases, the 2007/08 cotton production was roughly 55% of the 2006/07 level, resulting in underutilization of the ginning capacity and therefore higher per unit processing costs.

Table 8. Results from Equation (1): Seed cotton LPP using ginner cottonseed sales price as reference price

Country	Ginner cottonseed sale price	Lint export value	LPP of seed cotton at farm gate	Actual payment to farmers	LPP minus actual payment
(FCFA/kg)					
Benin	41	618	162	170	-8
Burkina	72	574	172	163	+11
Chad	20	553	144	170	-26
Mali	50	660	191	171	+20

Source: Authors' calculations based on data provided by study team¹²

For the second approach, which takes into account the local prices of oil and cotton cake to estimate the reference price for cottonseed, (1) all prices are expressed per kilogram, pre-tax and at the factory gate, (2) all weights are expressed in relation to a kg of cottonseed, and (3) crushing costs, returns to crushers and transportation costs are expressed per kg of cottonseed such that:

Equation (2) Cottonseed LPP at the ginner factory gate (FCFA/KG)

$$\begin{aligned}
 & (\text{Refined oil processing coefficient}) * \text{refined oil price} \\
 & + (\text{Cake processing coefficient}) * \text{cake price} \\
 & - \text{Average total marketing (crushing) costs/kg of cottonseed} \\
 & - \text{Return to crushers/kg of cottonseed} \\
 & - \text{Average total transportation costs (gin gate to crusher door) / kg of cottonseed} \\
 & = \text{Cottonseed LPP at the ginner factory gate (FCFA/kg)}
 \end{aligned}$$

The resulting cottonseed parity price is then substituted for the ginner sales price of cottonseed used as a reference price in Equation (1). Table 9 presents the parity price estimates for cottonseed.

The finding of note in Table 9 is that in all countries but Chad the parity price for cottonseed is substantially greater than the actual sales price of cottonseed. These results suggest that crushers are realizing returns on their oil and cake sales that would permit them to pay substantially more (26 to 38 FCFA/kg more, depending on the country) for their cottonseed. The differences are strong enough that an increase in crushing costs ranging from 38% for Benin to double for Mali would be required to close the gap between the parity prices and the actual factory gate prices of cottonseed. In Chad, a reduction in crushing costs of 25% would bring the parity price up to the level of the factory gate price.

Table 9. Results from Equation (2): Oil and cotton cake prices used as reference price for estimating LPP of cottonseed

Country	Refined oil price	Cake price	LPP of cottonseed	Actual cottonseed factory gate price	LPP minus actual factory gate price
(FCFA/kg)					
Benin	600	100	67	41	+26
Burkina	738	103	109	72	+37
Chad	629	40	0	20	-20
Mali	681	115	88	50	+38

Sources: Authors' calculations based on data provided by study team.

¹² Results presented in this and other tables dealing with parity prices differ from those presented in national workshops conducted in January and February of 2010 because suggestions from national consultants and workshop participants for improving the data and assumptions used in the analyses were taken into account in drafting this final report.

Part A of Table 10 reveals that when using the low-cost ginning assumptions, all countries but Chad have a parity price for seed cotton that is greater than the actual 2007/08 payment to farmers, with the differences ranging from 6 FCFA/kg for Benin up to 40 FCFA/kg for Mali.

Part B of Table 10 shows that these high parity prices decline substantially with the alternative (generally higher) processing costs. The sensitivity analysis in Part B of Table 110, which represents reality more closely than results in Part A, shows only Burkina with a seed cotton parity price greater (+4 FCFA/kg) than the payment actually made to farmers. The reduced processing costs reported for 2006/07 in Chad resulted in a cottonseed parity price slightly greater than the ginner sales price (26 vs. 20 FCFA/kg), yet the net impact of all the cost changes was not enough to bring the parity price on a par with the producer payment.

Table 10. Method 2: Cottonseed LPP used as Reference Price for seed cotton LPP

A. Low cost assumptions	LPP of cottonseed	Lint export value	LPP of seed cotton at farm gate	Actual farm gate base payment	LPP minus farm gate payment
	(FCFA/kg)				
Benin	67	618	176	170	+6
Burkina	109	574	191	163	+28
Chad	0	553	133	170	-37
Mali	88	660	211	171	+40
B. High cost assumptions	(FCFA/kg)				
	Benin	60	615	160	170
Burkina	109	562	167	163	+4
Chad	26	524	148	170	-22
Mali	43	660	142	171	-28

Source: Authors' Calculations based on data provided by study team

Note: For the "high cost assumptions," estimated 2007/08 processing and transport costs increase by 10%. For Mali and Burkina, 2007/08 costs reflect actual instead of prescribe costs. For Chad the sensitivity analysis retains the 2007/08 prices for lint and by-products but the alternative costs are those for 2006/07, which were generally lower for processing (due to higher volume) but higher for moving lint to FOB; this combination highlights the role of changing costs in shaping the Chad parity price results.

6.2. Implied Profit Margin Analysis

6.2.1. Overview and definitions

As noted earlier, a trend of ginner or crusher profit margins increasing over time may be a sign that price movements are not being transmitted effectively through the value chain back to the suppliers of the raw materials. In the C-4 this could result from the exercise of market (or political) power by intermediaries involved in the design and implementation of the pricing mechanisms. The challenge in doing an analysis of this type is that information about the most relevant margin—the ginner and crusher profit margins—is generally not available or of suspect quality. Historically, there has been skepticism about the accuracy of profit and cost-of-processing data made public by the ginning parastatals. Now that the ginning and crushing sectors in several countries have been liberalized, there is no obligation for the private sector to make production costs public, thus increasing the data challenge.

Because the study did not include a mandate for a full analysis of the costs and profit margins of the processing industries, it was necessary to use an "implied profit margins" approach. The implied profit margin uses inter-annual changes in marketing margins at different points in the value chain as an initial proxy for the upper bound of profit margins. A marketing margin is the difference in prices for a given commodity at different points in the supply chain when quantities

are expressed in comparable units (Tomek and Robinson, 2003). This difference consists of the costs incurred in processing (including transport and marketing) and the profits realized by the market intermediaries. Because it is movement in the profit part of this margin that is of interest, the observed marketing margins are combined with secondary information about subsector trends (particularly the extent to which processors are running under capacity and incurring higher production costs per unit) in an effort to determine the extent to which the inter-annual changes are being shaped by changing costs or changing profits. The analysis is useful as a preliminary indicator of whether there might be profits in the sector that could be passed back to farmers. Table 11 summarizes the key issues being addressed, the characteristics of the method, and the challenges faced in applying it to the C-4 situation.

Table 11. Diagnostic Tool 2: “Implied” profit margins analysis

Issue	The questions to address are: (1) Is there evidence that ginning and crushing firms have experienced increasing marketing margins over time? (2) While increased marketing margins are not a conclusive indicator of the exercise of market power by the processors or excess profits, they do suggest a need for further investigation.
Method	(1) Calculation of marketing margins to test whether there has been an increase in the farm to factory gate price spread in the C-4. (2) In the case of multi-component products such as seed cotton, the analysis must be done by converting different products to a common unit such as the seed cotton equivalent using product transformation coefficients. (3) Relative weights of each product in a ton of seed cotton are used to construct product transformation coefficients. (4) Marketing margins are then combined with secondary information on the likely direction of movements in processing costs, permitting interpretation as “implied” profit margins
Challenges	(1) Using data that has been aggregated to yearly prices and quantities without clear documentation on how the averages were calculated (e.g., with or without seasonal weighting factors for the prices, no clear statement of which months are covered for the sales data). (2) Cannot explicitly parse out the effect of possible changes in the cost structure over time from non-competitive behavior of processors.

The implied profit margins analysis provides a framework to analyze:

- the size of the marketing margins in a given year,
- whether the margins have increased over time.

Starting with the assumption that movements marketing margins are a reasonable proxy for movements in profit margins (the case where costs remain relatively stable over time), the results can be interpreted as follows:

- A negative margin for any given year or set of years implies that the processing sectors are losing money and processors may be paying more for the primary inputs (seed cotton and cottonseed) than justified by the end value of the products being sold.
- A positive margin for any given year or set of years implies that there may be some returns to pass back to farmers.
- Stable margins over time imply that processors are unlikely to be increasing (or decreasing) profit margins over time; this result implies that there are no additional profits being realized as a result of the recent increases in retail prices of cotton oil and cake.
- An increasing spread in the margin over time, suggests that (unless costs are also rising) processors may be realizing profits that are not being passed back through the system in

the form of higher prices paid for raw materials (seed cotton and cottonseed); this may be the result of (1) asymmetric market price transmission or (2) market power on the part of marketing intermediaries.

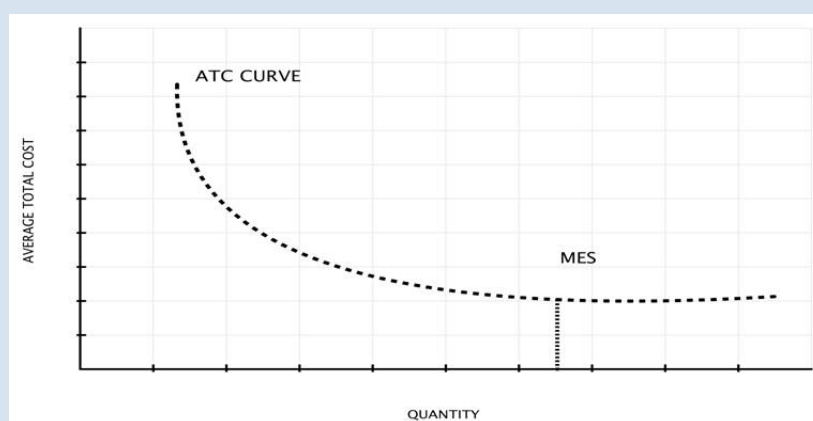
- A decreasing spread in the margin over time suggests that competition may have increased in the market through the entry of new actors who are willing to sell at lower prices, thereby bringing down the sales price of by-products, or through a reduction in bargaining power *vis-à-vis* cottonseed suppliers in the case of monopoly crushers.

If the assumption about relatively constant processing costs across time is removed, changes in the estimated marketing margins can reflect changes in both the processing costs and profit margins; but additional information is needed to separate the two components (see Box 6).

Box 6. Average Total Cost and Economies of Scale

The graph illustrates the effect on average total costs (ATC) of operating at different levels of capacity utilization

Average total cost curve and minimum efficiency scale



As quantity processed increases, ATC declines until it reaches the minimum efficiency scale (MES), where the costs level off and remain relatively constant.

Assuming there are economies of scale in processing, average total cost (ATC) will increase as throughput decreases. As a result, the relative importance of processing costs in the composition of the marketing margin will increase.

Conversely, as throughput increases, we expect to find ATC decrease until the firm reaches its minimum efficiency scale (MES) while the relative importance of processing costs in the composition of the marketing margin decrease.

Source: Authors

Movement in the processing costs is more likely than stable prices in the C-4 cotton sector given available evidence about both ginners and crushers frequently operating with excess capacity and therefore able to gain economies of scale as throughput increases.

The crushing sectors in all the C-4 have operated at less than 70% of capacity during the 2000-2008 period, with some years as low as 24% in Chad and 43% in Benin. Chad's single crushing firm, for example, hits the breakeven point when it processes 70,000 tons of cottonseed but has not exceeded 61,000 tons during the past 10 years. Similarly, ginning capacity utilization has been variable, Chad's utilization has ranged from 50-67% since 2000, Benin was 73% in 2005 and then dropped to 33% in 2006; Burkina has been more stable with two firms operating close to

capacity and one at about 75%, Mali has fluctuated from 100% in 2004/05 and 2005/07 to 45% in 2007/08 and 2008/09.

6.3. Calculating the Marketing Margins

The analysis presents three different types of marketing margins(see Box 8 for calculation details):

- **Crusher Margin:** Margins between the price paid by crushers for cottonseed and the price they received when selling processed products (oil and cake); ginner factory gate prices are used for the cottonseed price and crusher factory gate prices for the by-products, each weighted by the processing transformation coefficient (PTC).
- **Simple Ginner Margin:** Margin between the price paid by the ginner to purchase seed cotton and the prices received when selling processed products (lint and cottonseed); the final payment received by farmers (base price plus supplemental *ristourne* payment and input subsidies) is used as the seed cotton price and ginner factory gate prices of lint and cottonseed for the by-products. The ginner margins value exports at export prices and all other seed at the domestic sales price.
- **Synthetic Ginner/Crusher Margin:** This case is a combination of the crusher and ginner margins that reflects the four by-products: lint, seed, oil and cake. To get an accurate representation of the synthetic margin for both the ginning and the crushing operations, data is needed on the percent of the cottonseed processed into oil and cake versus the percent consumed as an end product (seed for next year's crop, cottonseed used as animal feed without any processing, etc.).

Box 7. Calculation of marketing margins from three different perspectives

Crusher Margin: Crusher selling processed cottonseed as oil and cake:

(Line 1) (PTC of oil) * (Price of oil)
 (Line 2) +(PTC of cake) * (Price of cake)
 (Line 3) – price paid to ginner for cottonseed
 (Line 4) = Crusher margin

Simple Ginner Margin: Ginner selling lint and cottonseed (excluding crusher value added):

(Line 5) (PTC of lint) * Price of lint
 (Line 6) +(PTC of cottonseed) * (Price of seed sold to domestic ginner) * % domestic sales
 (Line 7) +(PTC of cottonseed) * (Price of seed exported) * % export sales
 (Line 8) – price paid to producers for seed cotton (FCFA/kg)
 (Line 9) = Simple ginner margin

Synthetic Margin: Ginner selling lint and cottonseed valued by share of each end product sold

(Line 10) (PTC of lint) * Price of lint
 (Line 11) +(PTC of cottonseed) * (% seed exported) * (Price of seed exported)
 (Line 12) +(PTC of oil) * (PTC of cottonseed) * (% seed crushed) * (Price of oil)
 (Line 13) +(PTC of cake) * (PTC of cottonseed) * (% seed crushed) * (Price of cake)
 (Line 14) – price paid to producers for seed cotton
 (Line 15) = Synthetic ginner/crusher margin

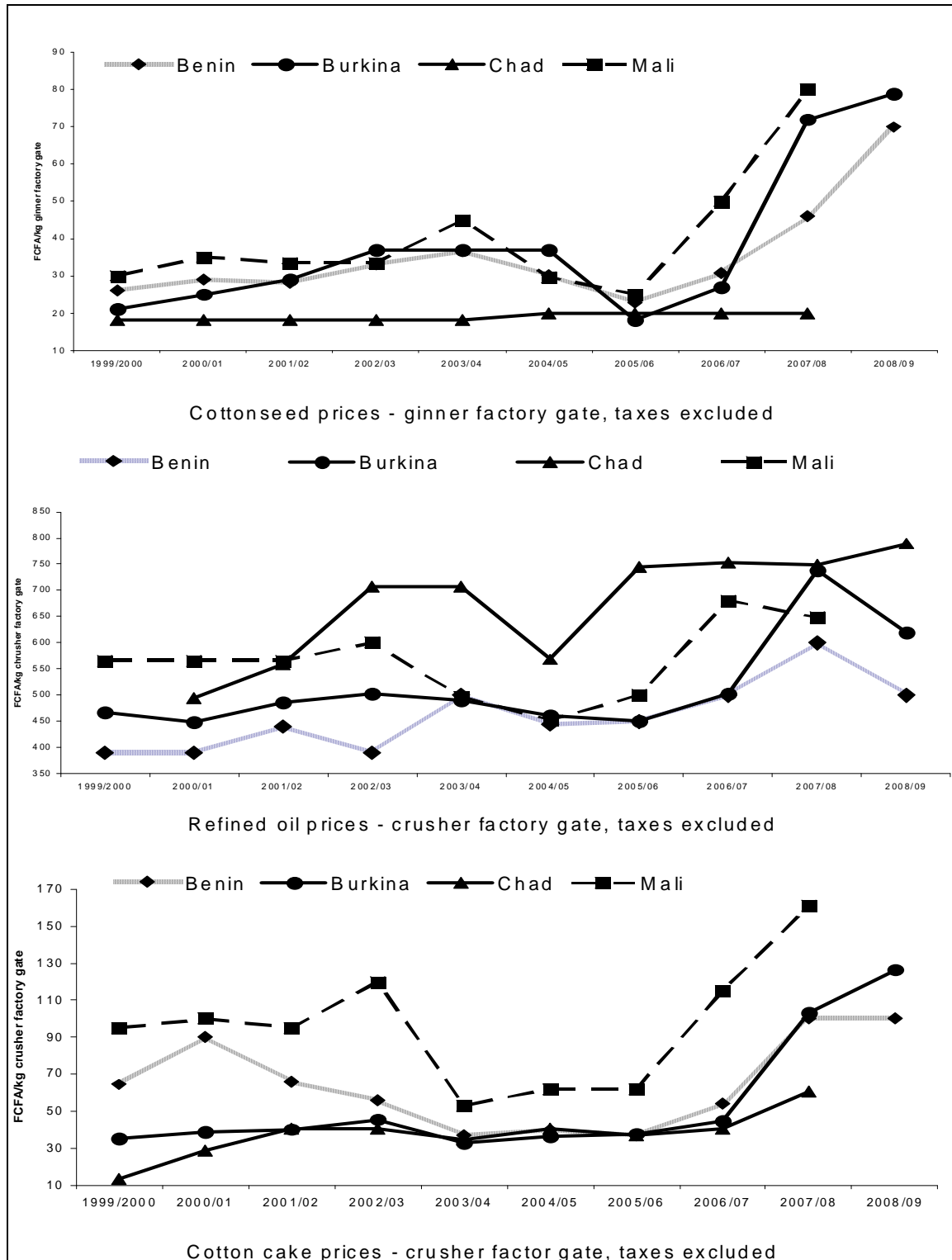
Note: PTC is the processing technical coefficient which reflects the percent (by weight) of the initial product (seed cotton or cottonseed) that is represented by each of the by-products. Very generally, lint yield is about 42% and cottonseed yield about 53% of the initial weight of seed cotton. Oil represents from 14 to 18% of the initial cottonseed weight and cake about 40%.

The trends in the margins are strongly influenced by prices of the different end-products, so it is useful to review these trends before moving to an interpretation of the margins. Figure 9 graphs the cottonseed, refined oil, and cotton cake prices for each of the C-4 during the period under study.

Noteworthy observations concerning the prices include:

- Cottonseed prices in Chad have remained almost constant and low while those in other countries rose dramatically beginning in 2006/07;
- Despite low prices for raw materials, Chad exhibits the highest refined oil price;
- Benin's refined oil price is low, probably as a result of competition from imports;
- Oil prices do appear to have peaked and are declining in all countries but Chad;
- Mali, with its very large and growing livestock sector has strong demand and high prices for cotton cake;
- Declining levels of cotton production and cottonseed availability since 2006 have probably contributed to the rising by-product prices as less domestic production is available in C-4 markets.

Figure 9. Nominal price trends for by-products in FCFA/kg: 1999/00 to 2008/09

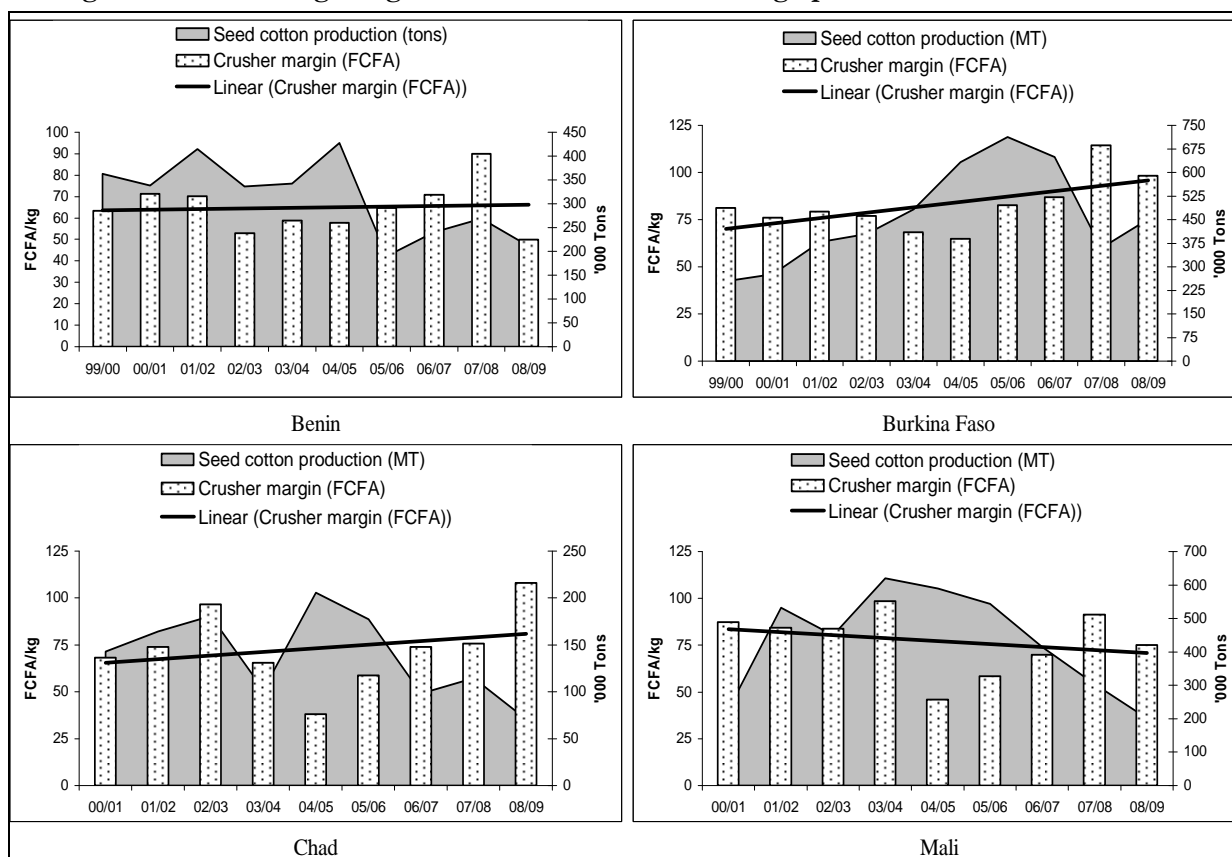


Source: Compiled from data collected by the study team.

6.3.1. Interpretation of Marketing Margins

Crusher marketing margins for all countries are shown in Figure 10 where the annual margins are represented by the columns and the seed cotton production by the line graph in the background. The linear trend lines represent the margins, but in all cases except Burkina the trend is not statistically significant.¹³

Figure 10. Marketing margins for C-4 cottonseed crushing operations



Source: Authors' calculations using data provided by study team.

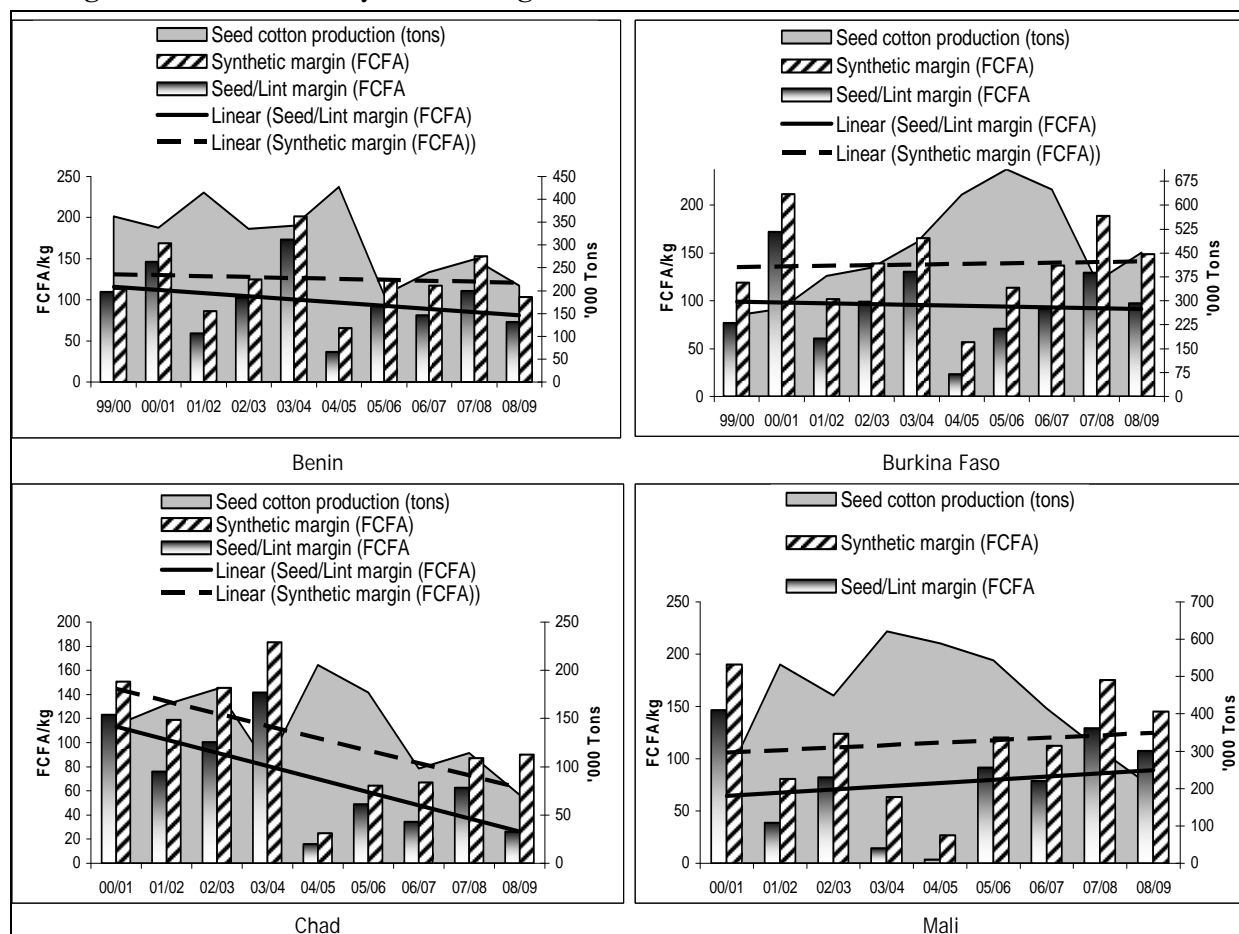
In the case of Burkina, the F test is significant at 0.02, the R squared is 0.36 and the coefficient on the year dummy is 2.87, indicating that the margin has been increasing at an overall rate of about 3 FCFA/kg from 1999/00 through 2008/09. The most salient observation, but not an unexpected one, is that the margins for 2007/08 were relatively large. During this year there was significant upward pressure on food prices in West Africa, including edible oils, but this year was also characterized by relatively low cotton production so a larger than usual portion of the margin could be accounted for by higher than usual processing costs due to underutilization of fixed assets. In other words, the relatively high marketing margins in 2007/08 may not be indicating excess profits that could be passed back to farmers. The situation may have been different for the earlier years (2000-2003) when marketing margins were relatively high at the same time that cotton production in all countries but Burkina was also high. This combination of factors suggests that some excess profits may have been realized during that period, but we cannot be certain without better data.

¹³ Results presented in Figures 10 and 11 dealing with implied profit margins differ from those presented in national workshops conducted in January and February of 2010 because suggestions from national consultants and workshop participants for improving the data and assumptions used in the analyses were taken into account in drafting this final report.

A comparison of the size of the margins across countries reveals that Benin has consistently lower margins than the other countries (average of 65 FCFA/kg) and Burkina has consistently higher margins (85 FCFA/kg on average), with Mali and Chad exhibiting averages of 77 and 73 FCFA/kg respectively. The lower margins in Benin are likely due to the strong competition from Asian imports (a function of Benin's coastal location) noted earlier and the lack of strong domestic demand for livestock feed. The higher marketing margins in Burkina may be due in part to more efficient processing coefficients—18% extraction rates for oil and 52% for cake compared to rates in the 14-16% and 40-42% range for other countries.

The ginner and synthetic margins are shown in Figure 11. The trend lines for the margins suggest stable or downward trends for all countries but Mali, where there appears to be a slight upward trend. None of these trend lines except that for Chad is statistically significant at 0.10 or better. The Chadian linear trend shows an annual decline of approximately 10 FCFA/kg (R squared of 0.45 and F test at the 0.07 level of significance). Unlike the crusher margins, the ginner and synthetic margins do not tend to peak in 2007/08 but in one or more of the years prior to 2004/05. Since 2004/05, when international cotton lint prices bottomed out, there has been a gradual increase in margins with 2007/08 generally exhibiting one of the highest margins since the crisis began. In all countries, however, the cotton production for 2007/08 was substantially below previous highs achieved from 2003/04 through 2005/06, suggesting that much of the 2007/08 margin could be a result of higher than usual processing costs.

Figure 11. Ginner and synthetic margins for the C-4



Source: Authors' calculations using data provided by study team.

This analysis also provides information on the relative contribution of the different end products to the overall margins. Table 12 shows that despite the rising trends in by-product prices and production, lint contributed on average over 80% of the total value from 2000 to 2009. The minimum and maximum shares (shown in parentheses in the table) confirm that there is considerable inter-annual variability, with the majority of the minimum contributions from lint (those under 80%) applying to 2007/08 (Mali and Burkina) and 2008/09 (all four countries). With only two years of by-products contributing higher than historical shares to the margins it is too soon to conclude that a structural change has occurred, but these results suggest a need to monitor margins in the future and to develop data sets permitting better margin analysis.

Table 12. Average contribution of cotton end products to the synthetic margin: 1999/00 to 2008/09

	Benin	Burkina	Chad	Mali
Contribution of:	Percent of synthetic margin (min/max % in parentheses)			
Lint	85 (78-92)	80 (72-86)	85 (73-94)	81 (77-85)
Exported seed	1 (0-6)	<1 (0 - <1)	1 (0-3)	0
Cotton oil	11 (1-15)	15 (11-20)	10 (3-18)	13 (11-16)
Cotton cake	3 (0-7)	4 (3-10)	1 (1-10)	6 (5-9)

Source: Authors' calculations from data collected by study team.

The issue of data availability and quality for this type of analysis needs to be considered in interpreting the results presented above. Price data were generally available, though it was often a challenge determining exactly what price a particular series represented (factory gate, retail, wholesale, with or without tax, etc.). The greater challenge was processing data. Only in Chad were data available on the actual quantities of seeds processed and oil and cake produced. For Benin, data were available on the quantity of seeds exported and the quantity of oil produced, which were used in conjunction with prescriptive processing coefficients to estimate the margins for all products. In Burkina Faso and Mali the existence of many small processors, for whom there is little information on cottonseed through put or processing coefficients, makes it impossible to accurately characterize the margins for the entire sector. Data of this type were also not adequate for the industrial processors. As a result, Burkina and Mali margins are based on the assumption that all the seed sold by the ginners was processed by industrial processors at performance levels comparable to the prescribed processing coefficients indicating good performance. This results in an over-estimation of the margins for the entire sector (small-scale processors do not have industrial levels of oil extraction).

The overall conclusion from this margins analysis is that there is little evidence of an established trend of increasing marketing margins over time that can be interpreted as the result of profits rising faster than costs. In most cases where crusher margins were high, they seem to be muted by the more dominant role of lint in shaping the overall ginner and synthetic margins. Farmer organizations and the cotton sector IA should, however, continue to monitor these margins and improve the database so that continued and more comprehensive analysis can be conducted in the future. If the contribution of lint to the margins continues to decline and that of by-products to increase, it may justify some revisions in the way that by-products are incorporated into the pricing mechanism.

7. Price Mechanism Simulations

In order to test the hypothesis that including the value of the cottonseed in the price paid to producers increases average prices and reduces inter-annual price variability, the current country-specific price mechanisms are used to simulate the impact of alternative scenarios of cottonseed valorization over the 1999/00 to 2008/09 period, permitting a comparison of the average prices and variability over time for the different scenarios.

7.1. General Approach

The first step is to establish a “base case” by applying the current price mechanism and using the observed values of the different parameters for each year. In cases where the formula already takes into account the value of cottonseed, average annual ex-factory, pre-tax prices reported by the ginning firms and/or IA are used for valuation. In the case of Burkina, which does not currently value cotton seed, the formula used for the simulations was modified to include seed valuation based on the average annual ex-ginner, pre-tax prices. The ten-year average results from the base case are then compared to the average observed producer prices (either base or final prices, depending on the country) during the study period and to a variety of simulated results.

The Mali and Chad analyses apply the price formula for the final producer price, known as the *rémunération finale* in Mali and the *prix effectif* in Chad. The Benin and Burkina Faso analyses apply the price formula for the price announced at the beginning of the season (*prix d'acompte* in Benin and *prix plancher* in Burkina Faso). Data issues (described in more detail below) precluded using the final reference price for all countries.

The alternative scenarios compared to the base scenario include:

- The value (price) of the cottonseed (FCFA/kg): simulation ranging from 0 to 200% of the value considered in the base case;
- The share of the value of cottonseed allocated to farmers vs. ginners: simulation ranging from 0 to 100% of the value allocated to farmers;
- The exogenously determined value of the lint (FCFA/kg): simulation ranging from 10% to 50% increases relative to the base case.

The 10-year average prices and coefficients of variation (standard deviation divided by the average as a measure of variability expressed in percentage terms) of the base case are compared to the simulated values paid to farmers over the period of the study. Note that the two “zero” valuations in the first and second scenarios listed above provide an example of what producer prices would be if by-products received a zero value in the pricing mechanisms. This permits a test of the hypothesis that valuation of by-products (compared to no valuation at all) can contribute to higher average producer prices and to lower inter-annual variance in those prices. A comparison of the base case with other simulated values permits one to evaluate the extent to which changes in the price formula or its parameters can change producer prices.

7.2. Discrepancies between the simulated base case and actual realized producer prices

Several of the base case simulation results are not equal to their observed prices during the ten-year period covered. This is due to three factors:

- For consistency in interpretation of the results, the current formula is used to simulate prices for the entire period (thus ignoring previous formulae that might have been

applied in earlier years);

- Historical final prices paid by the C-4 were often not determined by strict application of the formula;
- Difficulties in finding the exact same historical data on Cotlook A values and exchange rates as those used by the C-4 when they implemented their pricing mechanisms in the past.

The first point is understandable given that all countries but Chad changed the producer price mechanism at least once since the 1999/2000 production and marketing season. The second point results from either a failure to apply the formula strictly or because the initial price announced at planting was set so high that it exceeded the reference price calculated at the end of the marketing season, resulting in farmers receiving the higher base price as their final payment. As an example, in Chad, the pre-announced price (often determined through negotiations between stakeholders) exceeded the calculated final price for all but two years of our study period. For the third point, the manner in which the average values are determined in the formula is not always explicit in the available documentation nor are the sources of data used. In many cases, monthly or annual averages reported in secondary documents may differ from the results obtained by those having done the price mechanism calculations in “real time”

7.3. Country Specific Methods and Results

7.3.1. Mali

The base case for Mali applies the current producer price formula for the end of season price (*rémunération finale des producteurs*) using ginner reported lint and seed prices. In practice, should this final remuneration price be higher than the initial producer price announced at planting farmers receive a secondary payment equal to the difference between the two. When the initial price at planting time is higher than the final reference price, the ginner bears the difference (usually with assistance from the government and/or the support fund).

The base case for Mali used the parameters presented in Table13, and the following formula, which was theoretically applied by the Malians.

$$\mathbf{RFPCG} = \mathbf{A} \times [\mathbf{ICFE_FOB} - (\mathbf{1-Y}) \times \mathbf{Z}] \times \mathbf{RDFi} + \mathbf{PVGr HT} \times \mathbf{RDGr} \times \mathbf{PCOGr}]$$

Table 13. Parameters Used for the Final Producer Price (“*rémunération finale*”) in Mali

Final producer reference price (FCFA/kg)	RFP_{CG}	Varies
Cotlook index A FOB value (FCFA/kg)	IC_{FE FOB}	Varies
Lint yield norms under good performance (% seed cotton weight)	RD_{Fi}	42%
Cottonseed yield norms under good performance (% seed cotton weight)	RD_{Gr}	52.5%
Average CMDT sales price of cottonseed (FCFA/kg factory gate, excluding taxes)	PV_{Gr HT}	Varies
Share of cottonseed marketed	PCO_{Gr}	93%
Share of cotton lint production exported	Y	98%
Share of cotton lint production sold domestically	1-Y	2%
Costs of moving lint to FOB position (FCFA/kg of fiber)	Z	76
Farmers' share of subsector income	A	60%

Source: Diakité 2010

Results for the producer price simulations for Mali are presented in Table 14 where the 2000/01 – 2008/09 averages of the observed initial and final producer prices and various simulation results are compared to the simulation base scenario (third line of the table). Ideally, the simulation base scenario representing the final reference price should be a close approximation of the observed final producer price (base price plus supplementary payment). The observed average value is, however, 5% greater than the simulated average value, largely because there were many years during this period when the base price announced in May was greater than the final reference price, making the average observed final payment greater than the value obtained by relying entirely on the formula. The observed final price also exhibits a smaller coefficient of variation (9.7 vs. 13.4%) than the simulation values, suggesting that choices made in conjunction with the implementation of the pricing mechanism did keep the inter-annual variability of the final price lower than what it would have been had the formula been the determining factor in setting the final price every year.

The next three sections of Table 14 compare the results of some sensitivity analyses conducted on selected parameters of the pricing formula. Increases in the ginner sales price of cottonseed have relatively small effects on the seed cotton price. For example, a 10% increase in cottonseed prices (about 4 FCFA/kg of seed) elicits less than a 1% increase in the final seed cotton price. On the other hand, including seed in the formula does matter as illustrated by the first line of the second set of simulations where the share of the value of seed passed to farmers is set to zero and the final simulated seed cotton price drops from 176 in the base simulation scenario to 164 FCFA/kg. The last simulation adjusts the FOB lint price and illustrates the dominant role that lint plays in shaping cotton farmers' incomes. A conservative 1% increase in the lint price results in approximately the same producer price increase as obtained with a 10% increase in the cottonseed price.

The hypothesis that including seed in the pricing mechanism increases the price received by farmers for their seed cotton is confirmed by this analysis but the hypothesis that the inclusion of a value for cottonseed would reduce the variability of the final price paid to farmers is not supported. Under the current formula, the contribution of seed to the overall average prices from 2000–2009 was about 12 FCFA/kg of seed cotton. Coefficients of variation, however, were roughly 13% regardless of the simulation scenario used—so incremental increases in the relative importance of seed in the formula did not have much impact on overall price variability of final payments.

Table 14. Mali simulation results

	Average Producer Prices 1999/00 to 2008/09	% Difference*	Coefficient of Variation 1999/00 to 2008/09	% Difference*
Initial Producer Price (actual)	181.7	3.2%	11.5%	-13.9%
Final Producer Price (actual)	184.6	4.9%	9.7%	-27.8%
<i>Simulation Base Scenario</i>	<i>176</i>	<i>--</i>	<i>13.4%</i>	<i>--</i>
Simulation on value of the cottonseed (PVG _r HT)				
10% increase	177.2	0.7%	13.4%	0.25%
50% increase	181.9	3.4%	13.6%	1.52%
100% increase	187.8	6.7%	13.9%	3.66%
Simulation on the % share of the value of the cottonseed to be passed on to farmers (A)				
0% to farmers	164.2	-6.7%	13.3%	-0.40%
10% to farmers	166.1	-5.6%	12.3%	-0.63%
50% to farmers	174.0	-1.1%	13.3%	-0.34%
60% to farmers	Base Scenario	Base Scen.	Base Scenario	Base Scen.
100% to farmers	183.9	4.5%	13.7%	2.17%
Simulation on the value of the exogenously determined lint price (ICFE_FOB)				
1 % increase	177.6	0.98%	13.4%	-0.02%
10% increase	192.4	9.4%	13.4%	-0.22%
50% increase	258.3	46.8%	13.3%	-0.65%

Source: Authors' calculations

* The percent differences are calculated as (Average value on line of reference - Simulation Base Value) divided by the simulation base value.

7.3.2. Chad

The producer price mechanism in Chad is unique within the C-4 in that it adds a fixed, 5 FCFA amount to the producer price of seed cotton. The formula is:

$$PE = 19.3\% \times [\text{Cotlook A } t/t+1] + 5 \text{ FCFA}$$

where the expression in parentheses is the average of 16 monthly observations on the CIF price of cotton lint covering the period of January in year t through April in year $t+1$. At first glance the 5 FCFA/kg value for cottonseed appears not only arbitrary but also low. However, our analysis suggests that this value is actually quite generous compared to the alternatives examined.

To explore alternatives to the 5 FCFA/kg fixed valuation of cottonseed, it was necessary to introduce a few additional parameters to the existing formula that capture the potential impact of price movements in cottonseed. The alternative formula used to replace the constant factor of 5 FCFA/kg of seed cotton is shown below and Table 15 describes the parameters.

$$\text{Valorization of cottonseed per kilogram of seed cotton} = PP \times PVG_HT \times PGC \times RG$$

Table 15. Parameters Used to Calculate the Final Producer Price in Chad

Final price for seed cotton (<i>prix effectif</i>)	PE	Varies
Farmers' share of the Cotlook A CIF value	PP	19,3%
16 month Cotlook A average CIF(t/t+1)	Cotlook A t/t+1	Varies
Chadian fixed 5 FCFA/kg seed cotton value for cottonseed	V_gr	See above discussion
Producer share of seed value	PPcs*	Varies with base =19.3%
Cotontchad sales price for cottonseed (FCFA/kg, excluding tax)	PVG_HT*	Varies
Cottonseed yield per kg of seed cotton	RG*	Varies
Share of cottonseed marketed	PGC*	85%

Source: Padacké 2010

**Indicates parameters considered in simulations but not in the actual producer price mechanism*

This approach looks similar to the (theoretical) approaches to valuing the cottonseed in the price paid to producers in both Mali and Benin. Two “base case” simulations are estimated—one using the exact formula of Cotontchad shown above with the fixed value of 5 FCFA/kg of cottonseed and the other using the prices at which Cotontchad sells its seed to its DHS oil processing branch and the alternative cotton seed formula. The full formula for the combined value of lint and cotton seed is shown below and represents a modified *prix effectif*:

$$PE = 19.3\% \times [\text{Cotlook A } t/t+1] + [\text{PPcs} * \text{PVG_HT} * \text{RG} * \text{PGC}]$$

A particularity of the Chad formula is that it does not convert the Cotlook index to FOB terms by removing ocean freight and insurance costs, but uses the CIF value, which is higher than the FOB values used by other C-4 countries. For this reason, the share going to farmers (19.3%) is considerably lower than that used by other countries (usually in the 50-60% range). In the base scenario, the standard farmer share of 19.3% is also applied to the cottonseed portion of the formula. Given that the seed prices are local equivalents rather than CIF, it would be reasonable to consider a higher share—this is taken care of by looking at the second set of simulation results which include 50, 60, and 100% of the value going to farmers.

The average producer price for the cottonseed valuation scenario based on the exiting formula (5 FCFA/kg of seed cotton) obtained through simulation is 147 FCFA/kg—a value that is greater than all the other values obtained by simulating alternative seed valuation scenarios. Results of the other simulations (based on prices of seed sold by Cotontchad) range from 144 to 145 FCFA/kg using the 19.3% share to farmers applied in the current formula. At the point where farmers receive 60% of the seed value based on sales prices, the simulated producer price is equivalent to the simulated base price using the established 5FCFA/kg rule. In other words, farmers would have needed to get at least 60% of the value of realized DHS cottonseed sales revenues in order to be as well off as the seemingly arbitrary and low 5 FCFA they currently receive as a result of the price calculations now in effect.

As in the case of Mali, the impact of small increases in the lint price is much greater than the impact of large increases in the value of the cottonseed. A 1% increase in lint price increases the base simulation price by 1%; it takes a 10% increase in seed price to achieve a comparable increase. There is very little change in the coefficients of variation, regardless of the type of simulation conducted. This is likely due to the relatively low and stable seed sales prices reported by Cotontchad (18-20 FCFA/kg range for the entire period) and the relatively small contribution of seed to the overall value of seed cotton end products.

Table 16. Chad simulation results

	Average Producer Prices 2000/01 to 2008/09	% Difference*	Coefficient of Variation 2000/01 to 2008/09	% Difference*
Initial Producer Price (actual)	166.7	16.0%	6.5%	-43.3%
Final Producer Price (actual)	169	17.6%	7.0%	-38.9
Simulation Base Scenario (5FCFA/kg)	147		11.3	
Simulation Base Scenario (prix variable @ 19.3% share)	143.7	--	11.5%	--
Simulation on Value of the Cottonseed (PVG_HT)				
10% increase	143.9	0.1%	11.5%	-0.2%
50% increase	144.6	0.6%	11.5%	-0.8%
100% increase	145.4	1.1%	11.4%	-1.5%
Simulation on the % Share of the Value of the Cottonseed to Farmers (PP)				
0% to farmers	142	-1.2%	11.7%	1.5%
19.3% to farmers	BASE	BASE	BASE	BASE
50% to farmers	146.5	1.9%	11.3%	-2.4%
60% to farmers	146.9	2.5%	11.2%	-3.1%
100% to farmers	150.9	4.5%	10.9%	-6.0%
Simulation on the Value of the Exogenously Determined Lint Price (Cotlook A t/t+1)				
1% increase	145.1	0.99%	11.5%	0.01%
10% increase	157.9	9.9%	11.6%	0.1%
50% increase	214.7	49.4%	11.6%	0.5%

Source: Authors' calculations.

* The percent differences are calculated as (Average value on line of reference - Simulation Base Value) divided by the simulation base value.

7.3.3. Developing a Lint Reference Price for Benin and Burkina Faso

The formula for calculating the final prices paid to producers in Benin and Burkina are more demanding in terms of data needed than those for Mali and Chad. In Benin, the determination of the final producer price involves a variable measure of ginner processing and marketing costs which takes into account actual costs each year as well as a “reasonable” profit margin for the ginners. In Burkina, the final payment to farmers is determined after decisions are made about payments to (or drawdowns on) the smoothing fund. These decisions depend on the debit/credit situation of Burkina’s fund and are arrived at using a clearly described set of calculations, but taking these factors into account risked making it difficult to see the potential impact of by-product valorization on producer prices. Given these difficulties in both Benin and Burkina, the simulations use the base price formulae—called the *prix d’acompte* in Benin and the “*prix plancher*” in Burkina Faso. The simulations draw on information in Goreaux (2006) and Horus (2006) as well as reports by national consultants (Ahohounkpanzon and Zakari Allou 2010; Bayoulou 2010).

Because the base price is announced at planting and designed to motivate farmers to produce cotton during a given season, it is determined 6-7 months before harvest and up to a year before the lint production for that cropping season is entirely marketed. These formulae therefore both incorporate price expectations for the lint. Benin also considers lagged cottonseed prices from the prior season (a kind of naïve price expectations model for valuing the seed).

The Burkina formula initially called for a 7-year moving average but then moved to a 5-year average. Given the difficulty involved in recreating the historical 5-year averages (in particular, problems encountered in recreating the forecasted values for each year), the simulation uses a 3-

year average estimated from the International Cotton Advisory Committee (ICAC) monthly reports. The Benin formula calls for a price expectation from an “independent expert” for the up-coming season, but this part of the 2006 recommendations has not been implemented. Consequently, the estimated 3-year moving average FOB price is used for both Burkina and Benin. Box 8 provides a description of procedures used to obtain the moving average.

Box 8. Calculations for a 3-year centered moving average lint forecast price

Prices available in the month of March were considered most appropriate for use in the simulations of the base prices for Burkina and Benin because pre-season base prices are generally announced in April. Consequently, we used data collected from the ICAC monthly reports (*Cotton this Month*) for March from 1999 to 2008 and average monthly exchange rates (FCFA/USD) from OANADA, which allowed us to create average annual exchange rates that correspond to the ICAC cotton season (August 1 of year t to July 31 of year t+1). OANADA (<http://www.oanda.com/currency/converter>) provides both bid and ask prices for daily exchange rate estimates. The latter were used to convert Cotlook A prices to FCFA/lb.

The 3-year moving average considers the average Cotlook A from the previous season, the expected price for the current season and a forecasted price for the next season. The three-year moving average therefore considers actual realized average prices (\$/lb) for August 1 of year t-2 to July 31 of year t-1, actual realized values for August 1 of year t-1 to March of year t, and projected values estimated by ICAC for year t to year t+1). During the period under consideration, the Cotlook A prices were initially CIF in Liverpool, then CIF in Northern Europe, and since August 2004 they are expressed as CIF Far East (<http://www.cotlook.com>).

An average of the actual realized daily exchange rate (USD to FCFA) during August 1 to July 31 of ICAC season t-1 was applied to season t-1. Average annual exchange rates (calculated from average daily exchange rates) corresponding to the above ICAC cotton seasons and a conversion factor of 2.2 (for 2.2 lb/kg) were applied to convert the Cotlook Index A prices, expressed in \$/lb, to FCFA/kg for the expected current prices (t) and forecasted prices (t+1).

Information about pricing mechanism calculation procedures from Goreux (2006) and Horus (2006) guided the analyses. In Benin the CIF-FOB price differential was 32.5 FCFA/kg of lint (Ahohounkpanzon and Allou 2010, p. 22) and included both the FOB to CIF transfer costs and a price premium for high quality lint (KABA). For Burkina the CIF-FOB price differential was 48 (Bayoulou 2010, p. 16).

7.3.4. Benin

Because the Benin *prix d'acompte* formula considers lagged seed prices as a naïve price expectations model for cottonseed valuation, a simple application of the existing formula (see below) over the study period using the parameters presented in Table 17 met the study objectives.

$$\text{Prix d'acompte} = \text{Coeff_P} * \text{Part_Prod} * [\text{Valeur_fi} * (1-\text{Taxe}) + \text{Valeur_gr}(t-1) \text{ HT} * \text{poids_rel}] * \text{Ref}$$

Table 17. Parameters used to calculate the base price (*prix d'acompte*) in Benin

Risk coefficient	Coeff_P	0.9
Farmers share of FOB lint production costs	Part_prod	Varies*
Forecasted lint value for upcoming marketing season	Valeur_fi	Varies
Statistical tax imposed on lint exports	Tax	1.03%
Cottonseed sale price for t-1 (ginner factory gate, excluding taxes)**	Valeur_gr (t-1) HT	Varies
Cottonseed processing norms (seed cotton to cotton seed)	ReG	.54
Lint processing norms (seed cotton to lint)	Ref	.42
Ratio of seed yield to lint yield	poids_rel	1.29

Source: Ahohounkpanzon and Allou 2010.

*For the purposes of the simulation this value was constant at 60% which is at the upper end of the range estimated by Horus (between 53% and 60%).

**t-1 refers to the prior production/marketing season from the perspective of March of the current year, i.e., average cottonseed prices for April t-1 through March of t.

Simulation results are presented in Table 18 below. As in the case of both Mali and Chad, and consistent with our original hypotheses, increasing the reference price for the value of the cottonseed in the *prix d'acompte* results in higher average initial producer prices (up to a 5% increase in producer price if seed price doubles) and lower inter-annual variation (a 10% decline in the coefficient of variation compared to the base simulation case where the seed value represented a smaller share of the overall price). Likewise, increasing the share of the value of the cottonseed passed on to farmers to 100% results in higher average seed cotton prices (3.6% change) and lower inter-annual variation (6.8% less).

Setting the value of cottonseed passed on to farmers to zero (first line of the second set of simulations) illustrates that the producer price of seed cotton declines by 9 FCFA/kg and the coefficient of variation increases from 11.4% to 12.7% (a 12% increase). These results provide support for both of the study hypotheses: including a value for cottonseed increases producer prices and reduces inter-annual price variability.¹⁴

Also similar to Mali and Chad, a relatively small 1% increase in the FOB price of lint results in an almost equal percentage increase in the producer price (0.95%)—a greater net impact than that obtained by increasing the seed value by 10%. As the value of the lint in the formula increases (the case of the 10% and 50% increase in lint FOB price), the CV also increases, but by a small amount. This further confirms that in the case of Benin, price variability can be reduced slightly when the value of cottonseed relative to the value of lint increases in the formula calculations.

Consistent with our original hypotheses, increasing the reference price for the value of the cottonseed in the *prix d'acompte* results in higher average initial producer prices (up to a 5% increase in producer price if seed price doubles) and lower inter-annual variation (a 10% decline in the coefficient of variation compared to the base simulation case where the seed value represented a smaller share of the overall price). Likewise, increasing the share of the value of the cottonseed passed on to farmers from 60% to 100% results in a 3.6% increase in producer price and lower inter-annual variation (6.8% less). Setting the value of seed passed to farmers at zero (first line of the second set of simulations) illustrates that the producer price declines by 9 FCFA/kg and the CV increases by 12%. These results provide support for both study hypotheses: seed valuation increases the producer price and reduces the inter-annual variability in price.

A relatively small 1% increase in the reference price of the lint results in a 1% increase in the producer price of seed cotton; this represents a greater pass through of benefits to farmers than the simulated 10% increase in the cottonseed price, which generated a producer price increase of only 0.5%.

¹⁴The higher CV on the simulation base scenario compared to the actual initial and final producer prices should not be misinterpreted here; the lower CV for the actual results is because the actual results reflect decisions that were not based on the formula.

Table 18. Simulation results for Benin

	Average Producer Prices 99/00 to 08/09	% Difference *	Coefficient of Variation 99/00 to 08/09	% Difference*
Initial Producer Price (actual)	190	8%	9.4%	-17.7%
Final Producer Price (actual)	186	5.7%	6.8%	-40.3%
Simulation Base Scenario	175.5	--	11.4%	--
Simulation on Value of the Cottonseed [Valeur_gr (t-1) HT]				
10% increase	176.4	0.5%	11.2%	-1.1%
50% increase	180.2	2.7%	10.8%	-5.2%
100% increase	184.9	5.3%	10.2%	-10.0%
Simulation on the % Share of the Value of the Cottonseed to Farmers (Part_prod)				
0% to farmers	166.1	-5.3%	12.7%	11.9%
50% to farmers	174.0	-0.9%	11.6%	1.8%
60% to farmers	BASE	BASE	BASE	BASE
100% to farmers	181.8	3.6%	10.6%	-6.8%
Simulation on the Value of the Lint Reference Price (Valeur_fi)				
1% increase	177.2	0.95%	11.4%	0.11%
10% increase	192.1	9.5%	11.5%	1.0%
50% increase	258.6	47.3%	11.8%	3.7%

Source: Authors' calculations

* The percent differences are calculated as (Average value on line of reference - Simulation Base Value) divided by the simulation base value.

7.3.5. Burkina Faso

Among the C-4, Burkina Faso was the only country that did not explicitly compensate farmers for the value of the cottonseed in either the initial price formula (as with Benin) or in the final price mechanism (as with Mali and Chad). Consequently, the parameters shown in Table 19 with an “*” were added to the Burkina base price formula to permit seed valuation.

Table 19. Parameters used to calculate the floor price (*prix plancher*) in Burkina Faso

Prix de tendance, valeur FOB (FCFA/kg fibre)	Prix_tendance	Varies
Part aux Producteurs (fibre)	Part_Prod_f	60%
Plancher du tunnel de lissage 92%	92% Tunnel	92%
Plancher du tunnel de lissage 95%	95% Tunnel	95%
Rendement en fibre à l'égrenage	ReF	42%
Rendement graine à l'égrenage	ReG *	53%
Prix de vente moyen des graines de coton (FCFA/kg), position bec égreneuse (t-1) HT	Valeur_gr (t-1) HT*	Varies
Part aux producteurs (graine)	Part_prod_gr	Varies
% des graines de coton commercialisées	PCO_gr*	85%

* Indicates parameters considered in our simulations but not in the actual producer price mechanism

The formula implemented as “simulation base case 1” (SBC1) for Burkina Faso is the following with a value of 60% applied to both the *Part_prod_f* and the *Part_prod_gr* variables:

$$\text{Prix Plancher} = [\text{Prix_Tendance} * \text{Part_Prod_f} * (92 \text{ or } 95) \% \text{Tunnel} * \text{Rendement Fibre}] \\ + [\text{Valeur_gr (t-1) HT} * \text{Part_Prod_gr} * (92 \text{ or } 95)\% \text{Tunnel} * \text{ReG}]$$

For the “simulation base case 2” (SBC2) the *Part_Prod_gr* variable is set to zero so that the results are based entirely on the lint content of the seed cotton. This makes for a slightly more complicated table of results for Burkina (Table 20) which reports the changes between the various simulation scenarios and each of the base cases. As a point of departure, one notes that there is an 11 FCFA/kg difference between the two simulated base cases. In other words, ignoring cottonseed valuation gives farmers a price of 170 FCFA/kg that is 11 FCFA/kg lower than what they would get (181 FCFA/kg) if seed were valued at the factory gate price of the ginner and 60% of that value went to farmers. There is also a difference in the coefficients of variation for the two base cases with SBC1, where seed is valued, having a lower CV (11.0%) than SBC2 (12.5%), where seed is not valued.

The simulations for the 10%, 50% and 100% increase in seed price are all run assuming a 60% pass through of the seed value to farmers. A small 10% increase in seed price yields a very small 0.6% increase in the producer price and a relatively small (-0.9%) decrease in the coefficient of variation compared to SBC1 base scenario. As the sales price of seed increases up to the point of doubling, the producer price increases by a maximum of 5.7%, with the CV declining a bit (from -9 to -5.5%). This is the same general pattern observed for the other C-4 countries. In comparing these simulated price change results to the base case value of 170 FCFA/kg obtained if seed is valued at zero, one observes more significant increases in the rate of growth of the producer price (from 6.7% with a 10% increase to 12.1% for the doubling of the seed reference price, but roughly 50% of this difference between the two base case comparisons comes from the initial impact of deciding to value or not value seed (6% difference between the two cases at observed prices).

Table 20. Simulation results for Burkina Faso using 95% tunnel value

	Average 99/00 to 08/09	% Difference		Coefficient of Variation 99/00 to 08/09	% Difference (Base)	
		SBS1	SBS2		SBS1	SBS2
Initial Producer Price (actual)	167.8	-7.1%	-1.5%	6.16%	-43.8%	-50.6%
Final Producer Price (actual)	178.9	0.9%	5.1%	9.96%	-9.2%	-20.3%
Simulation Base Scenario 1*, 60% of seed value to farmer	180.6	--	6.1%	11.0%	--	-12.2%
Simulation Base Scenario 2**, zero seed value to farmer	170.3	-4.3		12.5%	4.2%	
Simulation on Value of the Cottonseed (assuming that 60% of seed value goes to farmers)						
		SBS1	SBS2		SBS1	SBS2
10% increase	181.6	0.6%	6.7%	10.9%	-0.92%	-13.0%
50% increase	185.7	2.9%	9.1%	10.6%	-3.8%	-15.5%
100% increase	190.9	5.7%	12.1%	10.4%	-5.5%	-17.1%
Simulation on the % Share of the Value of the Cottonseed to Farmers						
		SBS1	SBS2		SBS1	SBS2
0% to farmers*	= BASE 2	-5.1%	--	= BASE 2	13.9%	--
50% to farmers	178.8	-1.0%	5.0%	11.5%	1.72%	-10.7%
60% to farmers**	= BASE 1	--	6.1%	= BASE 1	--	-12.2%
100% to farmers	187.4	3.8%	10.1%	10.5%	-4.6%	-16.2%
Simulation on the Value of the Lint Reference Price (assuming that 60% of value of seed goes to farmer)						
		SBS1	SBS2		SBS1	SBS2
1% increase	182.3	0.9%	7.1%	11%	.10%	-12.1%
10% increase	197.6	9.4%	16.1%	11.1%	0.9%	-11.4%
50% increase	265.7	47.2%	56.1%	11.4%	3.7%	-9.0%

Source: Authors' calculations.

*This is the simulated base case scenario assuming that seeds are valued and the farmers' share is equivalent to their share for lint value.

**This is the simulation results for the formula that is actually implemented in Burkina Faso, where farmers receive zero percent of the value of the cottonseed.

If the share of the seed value going to farmers declines from the SBC1 scenario of 60% to 50%, the producer price declines by 1%; if the share increases to 100%, the producer price increases by 3.8%. The percent changes are more dramatic for SBC2 where the increase in shares from zero to 50%, 60% and then 100% increases producer prices by 5, 6.1, and then 10.1% over the base case of zero valuation of cottonseed. For each change in producers share, there is also a small reduction in the inter-annual variability of prices (11% decline in the CV when going from zero to 50%, followed by 12 and 16% declines for the 60 and 100% shares).

Two of the four simulations on the share of the cottonseed value going to farmers are represented by our two base cases. Results for the other values in this simulation (50% and 100% to farmers) show a 0.9% and a 3.8% increase in producer price for SBC1 with 5.0% and 10.1% for SBC2.

The final set of simulations on increases in the lint reference prices, as in other countries, provides the largest percent changes in producer prices and relatively small changes in the coefficient of variation. In comparing the percent changes in the CV for SBC1 and SBC2, it is worth noting that the reduction in variation is greater for the SBC2 comparison, because the initial CV for the zero valuation of seed scenario was 12.5 compared to 11 for SBC1 which did include seed valuation.

7.4. Summary of Simulation Findings

To facilitate a cross-country comparison of the simulation results, Table 21 summarizes the average producer prices and the percent changes from the base case for one selected value of each of the three types of simulations:

- 50% increase in cottonseed price
- 50% share of seed value to producers
- 10% increase in lint value

In addition, the Table shows the simulated producer prices if cottonseed were given a zero valuation in each country.

Table 21. Cross-country comparison of selected simulation results.

	Average 99/00 to 08/09	% Difference (Base)	Coefficient of Variation 99/00 to 08/09	% Difference (Base)
Mali				
Simulation Base Scenario	176.0		13.4%	
Zero valuation of seed	164.2	-6.7%	13.3%	-0.4%
50% increase in seed value	181.9	3.4%	13.6%	-1.52%
50% share of seed to farmers	174.0	-1.1%	13.3%	-3.4%
10% increase in lint value	192.4	9.4%	13.4%	-2.2%
Chad				
Simulation Base Scenario ^a	143.7		11.5%	
Zero valuation of seed	142.0	-1.2%	11.7%	1.5%
50% increase in seed value	144.6	0.6%	11.5%	-0.8%
50% share of seed to farmers	146.5	1.9%	11.3%	-2.4%
10% increase in lint value	157.9	9.9%	11.6%	0.1%
Benin				
Simulation Base Scenario	175.5	--	11.4%	--
Zero valuation of seed	166.1	-5.3%	12.7%	11.9%
50% increase in seed value	180.7	2.7%	10.8%	-5.2%
50% share of seed to farmers	174.0	-0.9%	11.6%	1.8%
10% increase in lint value	192.1	9.5%	11.5%	1.0%
Burkina Faso				
Simulation Base Scenario ^b	180.6		11.0%	
Zero valuation of seed	170.3	-4.3%	12.5%	4.2%
50% increase in seed value	185.7	2.9%	10.6%	-3.8%
50% share of seed to farmers	178.8	-1.0%	11.5%	1.7%
10% increase in lint value	197.6	9.4%	11.1%	0.9%
Source: Authors' calculations.				
<i>(a) The Chad base case differs from the actual base case of a set 5 FCFA/kg as it simulates prices if the sales value of cottonseed were passed through at a 19.3% share (comparable to the CIF price pass through). The simulated producer price using the 5 FCFA/kg formula results in an average price of 147 FCFA/kg.</i>				
<i>(b) The Burkina base case differs from the actual base case of zero seed valuation as it simulates prices that include 60% of the factory-gate sales value of cottonseed. The simulated producer price using the zero seed valuation is the 170.3 FCFA/kg shown on the next line of the table.</i>				

These particular simulations represent the most probable scenarios during the next several years. Seed prices should be more influenced by demand and supply in the future as the monopolies in the ginning sectors adapt to a more liberal economy and respond to rising demand for cotton by-products, hence the choice of a 50% rise in cottonseed values. Given the recurrent deficits in the C-4 cotton sectors in the recent past, it will be necessary to review the generally accepted 60-40% split between ginners and farmers with a likely decline in the share to farmers due to rising costs of transportation, energy, and critical functions, hence the choice of 50% for the share of cottonseed value to farmers. Although the lint market has improved a bit in the recent past, prices are unlikely to rise dramatically, hence the focus on a 10% increase in the FOB value.

The first comparison of importance is that between the simulated base case (which values seeds at the ginner sales prices and allocates a share to farmers based on their share of the lint price) and the case where seeds are valued at zero. The absolute value of the decline in price when seed is valued at zero rather than as valued in the base case ranges from 11.8 FCFA/kg in Mali to 1.8 F/kg in Chad, with Burkina and Benin both experiencing drops in the 9 to 10 FCFA/kg range. The results are consistent across all countries confirming our hypothesis that taking the value of seed into account increases producer prices (an obvious result, if all else is left equal in the formula) and reduces the inter-annual variability in the producer price (not evident without doing the simulations). The largest percent drop in the price when moving from the base scenario to the zero valuation case was in Mali (-6.7%) and the smallest in Chad (-1.2%) with

Benin and Burkina experiencing changes of -5.3% and -4.3%, respectively. The larger impact in Mali is related to higher average sales prices for cottonseed in that country during the recent past. The smaller impact in Chad is due both to lower seed sales prices and a lower base share of that value going to producers (19.3% versus 60% in other countries). The coefficients of variation for the zero valuation lines are virtually unchanged for Mali and Chad but variability is 11.9% greater in Benin and 4.2% greater in Burkina Faso when seeds are not valued, suggesting that there is more price stability when seeds are factored into the formula in two of the four countries.

The simulation results on the impact of rising cottonseed prices show that a 50% increase in the value of the cottonseed reference price (representing roughly an 8 to 19 FCFA/kg price rise, depending on country) increases the average producer price in the C-4 from 0.6% in Chad to 3.4% in Mali and reduces the coefficient of variation by between 0.8% in Chad and 5.2% in Benin.

In three out of the four countries, the base scenario consists of 60% of returns from cottonseed sales ex-factory and pre-tax going to farmers, while in Chad it is just 19.3%.

If the share of cottonseed value going to farmers were set at 50% rather than at the current levels, there would be very little change in the producer prices; 1-2 percent declines for all countries but Chad which would realize a 2% increase. For Burkina and Benin coefficients of variation increase slightly (just under 2%) with the assumption of a 50% share to farmers, illustrating that a reduction of the importance of seed in the formula for these countries increases inter-annual variability. For Mali and Chad, the CVs decline (3% and 2% respectively).

Finally, the most significant observation coming from these simulations is that the real bang for the buck is in finding ways to increase the FOB value of cotton lint. A 10% increase in lint prices is passed through almost entirely to the farmers, who realize 9.5% or better increases in producer prices. The increase in lint price results in a small (0.6% or lower) increase in the CV, which is not likely to discourage farmers when they see the additional 14 FCFA/kg (Chad) to 17 FCFA/kg (Burkina) that they could realize as a result of the lint price increase. In other words, it is clear that the relative importance of cottonseed (the assumed value or assumed share going to farmers) is marginal when compared to lint in the current price mechanisms, even when the value of cottonseed is hypothesized to increase considerably.

The simulations done to date provide an initial understanding of the role that valuation of by-products can play in shaping producer prices and inter-annual variability of prices. There is a positive contribution in the countries already taking seed values into account, albeit in a variety of ways. For Burkina, the analyses suggest that farmers would benefit from including the value of seed, but given recent subsector deficits a more thorough analysis of the overall impact on ginners' balance sheets is in order. Some combination of taking seed into account but reducing the overall share of the total pie distributed back to farmers may be the best option in Burkina (and perhaps in other countries which are also experiencing deficits).

Given the results to date, it appears useful to include by-product valuation in the pricing formula. Although the contribution to price levels and variability are mixed and relatively small, the inclusion of cottonseed valuation also contributes to greater transparency in the search for an equitable way of dividing up the sector income among the various actors. That said, it is obvious that a lot of time and resources should not be devoted to lengthy negotiations on exactly how this is done because the net contribution of by-product valuation is relatively small and there is more for farmers to gain by the sector focusing on improvements in lint quality that will result in quality premiums for exported lint and in exporters marketing strategies to ensure the best possible prices.

Analyses completed to date have not attempted to simulate major changes in the pricing mechanisms nor have they tried to simulate changes in policy variables that could have an impact on the simulation outcomes shown above. Many additional hypotheses could be tested with the excel spreadsheets developed for these analyses. For example, one could ask what the impact of a change in exchange rate policy would be on producer prices and how that impact would compare to changes in the way cottonseed is valued; since by-products are sold mostly on local markets and lint mostly on the international market, changes in the exchange rate would have a different impact on the outcomes for domestic and internationally traded by-products.

The simulations have also relied on ginner factory gate prices of cottonseed rather than looking at the more complex issue of whether there is a need to better integrate the values of the oil and cake end products into the analysis. The results of our implied margin analyses suggest that the present situation in both the oil and lint processing sectors is one of capacity underutilization and high costs rather than excess profits elsewhere in the sector that could be passed back to farmers. That said, this is an area that needs to be monitored so that if there are changes in costs and/or prices that increase margins for actors further down the value chain, adjustments in the pricing mechanism can be reconsidered.

The results of this study also suggest that some reflection may be in order on whether there are structural changes that the C-4 could make in how their sectors are organized that would simplify and perhaps internalize the distribution of lint and by-product benefits so it becomes a less contentious issue. This topic goes beyond the terms of reference for the current study, but as the C-4 move forward with liberalization and privatization of their cotton sectors (particularly Mali and Chad, countries that are at the beginning stages of reform), it may prove useful to become better informed about alternative cotton sector structural and institutional arrangements that have been used to deal with the difficult issue of how to value and distribute the value of multi-component products among the various actors in a sector. Issues of relevance include the size (small vs. medium or large) of ginning factories, the locations (centralized or dispersed), and the ownership (ginners or producer cooperatives). Because of its long and very successful history, maintaining a structure that resembles the *filière intégrée* introduced many years ago remains appealing to the C-4, but the extent to which this model can compete in the increasingly globalized cotton lint and by-product markets observed during the recent past remains an open question.

8. Conclusions

This study represents a first step in exploring the hypotheses that the incorporation of the value of cotton by-products in the pricing mechanisms of the C-4 (1) can improve the transmission of market signals to farmers and (2) contribute to a reduction in the inter-annual variability of producer prices. The study objectives are to:

- describe the size, organization, strengths, weaknesses, and constraints of the major by-product subsectors in each C-4 country and what this implies for increasing the value added of cotton by-products;
- describe and compare the cotton pricing mechanisms and accompanying policies (e.g., subsidies, taxes) currently used by each C-4 country;
- assess the extent to which current price mechanisms incorporate the value of by-products;
- evaluate the role that incorporating the value of by-products in the pricing mechanisms plays in changing the level of producer prices or reducing inter-annual fluctuations in producer prices.

8.1. Summary of key findings

Key findings concerning the organization and performance of the by-product sectors include:

- Cottonseed crushing industries are liberalized and privatized in all countries but Chad, where an internal department of the parastatal Cotontchad processes the by-products.
 - Benin's licensing regulations have kept the crushing industry small (3 industrial sized actors);
 - 30 to 60 firms (operating at very diverse scales and levels of technical efficiency) produce cotton oil and cake in Burkina Faso and Mali;
 - Chad has one industrial-sized cottonseed processing unit.
- In all countries with liberalized crushing sectors,
 - the industrial sized firms are under financial pressure due to declining supplies and rising prices of cottonseed;
 - several industrial sized firms with capacity to process only cottonseed have stopped operations during the recent past;
 - industrial firms equipped to process a variety of oil seeds have compensated for declining cottonseed through increased processing of alternative seeds;
 - small scale and artisanal processing units in Mali and Burkina Faso continue to function, obtaining cottonseed from a variety of local and imported sources.
- In all countries but Mali, there is overt tension between ginners and crushers;
 - ginners believe they can sell seed at a higher price if they export;
 - crushers believe government should mandate that ginners sell only to local industries at prices they can afford;
 - in countries with liberalized ginning sectors (Burkina and Benin), government frequently intervenes on the side of the crushers in an effort to stimulate domestic job creation;

- in Mali, government has encouraged the CMDT to distribute available cottonseed among the diverse types of processors (rather than only selling to industrial processors) in an effort to stimulate job creation at different levels.
- There is tension between the industrial sized firms and others in Mali and Burkina
 - industrial firms accuse others of not meeting health and environmental standards in Mali and Burkina, where capacity for food safety surveillance is limited;
 - industrial firms in Burkina charge that smaller firms are illegally selling sub-standard products in packaging falsely identified as that of the industrial firms.

Key findings concerning the application of price mechanisms include:

- All countries have published formulae recommended for use in establishing final reference prices that determine total seed cotton payments (base price plus supplements) payable to farmers at the end of the export marketing campaign;
- All formulae but those for Benin avoid using parameters based on actual ginning sector costs or performance, relying instead on prescribed ginning output ratios and average lint reference prices; this is meant to make payments to farmers independent of the processing and marketing performance of the ginners;
- Base prices announced at planting tend to be determined through negotiations among the key stakeholders (farmers, ginners, input suppliers, and government) in all countries but Burkina, which has applied their formula strictly since 2006;
- During the past ten years, the negotiated base prices have tended to be higher than the formula-derived end of season reference prices, leaving ginners in a position of having to pay farmers above the prevailing market rates;
- All price mechanisms include provisions to help ginners make higher payments to farmers when world market prices fall below base prices:
 - in Chad, the government provides the funding;
 - in Mali, there is a support fund managed by farmers; government frequently provides additional support;
 - in Benin, there is a plan for a support fund but it has never been funded and government has been covering sector deficits;
 - in Burkina, there is a smoothing fund that was created in 2006, funded in 2007 and depleted by 2008.
- All countries but Burkina already have some means of accounting for the value of cotton by-products in their pricing mechanism by including some procedure for cottonseed valuation in their formula:
 - Chad adds a fixed amount of 5 FCFA/kg of seed cotton to their formula (equivalent to 9-10 FCFA/kg of cottonseed actually produced);
 - Benin includes the average sales price of cottonseed sold from the previous (t-1) campaign and multiplies this by the farmers' variable share of total sector benefits;
 - Mali includes the average sales price of cottonseed for the current campaign in the calculation of the final reference price; this is multiplied by 0.60 (the producer share of sector revenues).
- There are large cross-country differences in prices paid to farmers (both the base and the final prices) that cannot be fully explained by differences in production and transport costs, nor by differences in input subsidies used to compensate for low producer prices

Diagnostic parity price analyses of cottonseed and seed cotton for 2007/08 show that:

- The cottonseed parity price was greater than the ginner sales price of cottonseed to crushers in all countries but Chad, suggesting that crushers realized returns on their oil and cake permitting them to pay more (26-38 FCFA/kg, depending on country) for cottonseed than they paid in 2007/08;
- When low processing costs representing more efficient capacity utilization are used, the parity price for seed cotton is greater than the final payment (including subsidy value) to farmers in all countries but Chad, suggesting that with efficient processing performance there is some flexibility in the system to increase producer prices of seed cotton;
- When estimates of actual 2007/08 processing costs (all higher than what would be obtained with the more efficient “target” levels) were considered, only Burkina exhibited a seed cotton parity price greater (by 4 FCFA/kg) than actual payments made to farmers, suggesting that given current processing performance there is a relatively small amount of flexibility in the system for passing more value added back to farmers.

Processing costs are a function of processor technical and economic efficiency as well as of capacity utilization. In terms of processor efficiency, the analyses have taken into account only the industrial sized firms, without looking into the relative efficiency and competitiveness of large industrial firms compared to mid- and small-sized industrial firms and artisanal processors. While there is some evidence that African cottonseed processing might be more efficient and competitive using operations of a smaller scale than those now dominating the C-4 markets (Baffes 2010), there is a need for additional research in this area.

In terms of capacity utilization, a key factor in the high processing costs of 2007/08 was the low capacity utilization due to sharply reduced cotton production. This experience raised the question of whether ginners alone should shoulder the burden of increased processing costs when the increases are in large part a result of production choices made by farmers. In general, there is a need to monitor parity prices over time (particularly the impact of changes in processing costs), and for the sector as a whole to find ways of reducing costs.

The implied margins analysis, which looked at changes in marketing margins and their key components (profits and processing costs) for 1999/00 to 2007/08 found that:

- Only Burkina showed an upward trend in the crusher marketing margin, influenced largely by 2007/08 and 2008/09 increases in the margin. Since these increases took place during a period of very low cotton production, the rising margins are thought to reflect rising production costs rather than rising profits;
- Only Mali showed an upward trend in the ginner and synthetic margins, which increased from 2005/06 through 2007/08 and then declined slightly. During this period, cotton production declined from over 500 thousand metric tons to under 200 thousand—a decline more likely to have been associated with increasing processing costs than increasing profits.

A breakdown of the contribution to the marketing margins made by the different cotton end products confirmed the predominant role played by lint (80-85% of the margins on average from 1999/00 through 2008/09), but also revealed the beginning of what might be a downward trend

in the lint contribution with numbers for 2007 and beyond generally falling below 80% across all countries.

- The contribution of oil averaged 10-15% (highest in Burkina where technical processing coefficients are strongest)
- The contribution of cake averaged 1-6% (highest in Mali where cake prices are high due to strong demand).

Simulations of different scenario for cottonseed parameter values in C-4 pricing mechanisms revealed that:

- Moving from zero valuation of seed to the prevailing methods of seed valuation resulted in average 1999/00 – 2007/08 seed cotton price changes ranging from 1 to 7%, depending on country;
- 100% increases in the ginner sales price of cottonseed (over levels prevailing from 2000-2008) yielded producer price increases also ranging from 1 to 7%
- Changing the producers' share of the cottonseed value from current shares (usually 50-60%) to 100% yielded producer price increases ranging from 4 to 5%
- By contrast, a relatively small 10% increase in the value of cotton lint yields an increase in the producer price of seed cotton of almost the same magnitude (9.4-9.9 %)—underscoring the point that lint does play the dominant role in determining the overall value of seed cotton.

Inclusion of cottonseed values in the pricing formula produces mixed results in terms of reducing inter-annual price variability. The general tendencies were as expected (the larger the role played by cottonseed in the simulation, the lower the CV for the overall average seed cotton price), but the size of the changes were generally very small. Burkina and Benin are the only countries exhibiting a sizable reduction in the CV when comparing a situation of no cottonseed valorization with one of valorization). Valuing cottonseed at prevailing prices led to a reduction in CV of 4.5% in Benin and 11.9% in Burkina.

8.2. Recommendations

Given the results to date, it appears useful to include by-product valuation in the pricing formula not only because it makes a small contribution to increasing producer prices and reducing inter-annual price variability, but also because it contributes to greater transparency in the search for an equitable way of dividing up the sector's income among the various actors. In setting up a systematic way of taking into account both fiber and by-product price variability over time, the C-4 countries can position themselves to take better advantage of the variety of market movements that influence the demand and supply of the full set of cotton end products. That said, it is obvious that a lot of time and resources should not be devoted to lengthy negotiations on exactly how this is done because the net contribution of by-product valuation is relatively small and there is more for farmers to gain by having the sector focus on improvements in yields or in lint quality that will result in quality premiums for exported lint.

One method of accomplishing this would be to focus on cottonseed valuation (rather than dealing with the full range of by-products) and truly liberalize the market for cottonseed so that it reflects the end values of other by-products. At present, the cottonseed markets in the C-4 are lacking in transparency and not fully reflective of demand and supply forces of downstream by-

products. Improving the cottonseed market would mean that (1) ginner sales prices of cottonseed were determined in the context of national, regional, and international price movements for cottonseed and (2) firms buying the seed would need to compete with all other firms (national, regional, and international) on the basis of what they could afford to pay and remain profitable. Such an approach could contribute to a movement toward the creation of more efficient operators at the national level, and possibly even at the regional level with a better distribution of oil crushing facilities across the West African region. For such a liberalized market approach to work without unanticipated negative effects it would need to be accompanied by reinforcement of the C-4 capacity for food safety monitoring and enforcement and some efforts to equalize the playing field between formal sector firms (who pay taxes) and the informal sector (who generally do not pay taxes). In addition, there is a need to address the issue of fraudulent imports of competing oil from Asia that escape regional import duties, making local cotton oil uncompetitive in countries such as Benin.

Recognizing that there may be a legitimate “infant industry” argument in terms of supporting national and/or regional oil crushing industries, C-4 governments (individually as well as regionally through their trade organizations) need to develop transparent policies in this respect with a clear, multi-year program of support to local vs. international cottonseed sales based on more solid economic analyses of the job creation and indirect economic benefits of protecting the sector than what is currently available.

There are many problems facing the C-4 cotton sectors and improvements in the way by-products are handled will represent only a small contribution to improving overall subsector performance. The research conducted in the preparation of this paper leads to the conclusion that cottonseed, oil, and cake are and will remain cotton by-products rather than “co-products” in the C-4 countries of West and Central Africa. Cotton lint will continue to represent the bulk of the value added in the C-4 cotton sectors and a failure to address the problems directly related to seed cotton production, cotton ginning and lint marketing will severely constrain the development of the by-product subsectors. This has been amply illustrated by the growing crisis in the cotton oil crushing sectors of the C-4 due to declining cotton production and cottonseed supply. Nevertheless, the predominant role played by lint in the overall creation of sector value added should not lead cotton sector analysts and strategists to ignore the potential contribution of the by-products and their relationship to a well-functioning farm and ginning sector.

References Cited

- Ahohounkpanzon, M. and Y. Zakari Allou. 2010. La prise en compte des co-produits du coton dans le mécanisme de fixation du prix de coton graine au Bénin. Consulting report prepared for Michigan State University/WACIP.
- Araujo-Bonjean, C. Calipel, S., and Traoré, F. 2006. Impact des aides Américaines et Européennes sur le marché international du coton. French Ministry of Agricultural Working Paper. http://www.agriculture.gouv.fr/spip/IMG/pdf/coton_marche.pdf.
- Araujo-Bonjean, Catherine and Jean François Brun, 2000. Les politiques de stabilisation des prix du coton en Afrique de la zone franc sont-elles condamnées ? Revised version of a paper presented at the Conference « Dynamique des prix et des marchés de matières premières : analyse et prévision » Grenoble, 5-6 november 1998.
- Baden, Sally. 2004. White gold turns to dust. Oxfam Briefing Paper 58. Oxfam International.
- Baffes, J. May 2010. Markets for cotton by-products: Global trends and implications for African cotton producers. Draft report for the World Bank.
- Bayoulou, J. 2010. La prise en compte des co-produits du coton dans le mécanisme de fixation du prix de coton graine au Burkina Faso. Consulting report prepared for Michigan State University/WACIP.
- Chaudry, R. 2008. "Update on Costs of Producing cotton in the World". Washington, DC: International Cotton Advisory Committee.
- Debertin, D. 1986. Agricultural production economics. Macmillian Publishing Company: New York.
- Diakité, Lamissa. 2010. La prise en compte des co-produits du coton dans le mécanisme de fixation du prix de coton graine au Mali. Consulting report prepared for Michigan State University/WACIP.
- Estur, G. 2007. "Evaluation du protocole d'accord Etat-CMDT-Producteurs sur le mécanisme de détermination du prix d'achat du coton graine." Consulting report prepared for the Primature, Mission de Restructuration du Secteur Coton du Mali. Marcé du Esves, France.
- Ethridge, M. D. 1975a. A comparative regional analysis of the wholesale marketing margin for crushed cottonseed. Southern Journal of Agricultural Economics, July 1975, pp 185-196.
- Ethridge, M.D. 1975b. Estimating the structure of time lags between wholesale and farm prices for cottonseed. Southern Journal of Agricultural Economics, December 1975, pp. 169-175.
- Fok, M. 2009. Cotton policy in SSA: a matter of institutional arrangements related to farmers' constraints. Paper prepared for the International Cotton Conference on Rationales and Evolution of Cotton Policies, May 5-17, 2008, Montpellier, France, and published in Life sciences international journal (1): 198-211.
- Fok, M. and Barbier, B. 2001 "Cotton scope and limitations of the world market for cotton by-products in French-speaking Africa." Oléagineux, Corps Gras, Lipides. Volume 8, Number 5, 239-45. Mai – Juin 2001, Dossier: Soja, Arachide, Coton: aspects des conditions d'évolution des filières.
- Goreaux, L. 2006. The cotton price smoothing scheme of Burkina Faso. Consulting report prepared for the Association Interprofessionnelle du Coton de Burkina Faso.
- Hanson, Robert. 2008. Cotton and products: C-4 cotton reform and production update. Global Agricultural Information Network GAIN Report No. SG8020. USDA Foreign Agricultural Service, Senegal.
- Hanson, Robert. 2009. Cotton and products: C-4 cotton reform and production update. Global Agricultural Information Network GAIN Report No. SG9006. USDA Foreign Agricultural Service, Senegal.
- Holtzman, J. October 2007. Report on the cottonseed processing industries of Benin, Burkina Faso and Mali. Technical report prepared by Abt Associates for WACIP.

- Horus Enterprise. 2006. Rapport final: Etude du mécanisme de stabilisation et de soutien des prix du coton-graine. Report prepared for the Benin cotton interprofessional organization.
- ICAC. Various dates. Monthly reports for the month of March (1999 to 2008) obtained from the ICAC web site at <http://www.ICAC.org>
- Lele, U. 1991. Aid to African Agriculture: Lessons from Two Decades of Donors' Experience edited by Uma Lele. Johns Hopkins University Press, Baltimore.
- Maizels, A. 1994. The continuing commodity crisis of developing countries. *World Development*, Vol 22. No. 11, pp. 1685-1695.
- Maizels, Alfred. 1992. [Commodities in crisis](#). Oxford: Clarendon Press.
- OANDA. Various dates. Monthly and yearly average exchange rates obtained at <http://www.Oanda.com>.
- Ouédraogo, A. 2007. Etude sur la trituration des graines de coton au Burkina Faso. Consulting report prepared for Abt Associates/WACIP.
- Padacké, Fauba. 2010. La prise en compte des co-produits du coton dans le mécanisme de fixation du prix de coton graine au Tchad. Consulting report prepared for Michigan State University/WACIP.
- Schroeter, J. R., and A. Azzam. 1990. "Measuring market power in multi-product oligopolies: The U.S. Meat Industry." *Appl. Econ.* 22(1990):1365-376.
- Sewadé, P. 2007. Etude sur la trituration des graines de coton au Bénin. Consulting report prepared for Abt Associates/WACIP.
- Shepherd, Ben and C. Delpuch. March 2007. Subsidies and regulatory reform in West African cotton: What are the development stakes? Group d'Economie Mondiale, Sciences Po (GEM). <http://mpira.ub.uni-muenchen.de/2289/>
- Shepherd, Ben. 2006. Estimating price elasticities of supply for cotton: A structural time-series approach. FAO Commodity and Trade Policy Research Working Paper No. 21. www.fao.org.
- Sidibé, M. 2007. Rapport de mission: Diagnostic sommaire de la trituration des graines de coton au Mali, Consulting report prepared for Abt Associates/WACIP.
- Sumner, D. A. 2006. Reducing cotton subsidies: The DDA cotton initiative, in Kym Anderson and Will Martin, eds., *Agricultural trade reform and the Doha development agenda*. Washington, D.C., The World Bank.
- Thirteen WNET New York. 2009. The dying fields: Global cotton industry: Cotton subsidies and the World Trade Organization. Wideangle, July 21, 2009. <http://www.pbs.org/wnet/wideangle/episodes/the-dying-fields/global-cotton-industry/cotton...>
- Tomek and Robinson. 2003. *Agricultural product prices*. Cornell University Press, Ithaca, New York.
- Tschirley, D., C. Poulton, and P. Labaste (eds.). 2009. *Organization and performance of cotton sectors in Africa: Learning from reform experience*. The World Bank.
- Watkins, Kevin. 2002. *Cultivating poverty*. Oxfam Briefing Paper 30. Oxfam International.
- World Bank. 1981. *Accelerated development in Sub-Saharan Africa*. The World Bank, Washington, D.C. This report is often referred to as "the Berg report"...a reference to the principal author of the report.

Appendices

Appendix 1: Characteristics of the cotton farming sector in the C-4

Farming Sector	Benin	Burkina Faso	Mali	Chad
Population involved	→300,000 farmers directly benefit	→172,000 cotton farms in 2005/06 with an average population per farm of 12 people (8 active). →Estimated total active population working on cotton is 1,4 million.	→Average of 170,000 farms in the CMDT zone from 2004/05-2007/07. →172,353 producers in 2004/05 →→174,749 in 2005/06, →→163,420 in 2006/07, →→117,933 in 2007/08 and →→83,993 in 2008/09 →→a decline of about 45% during the entire period. →Average population per farm is approximately 10 people. →Note OHVN farms not included in this number, but they are a small share of total number of farmers.	→350,000 producers representing about 3 million Chadians rely primarily on cotton production for income. →Cotontchad employs about 2000 individuals (8% of total government employment roles).
Average cotton area cultivated	→2000/01-2004/05 : 323 000 ha →2005/06 to present: 216 000 ha	→2000/01-2004/05 : 410 000 ha →2005/06 to present: 563 000 ha	→2000/2001-2004/05 : 465 000 ha →2005/2006 to present: 367 000 ha	→2000/01-2004/05. 256 000 ha →2005/06 to present 227 000 ha
Producer associations	→FUPRO (<i>Fédération des Unions des Producteurs</i>), created toward the end of the 1990s, was replaced by the CNPC (<i>Conseil National des producteurs de coton</i>) by a government order in 2006 following what was considered to be too much dissension among the members of FUPRO from 2002 to 2006. →The CNPC creates communal councils made up of representatives of village organizations; voting at the communal level is proportional to the quantity of seed cotton produced by each village. →The department-level councils are organized along the same voting principals and group together representatives of all the communal councils that exist in the department →The National Council of Cotton Producers (CNPC) has full authority to represent all producers at interprofessional meetings and it represents producers on the AIC board.	→UNPC/B (<i>Union Nationale des Producteurs de Coton au Burkina</i>), created in 1998, seems to be the most dynamic of the cotton producer associations in the C-4. →It includes about 12,250 GPC representing 4,162 villages, 280 departments and 36 provinces. →Holds 30% of SOFITEX stocks since 1998. →It holds half of the seats on the AICB and has always held the presidency of that organization. →Has taken responsibility for input supply. →Following its acquisition of shares in SOFITEX and additional shares in SOCOMA and FASOCoton, the UNPC/B has moved from the position of a management partner to that of « co-manager » of the cotton sector.	→UN_SCPC (<i>Union Nationale des Sociétés Coopératives des Producteurs de Coton du Mali</i>) was recently created as a national organization. →Entire sector is being restructured from village associations to official cooperatives with local and regional « umbrella » organizations in preparation for liberalization of the ginning sector. →Plans are underway for the union to manage input supply.	→There is a national producer association, <i>Union Nationale des Producteurs de Coton du Tchad</i> – UNPCT. Created 2 April 2007, the association received official authorization to operation on 30 April 2009. UNPCT joins together 10 local coordination committees (CCL). →At the village level (about 5,000 villages) delegates are elected from the local village associations (VA), created over time from 1986 to 1992; →Since 2000, delegates from VA represent their associations at the canton level (185 cantons) →Cantons select representatives to serve on the 10 CCL composed of 4 members each

Farming Sector	Benin	Burkina Faso	Mali	Chad
Support provided to producers	<p>→The critical functions of the sector are managed by the AIC using funds provided by ginners as an integral part of the price they pay to producers for the seed cotton.</p> <p>→Funds for critical functions have been inadequate and the GoB has recently made available financial resources for some critical functions (cotton research, technical and management training for farmers, seed production, cotton quality control, and some road maintenance).</p>	<p>→Extension services: 1 agent for 1000 hectares of cotton.</p> <p>→Small contributions for rural road maintenance.</p> <p>→No seed treatment services.</p>	<p>→Extension services: 1 agent for 350 hectares of cotton</p> <p>→Some road maintenance.</p> <p>→Some contributions to the transport sector for seed cotton collection.</p> <p>→No longer provide seed treatment services.</p>	<p>→Supply of inputs on credit.</p> <p>→Purchase of seed cotton</p> <p>→Transport of seed cotton.</p>

Appendix 2: Characteristics of the ginning sector in the C-4

	Benin	Burkina Faso	Mali	Chad
Type of sector	<p>→ Hybrid: no competition in terms of seed cotton purchasing so similar to national monopoly (multiple firms but quotas given to each firm);</p> <p>→No integration of extension and input supply into ginning company operations (hence, similar to competitive systems of East and Southern Africa).</p>	<p>Three Local Monopolies with defined geographic zones; no competition for seed cotton marketing within zone; all firms subject to national price mechanisms and management of critical functions by the Interprofessional.</p>	<p>National Monopoly with one cotton company authorized to purchase seed cotton at a single national price; vertically coordinated input supply and credit operations (with increasing responsibility being passed to producer organizations for these tasks).</p> <p>→Program underway to privatize sector in 2010 by creating 4 local monopolies</p>	<p>National Monopoly with one cotton company organizing all activities in the sector.</p>
Number of ginners and ownership	<p>→ 9 firms and 18 factories at present.</p> <p>→ Expansion happened in response to 1994 devaluation, but has resulted in serious overcapacity in recent years.</p> <p>→ SODECO has 10 factories (created in 2008 from former parastatal SONAPRA) →51.3% owned by SCP (<i>Société Commune de Participation</i>) which also has interests in major input supply firm and ICA-GIE.</p> <p>→GoB owns 33%; rest to be made available to farmers and local communities.</p> <p>→ ICA-Gie, created from 1995-97 by Beninois investor, it has 5 factories and comprises CCB, ICB, SOCOBE, SODICOT, IBECO.</p> <p>→ LCB (<i>Label Coton Béninois</i>) created in 1995 with capital from Aiglon Group-1 factory.</p> <p>→ MCI (Marlin's Cotton Industries) began operating in 1998/9, one factory; didn't operate in 2008/09</p> <p>→ SEICB created in 1996, Nigerian ownership; hasn't functioned for 4 campaigns.</p>	<p>→ 3 firms all created in 2004:</p> <p>→→SOFITEX (former parastatal) with 13 gins (largest capacity),</p> <p>→→SOCOMA with 2 gins, and</p> <p>→→FASOCOTON with 1 gin.</p> <p>→ Ownership of SOFITEX was opened up in 1998 when the <i>Union Nationale des Producteurs de Coton</i> du Burkina (UNPCB) became owners of 30% of the shares. Following reforms GoBF holds a 35 percent share of SOFITEX. The remaining shares were divided between the private firm DAGRIS (34 percent), the UNPCB (which retained its 30 percent share) and local banks (1 percent).</p> <p>→ FASOCOTON has a capital of 3.3 billion FCFA, belonging to Paul Reinhart (an international trader), who has 31 percent of the shares, IPS (a ginning company already operating in Côte d'Ivoire) which has 29 percent of shares, local private companies with 20 percent of shares, AMFERT, a regional input importer (10 percent of shares, and UNPCB (10 percent of shares).</p> <p>→ SOCOMA, with a capital of 6 billion FCFA, is owned by DAGRIS (51 percent), local private companies and banks (29 percent) and UNPCB (20 percent).</p>	<p>→ 1 firm: Compagnie Malienne pour le Développement des Textiles (CMDT) is the only cotton company.</p> <p>→ Has 18 factories in different locations.</p> <p>→ From the creation of the CMDT in 1974 until 2001, the GoM held 60% of the shares in the company and the CFDT (now Geocoton) held 40%. Following repeated sector deficits and recapitalizations in which Geocoton did not participate, the GoM currently owns 98% of the CMDT and Geocoton 2%.</p> <p>→ Plan after privatization is 61% of shares to ginners, 20% for the cotton producers union, 2% for employees of CMDT, and 17% for the government, but it is not clear how the UNPCB will get resources to pay for these shares.</p>	<p>→ 1 firm: Cotontchad (<i>Société Cotonnière du Tchad</i>) which operates 9 gins;</p> <p>→Ownership is 75% Government of Chad, 19% Dagriss (now Geocoton), 4,5% SGT (ex <i>Banque Tchadienne de Crédit et de Dépôt</i> which became <i>Société Générale Tchadienne des Banques</i>) and 1,5% Ecobank.</p>
National ginning capacity and capacity utilization	<p>→ 587,500 ton capacity;</p> <p>→ SODECO/SCP 312,500 MT</p> <p>→ ICA-GIE: 140,000 MT</p> <p>→ LCB: 50,000 MT</p> <p>→ MCI: 60,000 MT</p> <p>→ SEICB: 25,000 MT</p> <p>→ Utilization lowest in 2006 (33%) and highest in 2005 (73%).</p>	<p>→595,000 tons capacity total</p> <p>→450,000 for SOFITEX</p> <p>→100,000 for SOCOMA</p> <p>→45,000 for FASOCOTON.</p> <p>→SOFITEX and SOCOMA ran at 100% and FASOCOTON at 75% of capacity in 06/07</p>	<p>→500,000 tons capacity</p> <p>→Utilization at about 100% in 04/05-05/06, 83% in 06/07, and an average of 45% in 07/08 and 08/09.</p>	<p>→250-260,000 MT capacity (equivalent to 1700 tons of seed cotton per day during 150 days)</p> <p>→Utilization 50-67% since 2000/01 season.</p> <p>→Of the 9 gins, only 3 meet current technological norms; others are old technology and it is difficult to find replacement parts.</p>

	Benin	Burkina Faso	Mali	Chad
Ginner organizations	→ <i>Association professionnelle des égreneurs du Bénin</i> (APEB) recently replaced by government mandated <i>Conseil National des Égreneurs du Coton</i> in response to breakdown in APEB performance (some firms not following the rules).	None identified	Not relevant- a state-owned monopoly	Not relevant- a state-owned monopoly

Appendix 3: Characteristics of the oil processing sectors in the C-4

	Benin	Burkina Faso	Mali	Chad
Type of sector	Concentrated: 3 industrial firms (one not currently operating) with entry strictly controlled through licensing	Highly competitive with industrial (3), semi-industrial (30) and artisanal (30) firms	Highly competitive with industrial (3), semi-industrial (~10), and artisanal (~20) firms	National monopoly currently operating as a subsidiary of the national ginning company.
Role of co-products in the pricing mechanism (PM)	→Average sales price of cottonseed by ginners is taken into account In theory but not in practice.	→Co-product values are not taken into account in the price mechanisms. →UNPCB has addressed a formal request to the inter-profession to look into the possibility of increasing producer prices through a better valuation of cottonseed. During its general assembly held in April 2008, the inter-profession found the request of UNPCB admissible and decided to recommend a study. →Ginners recognize that low producer prices have resulted in declining production, which has important implications for ginner and oil crusher capacity utilization rates, yet recent cotton company losses suggest to the ginners that the only way of increasing producer prices in the short-run is through government subsidies and not increases in the valuation of cottonseed.	→Average sales price of cottonseed by ginners is taken into account in theory but a failure to fully implement the mechanism raises questions about how well this is accomplished.	→Since 1997 a fixed value of 5F/kg of seed cotton is added to the base price offered to farmers to pay them for the value of cottonseed. →No clear explanation of how this was determined.
Cottonseed price determination procedures	→Ginners propose a jointly agreed to " <i>bec égreneur</i> " price to crushers. Negotiations take place, with crushers trying to obtain a better price. A final agreement is signed, however, ginners sometimes evade the agreement by exporting part of their production. →Ginners believe they should be able to sell cottonseed to the highest bidder and don't wish to favor the local crushing industries. →Crushers believe that government should ban exports of cottonseed until domestic needs are met. →Government has been called on in the past to mediate ginner-crusher negotiations, but seems to have turned it all over to the Inter-professional now.	→Price of cottonseed is assessed at the beginning of each campaign, after negotiations with ginners. →SN-CITEC exercises influence on the level of the cotton-seed price because of (i) its privileged links with SOFITEX (overlap in shareholders) and (ii) its size (about 60% of capacity). →SOFITEX is trying to increase the value of cottonseed to improve overall profitability. The 2007/08 cottonseed price of 82 FCFA/kg (all taxes included and delivered to SN-CITEC) was double that of the previous year (40 FCFA/kg); the higher price was retained for the 2008/09 campaign. →SN-CITEC claims that a price at this level and low supplies resulting in capacity underutilization threaten its solvency. →Prices for cottonseed imported from neighboring countries appears to be determined by market demand and supply (primarily demand from small scale crushers).	→Price appears to vary, but not clear how it is determined given that CMDT continues to maintain a monopoly of sales of cottonseed. →Since 2000 cottonseed prices reported from various source range from 17 to 94 FCFA/kg, with a fairly steady increase over time.	→Prices of cottonseed vary by quantity of a transaction and location of the purchaser (domestic, regional). →Prices ranged from 11 to 15 FCFA/kg before 2000/01; since that time the range has been from 12 to 30 FCFA/kg.

	Benin	Burkina Faso	Mali	Chad
Evolution of and key actors in the oil crushing sectors	<p>→During 1980s the SONICOG parastatal was equipped to crush cottonseeds, which it got in small quantities and low prices. Cotton company also exported cottonseed to Southern Europe due to strong demand by dairy sector--the first time an export market for Benin cottonseed was established.</p> <p>→FLUDOR built a new oil-mill in Benin in 1996 with assets of 3.350 billion F CFA mainly held by Irish investors.</p> <p>→SHB (<i>Société Huilerie du Bénin</i>) created in 1997 from former parastatal -The assets of SHB (about 4.176 billion F CFA) are held by Ivorian and Beninois investors.</p> <p>→IBCG (<i>Industries Béninoises des Corps Gras</i>) created during privatization of former parastatal in 1997; also owns palm oil mills; assets of 3.5 billion FCFA initially owned by a Malian investor installed in Switzerland; firm has not crushed cotton seed since 2006 and is currently owned by a Swiss investor. According to some accounts, IBCG has never processed cottonseed.</p>	<p>→SN-CITEC, initially established in 1941 for groundnut processing and nationalized at independence as SHSB. Privatized in 1995. Assets of 3.445 billion FCFA: DAGRIS (45,55%), SOFITEX (34,7%), AGROLEA (6,97%), BIB (1,45%), other privates (11,76%). Has capacity to process all types of oil seeds and shea nuts.</p> <p>→SOFIB launched in 1984. Its assets are held primarily by a Burkinabé investor.</p> <p>→JOSSIRA created in 1998; assets of 600 million FCFA shared by <i>Famille Moussa Gros</i> (94%) and CORUS Investment (6%). Did not operate during 2008/09 season.</p> <p>→1997 first semi-industrial unit set up near Bobo Dioulasso; additional units appeared around 2002; now about 30 of them; produce cotton cake and neutralized oil.</p> <p>→Approximately 30 additional crushers using artisanal techniques have been added; they produce crude vegetable oil (no refining at all) and soaps.</p> <p>→Expansion was fueled by Burkinabé having been expelled from Côte d'Ivoire looking for investment opportunities.</p> <p>→In 2007, rising prices for vegetable oil imports and petroleum products led to more investment in oil crushing facilities.</p> <p>→Speculation about Asia moving toward bio-fuels also a stimulus for expansion.</p>	<p>Pre-1981: cottonseed given to cotton farmers as animal feed.</p> <p>→1981: HUICOMA created as a subsidiary of CMDT with monopoly rights to cottonseed processing from 1981-2001.</p> <p>→2001: CMDT sold their capital in HUICOMA to the GOM.</p> <p>→2003: <i>Société des Oléagineux du Mali in Koutiala</i> established the first competition.</p> <p>→2005: HUICOMA privatized; the current ownership is:</p> <p>→→GoMt = 12%,</p> <p>→→CMDT employees = 0.745%</p> <p>→→HUICOMA employees = 0,745%</p> <p>→→Madame M. Sanogo =0.740%,</p> <p>→→Dionkè Yermakore 1.640% ;</p> <p>→→Alou Tomota = 84.130%</p> <p>→Other large crushers (>50,000 MT of cottonseed/yr capacity) now operating: <i>Huilerie Abou Woro</i> in Sikasso and <i>Huilerie Cotonnière de Sikasso</i> (HUICOS) which are operating but with some problems of access to raw materials..</p> <p>→2007: 49 crushers registered with the <i>Dir. Nat. des Industries</i>; down to 34 by 2008/09, due in part to stricter enforcement of quality standards. Diverse locations: Bamako (6), Koutiala (11), Sikasso (4), Ségou (3), etc.</p>	<p>→DHS (<i>Direction de l'Huilerie Savonnerie</i>) created in 1977 as a direction under Cotontchad management.</p> <p>→Separated from Cotontchad for a few years in the early 2000s but this didn't work, so it was reabsorbed.</p> <p>→Capital (see Cotontchad in ginner table)</p>
Crushing capacity and utilization	<p>→Total industrial capacity of 250,000 MT of cotton seed able to produce 40,000 MT of refined oil (16% average extraction) and 95,000 MT of cake (38% average extraction).</p> <p>→SHB capacity is 120,000 tons of cottonseeds per year for a production of 19,200 tons of refined oil and 45,600 tons of cotton cake.</p> <p>→Fludor capacity is 14,400 tons of refined oil and 34,200 tons of cake from 90,000 tons of cottonseed.</p> <p>→IBCG capacity 40,000 tons of seed.</p> <p>→Average national utilization from 2000-2008 was 71%; 2006 (43%), 2007 (52%), 2008 (Not Avail), 2009 (60%).</p>	<p>→SN-CITEC has 120,000 MT capacity; running at 72-78% capacity last two campaigns.</p> <p>→JOSSIRA has 35-66,000 MT capacity; didn't operate this past year.</p> <p>→SOFIB has 30-50,000 MT capacity; has not operated for several years.</p> <p>→Combined semi-industrial capacity of about 30 operators estimated at 1431 MT/day in 2007.</p> <p>→Entire semi-industrial and artisanal sectors (members of GTPOB) seem to have received less than 50,000 MT of cottonseed this past year.</p>	<p>→Industrial capacity:</p> <p>→→HUICOMA: 345,000 MT</p> <p>→→H. Abou Woro: 60,000 MT</p> <p>→→HUICOS: 52,000 MT</p> <p>→Total capacity for all 34 authorized crushers (industrial, semi-industrial, artisanal) in 2008/09: 997,100 MT</p> <p>→Utilization in 2008/09 < 11% (production of cottonseed estimated at 106,451 tons vs. crushing capacity of 997,100 tons)</p>	<p>→DHS: 100 000 MT of cotton seed of which about 40% used on average since 2000/01.</p> <p>→Annual utilization has ranged from 24% in 2007/08 to 61% in 2002/03</p> <p>→Low utilization in 2007/08 due to Cotontchad decision to sell large quantity (16,000 MT) of cottonseed to others.</p>

	Benin	Burkina Faso	Mali	Chad
Employment generation	<p>→SHB: 110 permanent and 200 seasonal</p> <p>→Fludor: 250 permanent and 170 seasonal.</p>	<p>→CITEC: 340 salaried, 650 seasonals and handworkers</p> <p>→SOFIB: 425 employees all categories combined</p> <p>→JOSSIRA: 165 employees when operating.</p> <p>→Mid-sized industrial firms (40-100,000 MT capacity) number about 30 and employed about 1187 people in 2007.</p> <p>→Semi-industrial and artisanal firms: no firm information on numbers and employment.</p>	<p>→Industrial units:</p> <p>→→HUICOMA 811 employees</p> <p>→→Abou Woro 252 employees</p> <p>→→HUICOS 180</p> <p>→2960 total estimated employees for the entire sector of 34 crushers (all types) registered in 2008/09.</p>	<p>→Permanent employees of DHS ranged from 183-266 and seasonal employees from 0 to 104 between 2000 and 2008.</p>
Regional professional organizations	<p>SHB: Member of AIFO (<i>Association des industriels des filières oléagineuses</i>) of UEMOA</p>	<p>SN-CITEC belongs to AIFO de l'UEMOA created in 2000.</p>		
National professional organizations	<p>→Not members of national cotton inter-profession.</p> <p>→G-TRI: formed by the 3 industrial crushing firms to strengthen negotiations with ginners to improve access to cottonseed. G-Tri has tried to join AIC, the cotton inter-professional organization, but without success.</p>	<p>→Not members of national cotton inter-profession.</p> <p>→The three industrial firms belong to <i>Groupement Professionnel des Industriels (GPI)</i>, which groups all the industrial firms officially recognized by the GOB</p> <p>→APHB (Burkina Oil Producers' Assoc.) united the smaller crushers in 2003 to strengthen negotiating position <i>vis-à-vis</i> SOFITEK for access to cottonseed.</p> <p>→GTPOB (<i>Gie des transformateurs de produits oléagineux du Burkina</i>) created in 2005, with 42 members. It groups the same operators and has the same objectives as APHB, which seems to have been replaced by GTPOB (though former still exists legally). GTPOB appears to be the most important and dynamic organization in the subsector, but following internal disagreements, two new groups were created in 2008.</p> <p>→The dissidents founded GHH <i>Groupement des Huiliers du Houet</i> (11 members) and CPOD (Cooperative of Oil products Producers and Sundries) (6 members).</p>	<p>→Not members of national cotton inter-profession.</p> <p>→ Members of the Chamber of Commerce</p> <p>→The Ministry of Industry and Commerce reports that a national association of oil seed crushers was established in 2008.</p>	<p>→Not applicable</p>

	Benin	Burkina Faso	Mali	Chad
Non-trade regulatory Issues	<p>→Relevant regulations are those applying to the cotton sector in general and those applying to food and sanitary controls.</p> <p>→No national capacity to test for gossypol contamination in oil but less of a problem than in other countries as all of crushing infrastructure is industrial.</p>	<p>→Regulations applied to the firms operating in the sector of cottonseed processing includes:</p> <p>→→the environmental code</p> <p>→→the public health code</p> <p>→→laws on completion</p> <p>→→laws about food packaging</p> <p>→→laws about food quality</p> <p>→Problem is not lack of regulations but lack of enforcement. Government began to be stricter in 2005 with many firm closures.</p> <p>→ Some sources also mention a temporary halt to issuing licenses for new oil seed crushing businesses.</p> <p>→Ginners argue that closures not strictly enforced and many firms now operating do not meet health/environmental standards.</p> <p>→No national capacity to test for gossypol contamination in oil.</p>	<p>→Concerned by the proliferation of artisanal crushers producing poor quality oil, the GOM has proposed an annual assessment of all licensed firms and the publication of a list of authorized firms.</p> <p>→The efficacy of the assessments is not clear.</p> <p>→No national capacity to test for gossypol contamination in oil.</p>	<p>→None identified other than those pertaining to trade which are described below.</p> <p>→No national capacity to test for gossypol contamination in oil, but not viewed as a problem given industrial nature of processing equipment.</p>
Regional trade restrictions and issues	<p>→Subject to regional UEMOA policies.</p> <p>→After 2001/ 2002 campaign and complaints by local crushers, a ban was imposed on exports of cottonseed. Some ginners continued exporting, but in smaller quantities.</p> <p>→In 2004/05 the ban was cancelled.</p> <p>→November 2006 importation by road of comestible oils was outlawed BUT ban found to be in contradiction to UEMOA community rules.</p> <p>→In 2007 the ban was only on importation of oil NOT coming from UEMOA and CEDEAO zones (i.e., direct from Asian competitors).</p>	<p>→Subject to regional UEMOA policies.</p> <p>→Pressure from GOB and crushers to restrict ginner exports of cottonseed.</p>	<p>→Subject to regional UEMOA policies.</p> <p>→No evidence of ginner interests in exporting cottonseed.</p> <p>→No evidence of cottonseed export bans.</p>	<p>→In CEDEAO trade zone.</p> <p>→2008/09: exports of cottonseed were declared illegal</p> <p>→Co-product exports are not made directly by DHS but by Chadian clients of DHS who purchase in Moundou and then export to neighboring countries.</p>

	Benin	Burkina Faso	Mali	Chad
Domestic trade restrictions and issues	<p>→Because of 18% VAT applied to cotton co-products, can't compete with clandestine Asian oil imports (i.e., ones that escape paying UEMOA import duties by coming from neighbors like Togo)</p> <p>→Strategy is to export locally produced cotton oil (exports not subject to VAT) to Nigeria and Cameroon.</p>	<p>→Co-products subject to 18% VAT but seem to face less competition from clandestine imports than Benin.</p> <p>→Weak government regulatory enforcement allows substandard oils to be produced and sold.</p> <p>→Small-scale producers imitate packaging of SN-CITEC to sell their inferior products; GOB does nothing to regulate.</p>	<p>→Co-products subject to 18% VAT as in other countries, but does not make cotton oil non-competitive as in Benin</p> <p>→Issue of poor quality (gossypol contaminated) oil frequently in the press past several years.</p> <p>→Sales of animal feed by HUICOMA are subject to government regulations requiring allocation of specified shares of production to selected groups:</p> <p>→→50% to cotton producers,</p> <p>→→40% to livestock herder associations,</p> <p>→→4% to government services and NGOs</p> <p>→→the rest can be sold on the open market by HUICOMA.</p> <p>→Established rules are used to allocate supplies among different producer organizations and associations.</p>	<p>→Co-products subject to 18% VAT.</p> <p>→DHS can sell oil only to licensed traders, but cake sales have no such restriction.</p> <p>→Oil is sold to wholesalers on a quota basis; quotas are set by DHS and sales take place at the factory gate in Moundoun.</p> <p>→Complaints by traders not getting access resulted in a 2008 ruling designed to make the quota allocation process more transparent.</p> <p>→Cotontchad established a commission to review trader certifications and determine qualification for exoneration from the 4% IRPP tax.</p> <p>→The maximum number of certified traders was set at 65.</p> <p>→Quotas are allocated quarterly and must be paid for and collected within one week of the award or they are reallocated.</p> <p>→2007 issue of seed quantity sold to DHS having been reduced, but not clear where seed went.</p> <p>→Sales procedures often lack transparency and probably result in many sales at prices lower than the real value of the products.</p> <p>→Legislation in 2008 addressed these shortcomings, but improvements in the implementation are needed.</p>
Market characteristics and perspectives: Unprocessed Cottonseed	<p>→Southern European dairy industry demand for cottonseed has been high (preferred to processed cake and meal due to sanitary controls); unclear if this high price is due to market forces or farm subsidies.</p> <p>→Major tension between ginners who believe they can get better prices by exporting seeds and crushers who pressure GOB to restrict exports.</p> <p>→Crushers argue that they cannot operate profitably if they have to purchase at prices offered by EU.</p> <p>→Lack of public information on costs of cottonseed processing make it impossible to confirm the assertion.</p>	<p>→Southern European dairy industry demand for cottonseed has been high (preferred to processed cake and meal due to sanitary controls); unclear if this high price is due to market forces or farm subsidies.</p> <p>→Major tension between ginners who believe they can get better prices by exporting seeds and crushers who pressure GOB to restrict exports.</p> <p>→Crushers argue that they cannot operate profitably if they have to purchase at prices offered by EU.</p> <p>→Lack of public information on costs of cottonseed processing make it impossible to confirm the assertion.</p>	<p>→Very strong domestic demand for rapidly expanding dairy, livestock, and poultry sectors as well as for oil sector.</p> <p>→Issue of exporting seed has not been raised.</p>	

	Benin	Burkina Faso	Mali	Chad
Market characteristics and perspectives: Oils	<p>→Estimated share of national oil demand that could have been satisfied from domestic cotton oil production (assuming 7 kg/capita consumption) from 2001-06 is 53%. Some estimates of consumption go as high as 9.94 kg/person per year.</p> <p>→The local crushing industry cannot compete with Asian palm oil on the local market due to the 18 percent value added tax applied to domestically processed cottonseed oil and ability of Asian oils to enter market as monetized food aid or through other venues where the 22% UEMOA tax is not applied.</p> <p>→This has led two local processors to export most of their oil and meal (much of it to Nigeria), obtaining exemption from tax.</p> <p>→As a result, imported oil supplies most of the demand in the local market.</p>	<p>→Estimated share of national oil demand that could have been satisfied from domestic cotton oil production (assuming 7 kg/capita consumption) from 2001-06 is 57%.</p> <p>→Burkina's domestic vegetable oil consumption is estimated to be 50,000 MT.</p> <p>→Roughly 31,000 MT of cotton seed oil are produced domestically, so production does not meet demand.</p> <p>→Nearly all the oil produced in Burkina is consumed domestically, with limited exports to Mali.</p> <p>→SN-CITEC, for example sells 87% of its oil domestically and 11% in the regional market.</p>	<p>→Estimated share of national oil demand that could have been satisfied from domestic cotton oil production (assuming 7 kg/capita consumption) from 2001-06 is 50%.</p> <p>→2006 oil imports from Côte d'Ivoire and Burkina were 10,350 tonnes.</p> <p>→Vegetable oil markets in Mali tend to be open and competitive, with spatial differences in prices apparent.</p> <p>→For example, a 200 liter barrel of HUICOMA cotton oil may sell at a wholesale price of 113,000 FCFA (tax included) while sales in Kita, Ségou and Koutiala for the same quantity may sell in the range of 90,000 to 97,000 FCFA/barrel.</p> <p>→Malian cotton oil tends to be more expensive (about 5000 FCFA/barrel) than imported palm oil but appreciated by consumers for frying because it withstands higher temperatures.</p>	<p>→Average per capita oil consumption is 3 liters/year for a national demand of 21 million liters.</p> <p>→Domestic demand is not yet covered by domestic production.</p> <p>→Strong demand for Chad's oil in Cameroon and the Central African Republic.</p> <p>→Artisanal production of groundnut oil does compete with cotton oil, but consumers prefer cotton oil (neutralized rather than refined).</p> <p>→Wholesalers have been accused of speculating with DHS supplies, buying them up in March and April and not selling them until the rainy season, at a much higher price.</p> <p>→DHS does not have a clear, stable policy with respect to marketing.</p>
Market characteristics and perspectives: Animal feeds, cake, meal, hulls	<p>→Most cake and animal feed is exported to South Africa and Nigeria as Benin has a very small livestock sector.</p>	<p>→Not clear if all cake produced is marketed domestically at present; in the past there was excess production and exports to Mali.</p> <p>→SN-CITEC has been using cottonseed hulls to generate energy to run equipment; extent to which this is more profitable than selling hulls in animal feed not clear.</p> <p>→ 250 kg of hulls can produce one ton of steam; 10kg à 12 kg of steam can produce 1kwh of electricity (which can also be produced by 1 kg of diesel fuel).</p>	<p>→Domestic demand for animal feed is 200,000 MT.</p> <p>→2006 saw both exports (8,705 MT) and imports (715 MT) of cotton cake.</p> <p>→Price differentiation between HUICOMA (70 FCFA/kg) and other sellers of animal feed (50-60 FCFA/kg).</p> <p>→Supply shortages can push prices to 200 FCFA/kg during peak periods.</p> <p>→Firms with low oil extraction rates can compensate by selling animal feed during peak periods.</p> <p>→ Only HUICOMA Koulikoro produces "<i>tourteaux déshuilés</i>" and HUICOMA Kita "<i>tourteaux gras</i>".</p> <p>→Animal feed, which contains 50-70% cotton hulls, is produced by all processors.</p> <p>→Some use of hulls to run ginning equipment of CMDT.</p>	<p>→From 2001, when DHS was temporarily made independent of Cotontchad, DHS was expected to purchase cottonseed from the ginner. This was the beginning of the cottonseed market.</p> <p>→Demand for cake is strong during the first five months of the calendar year, reaching a peak between February and May, when other sources of feed are limited.</p> <p>→All domestic cake supply comes from DHS, but some animal feed (with a high concentration of hulls, not desired by Chadian herders) is also available from Cameroon.</p> <p>→Cake is also exported to Cameroon and Nigeria (AFFCOT is a customer) by Chadian traders who get their stocks from DHS. Quantities exported are poorly documented.</p> <p>→For the domestic market, the dispersion of clients (herders) constrains the development of sales, suggesting a need for improved herder organizations.</p> <p>→Some limited activity on the part of nomadic herders to invest in distribution services has been observed.</p>

	Benin	Burkina Faso	Mali	Chad
Indicators of crushing sector technical and financial performance	<p>→SHB averages 2001-05: →→93.7% of cottonseed acquired was processed →Estimated oil content of Benin cottonseed is 20% →→Avg refined oil yield 15.98% (ranging from 13.9 in 2005 to 17.03 in 2001) →→Avg cake yield 41.5% (ranging from 48.1 in 2001 to 37.7 in 2005).</p>	<p>→Estimated oil content of Burkina cottonseed is 21%. →SN-CITEC 18% cottonseed to refined oil extraction rate. →JOSSIRA 11.5% cottonseed to refined oil extraction rate. →30 smaller units (12-100 MT capacity) 9-11% refined oil extraction rate.</p>	<p>→Estimated oil content of Malian cottonseed is 20%. →HUICOMA processing coefficients: →→Yield in crude vegetable oil is 16% to 17% for an average oil content of 20% for cottonseed. →→Yield going from crude to neutralized oil is 90% to 92%. →→Yield from grain to refined oil is 14 to 15,20%. →Medium sized processing results: crude oil extraction rate of 10% à 12%, 89-90% of this is rate to neutralized oil →<i>Société des Oléagineux du Mali (SMO) de Koutiala</i> has a cottonseed to refined oil rate of 8,63% to 10,5 %. →Smaller units in Ségou, Sikasso, Bougouni, Bamako and surrounding area has 8 to 10% extraction rate for crude oil and subsequent rate of 80-86% for crude to neutralized. These units do not have cleaners or hullers.</p>	<p>→Estimated oil content of Chadian cottonseed is 20%. →Average crude oil yield is <18% (e.g., 16 in 1998). →Yield from crude to neutralized oil is 90%. →Yield from neutralized to refined oil is 98% →Cake yield is about 40%. →Annual deficits exceeded 1.7 billion FCFA from 2002/03 to 2007/08; break-even point requires processing 70,000 MT of cottonseed; maximum since 2000/01 was 61,000 MT in 2004/05. →DHS has received GOC subsidies of 2.2 billions FCFA (1.5 billion in 2006/07 and 0.7 billions in 2007/08. →Investments: 800 to 850 millions FCFA from subsidy used to purchase spare parts and 950 millions FCFA spent in 2004 to repair the <i>Chaudière BABCOCK</i>.</p>

Appendix 4: Characteristics of seed cotton price mechanisms in the C-4 countries

	Benin	Burkina Faso	Mali	Chad
Key dates in the evolution of cotton sector pricing mechanisms	<p>→Before 2000: National (not cotton-specific) stabilization fund and price commission</p> <p>1999: Begin privatization of sector</p> <p>2000: <i>Assoc. Interprofessionnelle du Coton</i> (AIC) created by ginners, input suppliers, and farmers;</p> <p>→AIC given task of managing the sector in 2000.</p> <p>→99/00-02/03: Waddell Methods</p> <p>→2004-1st revisions to Waddell</p> <p>→2006: 2nd revisions to Waddell (this is situation described below)</p>	<p>→1995-2005 A support fund supplemented with a price mechanism was in place.</p> <p>→1995-1999: Cotton sector managed via a « <i>contrat plan</i> » between the GoBF and SOFITEX.</p> <p>→1997: Decision made to place a 8.5 billion FCFA ceiling on the support fund and to give the UNPCB authority to manage the fund.</p> <p>→1999: AICB (<i>Association Interprofessionnelle de Coton au Burkina</i>) created giving UNPCB and SOFITEX joint responsibility to manage the sector by setting prices and ensuring the implementation of critical functions.</p> <p>→2003: Support fund empty following payment of debts from 2001/02 to SOFITEX.</p> <p>→2004: End of the SOFITEX monopoly on ginning as SOCOMA and FASO Coton established.</p> <p>→2006: AICB adopts a new price mechanism and replaces the support fund with a “smoothing” fund.</p> <p>→2008 : Initial funding for the smoothing fund obtained from the European Union</p>	<p>→2002: <i>Arrêté Interministériel</i> established rules for setting prices for 2002/3-2004/5</p> <p>→2005: <i>Protocole d'Accord Etat-CMDT-Producteurs</i> revised earlier mechanism and laid out rules for 2005/06-2007/08</p> <p>→2008: Minor modifications in existing PM to set prices for 2008/09; switch to Cotlook A Far East from Northern European index</p> <p>→2009: Prices determined through negotiations and announce by a press release signed by CMDT, producers union, and Min of Finance</p>	<p>→1993: Pacte d'Actionnaires allowed producer price to be set by cotton company and approved by government</p> <p>→1995-96: <i>Etude sur les MdP</i> and audit of Cotontchad by SOFRECO</p> <p>→1997: Implementation of current mechanism</p> <p>→2005: <i>Equipe Technique chargée de la mise en oeuvre de la Feuille de Route Coton</i> (ETFRC); A recommendation to increase the producer share in the formula and the value for the cotton seed was not implemented.</p>
Minimum guaranteed producer price	<p>→MGP must cover essential production costs plus value of family labor; set for a period of 3 years but indexed on input costs.</p> <p>→Recommended range of 150-170 f/kg by Horus report in 2006.</p>	<p>→No longer a set guaranteed price though there was one prior to 2006 which was set to a range between 160 and 175 FCFA/kg.</p> <p>→Current system is that the <i>prix de tendance</i> is the guaranteed price and it changes each year.</p>	<p>→A minimum price that producers must receive regardless of world price can be set for 3 years.</p> <p>→Adjustment allowed during 3 years if major input price changes occur. →Established at 165 FCFA/kg in 2002 and retained in 2005 Protocol.</p>	<p>→Not mentioned.</p>
Determination of the base price	<p>→<i>Prix d'acompte</i> (PdA) set at planting. Must be ≥ minimum guaranteed price.</p> <p>→Pd'A based on independent expert's estimate of FOB market expectations, taking into account (a) a coefficient of prudence (.9), (b) the share of seed cotton production costs in the total costs of fiber and cotton seed production (variable, depending on capacity utilization, etc.), (c) a quality premium on FOB value, (d) target seed and fiber output shares, and (e) adjustments for taxes and the value of seed sold in n-1.</p>	<p>→<i>Prix tendance</i>, which is based on a 5-year moving average of the Cotlook index * .95 (coefficient of prudence--set at .92 when the ginner is indebted to the support fund) * the ginning ratio (42%).</p> <p>→The producers' share of this FOB price is 60% (see below).</p>	<p>→Done through negotiations.</p> <p>→Must be greater than the guaranteed minimum price.</p> <p>→2005 Protocol set a range of 160 to 175 FCFA/kg for the next 3 years; actual values were 160, 165, and 171 FCFA/kg.</p> <p>→Note that the 160 price is below minimum guaranteed identified in 2002</p>	<p>→Based in part on cost of production formula using input package F2 (100kg NPKSB and 50 kg urea/ha) and animal traction but also on an analysis of anticipated cotton lint prices for the upcoming season (using a variety of ICAC and exchange rate projections). →Analysts establish a range of expected values.</p> <p>→Final decision is negotiated among producers and Cotontchad, with government assisting.</p>

	Benin	Burkina Faso	Mali	Chad
Period used to determine average index for base price	→FOB to be determined by external expert; no criteria re dates seem to have been set but the seasonality of fiber sales is taken into account in weighting the anticipated prices. →This system never used.	→5-year moving average (two years back, current year, two years forward). →Under discussion: started as 7-yr, now proposing variety of alternatives.	→Not relevant as there is no formula for the base price.	→Period covered in setting relevant price ranges not specified in documentation.
Determination of final lint price and seed cotton equivalent	Formula for the base price is used, but with actual rather than estimated production numbers; the calculation is made with the same seasonality of sales used to estimate the base price.	→ <i>Prix de vente de reference</i> is based on the Cotlook Index A during the marketing campaign, using other parameters contained in the base price calculations.	→Based on Cotlook A averages and ginning norms (42% lint, 52.5% seed), taking into account share of total production marketed and exported	→Based on norms, not actual performance of Cotontchad by using the CIF sales price for a 16 month period
Period used to determine average index for final price	→Mar t – April t+1, →Values weighted with the same seasonality of sales as used for the <i>PdA</i>	→Apr t - Mar t+1	→Average of April-June predictions for year t and July t through March t+1 actual values.	→Average Cotlook A from Jan t to Apr t+1.
Determination of total price paid to producers (base price + <i>ristourne</i>)	→Determined in May/June of n+1 and used to build price support fund and make surplus payment to farmers; →built on the elements in the <i>PdA</i> calculations but adjusted for the actual level of seed cotton production rather than the estimated level. →Roughly, the value of all fiber produced and seed sold, minus costs (excluding price of seed cotton), minus <i>PdA</i> /fiber yield. →Recommended that farmer share of what is left after building the fund be based on producers' share established for the <i>PdA</i>	→ <i>Ristourne</i> is calculated after the calculation of a <i>prix de vente de reference</i> and the determination of payments to the support fund; →these payments are a function of the level of funds and the difference between the base price and the final price.	→Base price + share of <i>ristourne</i> (final price - base price) not allocated to the support fund →In most years, the <i>ristourne</i> is divided with 50% going to the fund and 50% used as a supplement to price paid to farmers.	→Base price + <i>ristourne</i> (difference between the base price and the final lint price). →If the producer price equivalent of the final lint price is lower than the base price, farmers get only the base price. →When the base exceeds the final, the government is to reimburse Cotontchad for the base price - the final price * total production.

	Benin	Burkina Faso	Mali	Chad
Determination of the producers' share of the prices	<p>→The producer's share is a variable share that takes into account the quantity of seed cotton produced and processed (and therefore, ginning capacity underutilization).</p> <p>→It is the share of seed cotton in the overall FOB production cost of fiber.</p> <p>→ For the base price, the estimated production is used, for the calculation of the surplus, the actual production is used.</p>	<p>→Pre-1996 producer share had been about 50%. Current 60% proposed by SOFITEX based on an analysis in 2000-2003 period; accepted by farmers organization.</p> <p>→60% appears to have historical origin in an analysis of 25 years of retrospective data in 1996 where it was determined that 650 FCFA/kg was lowest CIF price ever faced. Assuming future prices would not go below 650 F/kg, it was determined that SOFITEX could pay farmers 60% of the 650 F price and still cover all their costs.</p> <p>→As CIF has frequently gone below 650 in recent years, current thinking is that the shares need to be reviewed and made flexible given changes in cost structures for both farmers and ginners.</p> <p>→Prior to 2001/02 producer share was considerably below 60%, but since it has been as high as 77% (04/05).</p>	<p>→60% of Cotlook FOB adjusted as indicated above to estimate final lint price. Percentage used appears to have been copied from that used in Burkina.</p>	<p>→19.3% of CIF CotlookA Liverpool lint price converted to FCFA;</p> <p>→Based on analysis of situation in 1996/97 and rough goal of dividing sector benefits among actors as follows: 50% producers, 30% cotton company shareholders (i.e., government), 20% Cotontchad.</p>
Methods used to incorporate the value of cotton seed in the producer price	<p>→Based on average cotton seed sales price of ginning companies.</p> <p>→Prices for t-1 used in formula to determine Pd'A for period t.</p>	<p>→Not a part of the PM procedures</p>	<p>→Based on average cotton seed sales price of ginning company and same producer share as used for lint (60%).</p>	<p>→5 FCFA/kg of seed cotton fixed value added to farmer payment based on lint values since 1997.</p>
Support fund	<p>→Fund theoretically sourced from profits in good years, but in reality the fund does not exist and the government covers deficits</p>	<p>→The fund is the most important component in terms of stabilizing cotton sector finances; the price setting mechanisms are additions to the fund to improve the fund's stabilizing performance.</p> <p>→Neither the support fund nor the smoothing fund have stabilized the sector as desired.</p> <p>→The system worked reasonably well to 2004/05 but then the fund was "unfunded" to 2006/07 and quickly depleted again by 2007/08.</p>	<p>→In 1998 a stabilization fund existed, but was poorly managed by the CMDT.</p> <p>→2002 saw the creation of a support fund that was managed directly by the producers; the fund received money not only from payments made by producers through their <i>ristourne</i> but also from contributions by development partners (European Union and the French Development Agency).</p> <p>→Producers have continued to contribute a share of their <i>ristourne</i> to the fund following the 2005 Protocol (2005/06 to the present day).</p> <p>→Producers have drawn on the fund to make payments to the CMDT (about 3 billions FCFA).</p> <p>→CMDT has experienced negative balances since 2005/06, even after having received support from the fund.</p> <p>→GoM has frequently recapitalized the CMDT to redress the problem of negative balances</p>	<p>→Government provides subsidies to Cotontchad.</p>

	Benin	Burkina Faso	Mali	Chad
Implementation	<p>→1999/00-2002/03 formula calculated but not effectively applied as formula prices <> applied prices.</p> <p>→Different sources of estimates for producer costs posed problems.</p> <p>→Since 2003, no attempt to officially implement formula.</p> <p>→General history of negotiating parties not being able to agree so government usually intervenes to set prices, often late in the season.</p>	<p>→Since 2006 formula implemented to the letter (to encourage donor assistance for external funding of the support fund),</p> <p>→Unfavorable producer prices compensated for to some extent with input subsidies</p>	<p>→Work is done by an inter-ministry commission, CMDT, OHVN, and UNSCPC.</p> <p>→Final price and overall subsector results appear to be strongly influenced by negotiations about "prix de base",</p> <p>→negotiations do not seem to weight world market price projections as heavily as political factors and farmer costs of production.</p>	<p>→Negotiations for base price tend to result in a price that is higher than the "final" price,</p> <p>→Farmers' share of the CIF Cotlook price (minus the 5 F/kg for cotton seed) has averaged 22.5% rather than the prescribed 19.3%.</p> <p>→Relevance of a fixed 19.3% over time applied to the CIF price needs to be reviewed.</p>