ASHESI UNIVERSITY COLLEGE

AN EMPIRICAL INVESTIGATION OF THE COSTS AND BENEFITS FROM MOVING UP THE SUPPLY CHAIN: THE CASE OF GHANA COCOA

By

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DECLARATION

I hereby declare that this dissertation is the result of my own original work and that no part of it has been presented for another degree in this university or elsewhere.

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I hereby declare that the preparation and presentation of the thesis were supervised in accordance with the guidelines on supervision of thesis laid down by Ashesi University College.

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ABSTRACT

Using simple cost-benefit analysis, this thesis investigates why Ghana, the world's second largest cocoa producer, has followed a strategy of exporting its cocoa beans instead of processing the beans into semi-finished and finished cocoa products. It is assumed that apart from the necessary technological ability needed to process cocoa beans the economic incentive for an increasing focus on processing relative to producing the beans for export is the profit incentive. The analysis is complicated by the fact that although there may be higher margins to be earned from processing cocoa, Ghana also earns high premiums from exporting raw beans because it exports the most quality cocoa in the world: all cocoa is typically discounted to Ghana. The results of this study showed that while generally, costs were higher for processing of raw cocoa beans into semi-finished and finished products and revenues from processing were mostly higher than from production for export; profits from processing were always higher than from production. This proved that financially it would be more profitable to increase processing of cocoa beans in Ghana. This study would serve as a springboard for further research on Ghana's cocoa industry and would largely benefit the Ghana government and Ghana Cocoa Board with regards to plans for expansion of the cocoa industry. It would aid the government and COCOBOD in the creation of policies and regulations which would boost the industry.

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CHAPTER 1: Introduction

1.1 Background of the Study

Ghana is endowed with a variety of mineral and agricultural produce (Breisinger et al., 2008). Historically, Ghana's Gross Domestic Product (GDP), an indicator of the total value of all goods and services produced within Ghana, has been led mostly by the agricultural sector of the economy. In 2004, agriculture contributed 46.7% of the overall growth in GDP, up from the 41.4% recorded the previous year. This growth was in large part, a direct consequence of the rehabilitation of cocoa production (Aryeetey and Kanbur, 2008).

Africa's first crop of cocoa was planted in Ghana over a century ago by Tetteh Quarshie (COCOBOD, 2000). Subsequently, Ghana's status as a cocoa producer grew and peaked in the mid 1960s, collapsed in the early 1980s and was revived in the late 1980s (Jaeger, 1999). In the 2002/2003 season, the country's cocoa production peaked similar to the 1960 levels. Ghana's output reached 566,000 tonnes in the mid 1960s before falling to about 159,000 tonnes in the early 1980s. Ghana's cocoa output increased to 350,000 tonnes at the end of 1999. Due to good agronomic practices and higher cocoa prices, the output reached 700,000 tonnes in 2008 (COCOBOD, 2009).

The fall in cocoa output in Ghana's history was attributed mainly to poor management of the Cocoa Marketing Board (Jaeger, 1999). However, several other reasons can also be cited. The main causes include land

degradation in the producing areas and swollen shoot disease (Jaeger, 1999). A fall in international terms of trade in the late 1970s and early 1980s resulting in the decline in cocoa prices also affected production (Jaeger, 1999). Another cause of the fall was the drought and extensive bush fires in the 1980s, the massive migration to Nigeria due to poor economic conditions domestically and the oil boom in Nigeria. Consequently, output per worker plummeted compared to historical levels, reaching 4.17% between 1980 and 1984 (Aryettey and Kanbur, 2008). Since cocoa production is a major contributor to the economy, it was only natural for the GDP of the country to fall as production declined (Aryeetey and Kanbur, 2008).

Analysis of the trends of Ghana's history reveals that increased cocoa revenue is associated with rising economic growth (Brempong Gyimah, 1986; Armah, 2008). A shift to increase processing would contribute to the national economy through an increase in foreign exchange earnings, an improvement in the GDP of the country as well as an improvement in the balance of payments (Awua, 2002).

As the world's second largest producer and major contributor to the growth of the country, cocoa is highly valued by Ghana.[1] The cocoa industry of Ghana consists of cocoa bean production by smallholder farmers, collection and bagging by Licensed Buying Companies (LBCs), quality assurance by COCOBOD, haulage of cocoa by private haulers, warehousing and other logistics by private companies and COCOBOD, and exports to

[1] See Appendix A for Share of countries in total cocoa production for 2005/2006

external buyers by COCOBOD (Amoah, 2008). Currently, Ghana exports about 70% of its raw cocoa beans (COCOBOD, 2009). That is, the farmers grow the cocoa seeds. The pods are then collected, broken and the beans extracted. The beans are then harvested, fermented, dried and bagged for export (International Cocoa Initiative, 2008). This is the process that 70% of cocoa from Africa, 19% of cocoa from Asia and Oceania, and 11% of cocoa from the Americas go through (World Cocoa Foundation, 2009).

Other processes on the cocoa value chain include cleaning, roasting and removing of the shell of the bean (International Cocoa Initiative, 2008). The nib in the shell is ground to form a cocoa paste. This paste can be pressed to extract cocoa butter which represents 50% of the cocoa bean. The remaining is the cocoa powder which is typically used for producing cocoa drinks, for baking and in the cosmetic industry. It is also used in chocolate, confectionary and other food products (International Cocoa Initiative, 2008). Together these activities form Cocoa processing which is distinct from production. This processing mostly occurs in industrialized countries in Europe and the United States. Europe, America, Asia and Oceania, and Africa grind approximately 41.1%, 22.7%, 19.5% and 16.6% of world cocoa beans respectively (World Cocoa Foundation, 2009).

According to the Global Trade Atlas, as of March 2009, the Netherlands imports cocoa beans to the tune of USD 352,505,018. The United States imports USD 40,785,667 worth of cocoa powder and France imports USD 288,328,480 worth of retail chocolate. These three countries are the highest

importers in the respective categories of cocoa products (World Cocoa Foundation, 2009).

Amongst the regions which grind cocoa, Africa is the only one with a positive growth of 11.7% from 2007/2008 to 2008/2009. Currently of the 16.6% grinding in Africa, Ghana contributes about 23.8% (World Cocoa Foundation, 2009). Based on the various forms of products into which cocoa can be processed, avenues for maximum revenue for Ghana could possibly be achieved by increasing processing. Thus this thesis aims to investigate the cost and benefits of moving up the supply chain for Ghana's cocoa sector. Specifically the thesis will use a profit analysis based on the costs and revenues from processing and production of cocoa beans to determine whether it would be more beneficial to process more cocoa beans than export the raw cocoa beans.

1.2 Importance of Cocoa to the Ghanaian Economy

The importance of cocoa to Ghana has been identified by several previous researchers. In Ghana, cocoa has been the backbone of the economy for a century and plays a major role in employment, foreign exchange earnings, government revenue, education, infrastructural development amongst others. (Amoah, 2008)

The International Cocoa Initiative, assert that over 14 million workers produce cocoa, of which 10.5 million are in Africa. 95% of the world's cocoa is grown by small scale farmers. In Ghana, it is estimated that there are about 265,000 cocoa farm owners and roughly 800,000 people involved in

cocoa growing and these figures exclude those working in other areas of the industry such as the processing firms, Licensed Buying Companies, chocolate vendors and others (Awua, 2002). This therefore implies that the demand for cocoa directly affects many African nations and their citizens' livelihoods.

Apart from the over reliance of some families on cocoa, a dependency on the revenues from cocoa by the country as a whole could be quite detrimental especially since the price of this commodity is largely determined by the international market. Due to the volatility of commodity prices, there was a level of instability inherent in relying on one export commodity for revenues.

Historically, Ghana has shown some over reliance on revenues from cocoa. Aryeetey and Kanbul (2008), noted that Ghana's first president, Kwame Nkrumah, used cocoa revenue as security for loans to establish different state-owned industries. Nkrumah's dependence on cocoa, along with the fall in prices in the late sixties, caused a decline in the growth of the country and resulted in a coup to overthrow him. Sahn (1994), also states that from the introduction of cocoa in the late 19th century till the mid 1970's, Ghana dominated the world cocoa market, and to a large extent cocoa dominated Ghana.

1.3 Motivation

It is striking to note that despite enjoying the enviable position of producing the highest quality cocoa the world over, the scale of cocoa processing in Ghana remains relatively low. Why this and what are the

economic underpinnings of this observation? Why does Ghana not process more of its cocoa into chocolate especially given the fact that the locally manufactured golden tree is the most popular chocolate brand in the domestic market? Why is it that Ghana processes only a fraction of cocoa produced given the recent ramp up in Ghanaian production and the decline in Cote d'Ivoire's ability to export cocoa?

The motivation for the research emerged from a genuine curiosity about the relative profitability and feasibility of increasing the percentage of Ghana cocoa that is processed into chocolate. It is not clear whether a strategy of exporting majority of the cocoa as beans is superior to processing and exporting other forms of the cocoa product. On one hand, Ghana enjoys long-lasting relationships with western processors which guarantees a market for cocoa beans and enjoys a premium for exporting its quality cocoa as beans. On the other hand, adding value to cocoa beans through processing may be beneficial in the long run and may be a superior long term strategy. This research will explain the historical preference for production for export instead of processing and provide some answers as to what strategy will maximize returns for the Ghanaian cocoa industry going forward.

1.4 Statement of the Problem

Since independence Ghana has depended mainly on exports of raw cocoa beans for majority of its foreign exchange revenue although exporting cocoa beans is hardly the only market strategy available to Ghana. In particular, economic theory predicts that transforming an agricultural product

such as cocoa into a form that is closer to the end retail product through processing may increase the value of the final product (Teece, 1998). Therefore this thesis which intends to investigate the costs and benefits of moving up the supply chain by exporting processed cocoa instead of raw beans may be justified on many grounds.

Processed agricultural products are typically of higher value than the raw agricultural products because higher skilled labor is required to process such agricultural products into the end retail products. In moving up a vertical supply chain therefore processing countries can charge a higher price for the processed goods. Hence the study will assess the possibilities of Ghana engaging in large scale processing of cocoa for exportation while identifying why this has not yet been done.

The results of this thesis would provide investors with information that will guide them to decide whether to invest heavily in the cocoa industry or channel their money to other more profitable ventures. Also, based on this study, one will be aware of the advantages or disadvantages of encouraging large foreign processing companies such as Archer Daniels Midland (ADM) and Cargill into the country. Lastly, this paper will make a contribution to the literature that analyzes the advantages and disadvantages of moving up the vertically integrated agricultural commodity-based supply chain.

Bottlenecks which have caused the stagnation of the cocoa processing section of the industry will be analyzed. If the final results show that the costs of processing cocoa are greater than the benefits, then it may be better

to specialize in production for export. Research effort should thus focus on improving the efficiency of the production process, and the quality of the cocoa beans.

1.5 Research Objectives

The primary aim of this thesis is to identify, analyze and compare the costs and benefits of moving up Ghana's cocoa supply chain.

Specifically, the study's objectives include an assessment of:

1. the current cocoa processing industry in Ghana
2. the reasons why large scale processing and exporting of cocoa products has been limited since independence,
3. the possibility of large scale processing of cocoa to its final product and exporting,
4. the advantages and disadvantages of the movement up the cocoa supply chain to the Ghanaian economy as a whole and,
5. the cost and benefits of encouraging the setting up of foreign processing factories such as ADM and Cargill to the economy.

1.6 Significance of the Study

This study will augment existing knowledge on the continued profitability and sustainability of the cocoa industry in Ghana. Given the ongoing nationwide discussion about whether there is economic justification for processing up to 50% of cocoa beans instead of wholesale export of the unprocessed beans, this research will give readers insight on the costs and benefits of such a decision. Further, with the introduction onto the domestic

market of multinational processing companies such as Cargill and Archer Daniels Midland (ADM), this research will enable one to assess the costs and benefits of encouraging domestic processing by such multinationals as against maintaining the status quo of majority export of raw cocoa bean.

This study can serve as a springboard for further research on Ghana's cocoa industry. It will be especially useful to farmers who want to expand their scope of cocoa operations or to entrepreneurs who might start cocoa farms. Their awareness of the most profitable stage of cocoa along the supply chain (export of beans, processing and exporting processed cocoa products etc) would enable them maximize their profits from their operations if they were to expand their farming business. Also the study will be useful for investors and businessmen who seek to devote resources or capital in the agricultural sector.

Most importantly, the Ghana government and COCOBOD may benefit from this study because awareness of what stage of cocoa production enjoys the most significant margins, will guide plans for expansion of the cocoa industry and will enable them create policies and regulations which would boost the industry.

CHAPTER 2: Literature Review

Despite the possibility of a bigger pay off by processing a majority of the total cocoa beans produced, Ghana, the world's second largest cocoa producer has faithfully followed a strategy of producing majority of its bean for export over the years. Why? Is this strategy an optimal one? Should Ghana continue to produce raw beans for export or should more of the beans be processed domestically. Armah (2010) and Dand (1999) have argued that that Ghana's current strategy may have a profit motive because the country enjoys high and persistent quality premiums since Ghana cocoa is the best cocoa in the world: All other cocoa is discounted to Ghana cocoa (Dand, 1999). However, to fully answer the question whether it makes sense to move up the supply chain by becoming a processor of cocoa beans instead of just a producer of the beans, a careful cost benefit analysis is required but is lacking in the literature. This paper hopes to close that gap in the literature.

To investigate the possibility of a profitable movement up the Ghana cocoa supply chain, the literature reviewed will provide knowledge on the general world cocoa supply chain, that is, the centralization and concentration of cocoa processes along the supply chain. In addition to this, literature reviewed will analyze the structural problems surrounding the cocoa industry, concessions that have been made as a result of the development of the processes along the supply chain and sustainability of the entire supply chain. Apart from literature on the dynamics of the supply chain, literature on the success of the processing stage of cocoa in Ghana will

also be reviewed. Lastly the role of cocoa in Ghana's development will be reviewed.

Kaplinsky (2004) and Bass (2005) analyze and explain the factors that affect international cocoa prices. They provide graphical evidence illustrating that over a long period of time, prices of traded commodities including cocoa prices have fallen, consistent with the Prebisch-Singer (1950) hypothesis of downward trending prices of primary commodity prices. They believe that cocoa also suffers from price volatility. Kaplinsky (2004) attributes this volatility to natural events such as adverse rainfall and frosts. Variability in the supply and demand of cocoa products is also partly responsible the volatility in prices. Hence when supply of cocoa beans are higher than demand due to good weather conditions for example, prices may drop whilst if demand was higher than supply, prices would rise.

Before the 1990s, governance of the cocoa marketing chain was mostly controlled by cocoa marketing boards of Sub Saharan African countries because of significant oligopoly power but after the liberalization conditions imposed by the Structural Adjustment Programs by the World Bank and International Monetary Fund (IMF), governance in many cocoa producing countries shifted to these Multi-nationals (Kaplinsky, 2004). The IMF mandated the dissolution of cocoa marketing boards in producing countries that were typically monopsony cocoa buyers domestically and oligopoly sellers of cocoa internationally, leading to significant loss of market

power on the seller side. Ghana is a notable exception (Phillips and Tallontire, 2007; Bass, 2005; and Kaplinsky, 2004).

In the specific case of Ghana, the Ghana Cocoa Board (COCOBOD) to a large extent still governs the production and sales side of the supply chain of cocoa and remains a monopsony buyer of cocoa domestically. The literature attributes the superior quality of the Ghanaian cocoa beans, to the existence of the COCOBOD and the services it renders to farmers such as provision of access to fertilizer, pesticides, cocoa seedlings and quality control services.

2.1 Centralization and Concentration of Cocoa Processing

Kaplinsky (2004) notes that there is a general trend of concentration in the international food industry and the cocoa supply chain is no exception. He mentions that countries typically focus on the products which they can produce best or for which they have a comparative advantage in production and maximize their abilities in those products. Kaplinsky (2004) compares this to cocoa processing and production where cocoa growing, roasting and grinding of the beans are geographically concentrated. He attributes this centralization to strong economies of scale.

Fold (2001) gives further reasons for the centralization of cocoa processes. Fold adds that the concentration on a particular part of the supply chain may make the process more efficient. As a result, improvements or changes in intermediate goods, processing or technology are entrusted to cocoa processors; efficient planting, harvesting and drying methods are

entrusted to the cocoa producers; and beans are normally stored in industrialized countries since quality easily deteriorates in humid tropical climates (where storage is non-existent) and since stored supplies are then nearer to industrial customers or the processors.

Fold (2001) points out that that this centralization to some extent creates a dependency on all participants on the supply chain. Since all stages are separate, processors and grinders are dependent on producers. Also since most West African producers export to the European chocolate industry, they are highly dependent on changes in demand in the European industry. Regardless of this dependency, there is some established reputation of consistency amongst suppliers of the various cocoa products.

Fold (2001) and Kaplinsky (2004) hold similar views on the tendency of concentration in the food industry. However they ignore the argument concerning the productivity and profitability gains of a firm or country if it became a major participant in many supply chain processes or if it moved up the supply chain from production into processing or vice versa. Such movement up the supply chain is an example of vertical integration. It is not clear whether vertically concentrated food supply chains do less well than supply chains with specialization as described by Kaplinsky (2004).

Further, Prebisch and Singer (1950) explained over half a century ago that prices of primary commodities such as cocoa, decline in the long run relative to processed cocoa products, therefore creating the incentive to move up the supply chain by processing the primary product. Their argument

seem to provide support that vertically coordinated supply chains may be the preferred method of organizing the supply of food products such as cocoa. For this reason, one must determine if it is beneficial for Ghana which mainly produces cocoa to engage in processing, or if Ghana should continue to primarily produce for export.

It is also possible for Ghana to encourage a major grinder such as Barry Callebaut to invest in locating its processing activities in Ghana to take advantage of cheap labor costs. In such an instance mutual benefits can be realized because while Barry Callebaut is assured of a constant supply of the most quality cocoa in the world, Ghana will be assured of constant demand for its quality beans. This scenario is occurring to some extent in recent times where Barry Callebaut, Cargill and Archer Daniels Midland, major foreign processors, have set up cocoa processing plants in Ghana. Despite this seemingly positive developments, it remains unclear from a profit standpoint if (i) Ghana should continue to encourage MNCs to process Ghana cocoa domestically or (ii) increase investment into the state-owned cocoa processing company to increase processing operations or stick to production for export. It is this gap in the literature, the absence of a careful analysis of the cost and benefits involved when a cocoa producing country like Ghana moves up the supply chain, that this research hopes to plug.

2.2 Structural Problems Associated with the Cocoa Sector

Bass (2005) discusses the numerous constraints and limited opportunities for West African farmers and companies in the cocoa business

as well as the policy options which could improve the position of West African countries and firms in the cocoa supply chain. He makes mention of the adverse price movements of raw beans and high barriers to entry in markets for semi-processed and final products.

Yeats et al (1996) echo similar ideas to that of Bass (2005). They confirm Bass's (2005) point that freight costs for many processed commodities such as cocoa powder and butter are higher than those on primary unprocessed components such as cocoa beans. They also indicate that a shift to exports of processed goods would increase price stability, create jobs, and increase earnings amongst others.

In addition to the high barriers to entry, there are high tariffs with regards to the export of semi-processed and processed agricultural products (Bass, 2005). Regmi et al (2005) also states that market access is a major obstacle to the expansion of global trade in processed foods. Tariffs are used to stimulate imports of unprocessed agricultural commodities at the expense of processed products (Regmi et al, 2005). Bass (2005) gives an example in which the European Union imports raw cocoa beans from West African countries, without tariffs whereas cocoa paste and butter from Indonesia have tariffs. Regmi et al (2005) argue that through globalization, producing countries can have access to capital and technology needed for processing. Thus a uniform cut in tariffs will increase trade in high value products which will in turn, improve wages in developed and developing countries.

With the above stated advantages that could be gained from increased processing, this study will attempt to explore the profitability of processing. Once this is determined, the advantages of price stability and increased earnings amongst others from mass processing could be ascertained in another study.

2.3 Effects of Changes in Cocoa Quality on the Global Industry

As the processes at each stage of the supply chain develop, improve or become more efficient, some concessions on quality have been made. Fold (2001) addresses this issue. He states that grinders are currently 'more willing and able to compromise on quality' so as to exploit lower costs by using advanced forms of transport and storage. According to Fold (2001), 'technological and organizational developments in the chocolate industry have removed the demand for uniform and high quality beans as well as the willingness to pay a premium for them.' For this reason, any attempts by a cocoa producer to upgrade quality control systems to gain a price premium will be fruitless.

Instead of an emphasis on bean quality, there is rather a focus on circulation time, volume and cost savings. Bass (2005) enhances Fold's (2001) statement by adding that the new transport and grinding technologies have eroded the emphasis on quality. Bass (2005) also adds that shipping large amounts of beans is of more importance than the size and quality of the beans.

Notwithstanding the critique by Bass (2005) and Fold (2001), it continues to be true that Ghana cocoa is the industry standard in terms of quality so that all other cocoa not originating from Ghana are sold at a discount to Ghana cocoa. Although Fold's (2001) paper suggests that quality is of no importance his argument seems questionable since discussions with officials of COCOBOD suggests that processors prefer Ghana cocoa and are willing to pay high premiums for Ghana cocoa.

Thus, if Ghana was to expand its cocoa industry, it should continue to ensure that it does not compromise on the superior quality beans that it is known for since many processors might insist on purchasing Ghanaian beans to enhance the quality of the end retail product.

2.4 Sustainability of the Supply Chain

In order to move up the cocoa supply chain, one must first investigate its sustainability. One major factor affecting sustainability of the entire industry is the sustainability of the purchasing practices in the cocoa sector. Phillips and Tallontire (2007) explore this subject. The cocoa supply chain includes local collectors, intermediary traders, wholesalers, exporter, processors and manufacturers. In order for this chain to survive, each actor must be well compensated for his/her efforts to ensure his/her interest in the industry and improve their livelihoods. Fold (2001) also adds that lower purchasing prices result in reduced incentive for farmers to care about quality.

Phillips and Tallontire (2007), list a number of sustainable purchasing practices and the perceived benefits of its adoption. A few of their suggestions include:

- Longer term contractual commitments which will assist production and planning and reduce volatility in prices,
- Direct relationships, which will build trust and stability in the chain and reduce the number of middlemen, and
- Improved access to affordable credit and pre-harvest finance which will improve cash flow of farmers to purchase agricultural inputs and cover harvest expenses.

Unfortunately the author's identify that due to mistrust of co-operatives, corporate inertia and the dispersed cocoa market, longer term contracts would be difficult. Also, barriers to direct relationships included distance to dispersed producers and the lack of an enabling environment amongst others. With regards to improving access to credit, a few problems would be the literacy rates of farmers, the inability to deal direct with individual farmers and the role of intermediaries in the supply chain. Therefore as the movement up the supply chain is assessed, such methods to sustain this movement should also be included in the analysis to give an accurate report on the possibilities of Ghana moving up the cocoa supply chain.

2.5 Successful Processing and Chocolate Manufacture in Ghana

Apart from the dynamics of the cocoa supply chain, the success of a processing company in Ghana must also be reviewed. Awua (2002) examines

the entire cocoa industry and gives reasons for the state of affairs. The author employs a quantitative value-added type of analysis to determine if processing is profitable for Ghana. In particular he estimates the added value to total beans processed and value added based on one metric tonne of beans processed, and the financial performance of Cocoa Processing Company from 1992 to 2000 to reach a conclusion. He concludes that there are various benefits to processing in Ghana and for that reason government should facilitate such activities.

Awua's (2002) work bears some similarities to this study. However, while Awua (2002) focuses on the added value per metric tonne of processing alone, this study makes a conclusion based on both (i) an analysis of the revenues, costs and profits per tonne of production for export as well as (ii) the revenues, costs and profits per tonne of processing in order to make a more complete determination of the potential gains from processing relative to production for export. This paper also uses more recent data. In addition, based on the analysis made, this study will suggests methods of increasing revenues and decreasing costs so as to generate more revenues from processing.

2.6 The Role of Cocoa in Ghana's Development

The aim of this study is to assess whether a movement up the Ghanaian cocoa supply chain will benefit the country. For this reason, it is pertinent to analyze literature on the role of cocoa in Ghana's development. Breisinger et al. (2008) give some perspective on the issue. The objective of

their paper was to analyze the role cocoa might play in Ghana's effort to reach a Middle Income Country status, accelerate growth and reduce poverty. The paper confirms that cocoa is the driver of growth and poverty reduction in Ghana. However, in order be more effective, Ghana must produce an additional 60,000 tonnes per annum on its current production. The current ramp up in Ghana cocoa production is in part in response to such calls for increased cocoa production.

Breisinger et al. (2008) report that it is unlikely that further growth in the cocoa sector would largely reduce poverty. Reasons such as the geographical concentration of cocoa production and the minute share of cocoa income in the poor's total agricultural income are given as support for their claim of limited potential of cocoa to reduce poverty. They also suggest that without further investment in cocoa processing sector, the country's share will remain below that of countries such as Cote d'Ivoire.

This thesis makes a contribution to the literature since it is country specific and therefore provides an in-depth analysis on the possibilities of cocoa processing for export. In particular, the relative profitability of a strategy of exclusive production for export is compared with a strategy consisting of exporting both non-processed and processed cocoa products. This paper will provide results that may support or reject Breisinger et al.'s suggestion that cocoa processing must be expanded.

CHAPTER 3: Mechanics of Cocoa Production and Processing

The major steps in the cocoa/chocolate business can be divided into five stages: (1) beans production (2) grinding and production of semi-finished materials (3) production of industrial chocolate (4) production of consumers' chocolate and (5) retailing (Bass, 2005). The literature from the previous chapter shows that majority of bean production is done in African countries while the other steps are done in Western countries.

This thesis aims to determine whether Ghana, a major cocoa bean producer, should move from the bean production stage to the grinding and production of semi-finished products stage. In producing or processing cocoa, there are a number of procedures that the producer or processor must engage in to obtain desired results. This chapter therefore seeks to provide knowledge on the basics of cocoa production and processing, the general supply chain and Ghana's unique supply chain, the current cocoa processing industry in Ghana, the advantages and disadvantages of moving up the supply chain and the trends in cocoa production.

3.1 Basics of Cocoa Production for Export and Processing

Ghana mainly exports its raw cocoa beans. Majority of the cocoa production is done by small scale farmers with a few acres of land (World Cocoa Foundation, 2009). At the farm level, cultivation of cocoa is a delicate process since crops are susceptible to conditions such as changes in weather patterns, disease, and insects (World Cocoa Foundation, 2009). Cocoa farming is a demanding and labor intensive process which is difficult to mechanize. First, farmers must clear land, care for the seedlings and

maintain the young trees for five years until the tree produces a crop. The pods are then collected, broken and the beans extracted. The beans are fermented, dried and bagged for local collectors or buyers (International Cocoa Initiative, 2008). There are times when roasting is done by the producer. After these activities, cocoa processing is the next key step in preparation for commercial consumption.

At the cocoa processing plant, if roasting has not already been done, the beans are cleaned, roasted and the shell of the bean is separated to leave the nibs. The nibs are ground into chocolate mass, cocoa paste or cocoa liquor. The mass is pressed to extract cocoa butter and cocoa powder. Together these activities form cocoa processing which is distinct from production. The cocoa powder is used for the drinks, baking and cosmetic industry. It is also used in chocolate, confectionary and other food products (International Cocoa Initiative, 2008). [2]

3.2 The Cocoa Supply Chain

A supply chain is a network of retailers, distributors, transporters, storage facilities, and suppliers that participate in the production, delivery and sale of a product to the consumer (Kietzman, 2009). The activities on the supply chain transform the beans into finished products for consumption.

The general cocoa supply chain consists of many participants. First the smallholder farmer sells his beans to an assembler at a local collection point. This goes to the urban wholesalers and traders. The beans are sold to other wholesalers or exporters. The beans are shipped and received by importers

[2] Appendix B shows the diagrammatic form of the basics of cocoa production and processing

in Europe or the United States. They are sent to processors in these countries and then processed into products for use by chocolate manufacturers, confectionary and drink manufacturers. The final products are sold to Wholesalers or retailers and finally to the consumer (Phillips and Tallontire, 2007). [3]

Phillips and Tallontire (2007) also describe an alternative chain which is similar to the Ghanaian supply chain, which to a larger extent reduces the number of middlemen and benefits the farmers. In this chain, the Smallholders sell their goods to Licensed buying companies (LBCs) and they intern sell the beans to the COCOBOD (a state-owned company exclusively in charge of domestic marketing of cocoa in Ghana). The beans are then shipped by some traders to cocoa processors in Europe. The processed cocoa (mostly cocoa butter and cocoa liquor) moves to the chocolate manufacturers and they send their goods to wholesalers who intern send these goods to retailers.[4]

These supply chains show that from the supplier to the end user, value is added to the product. Therefore supply chains link value chains. Thus, a movement from the current production stage to other stages along the supply chain may enable Ghana gain revenues along each step through the value added returns.

[3] Appendix C shows the diagrammatic form of the general cocoa supply chain
[4] Appendix D shows the diagrammatic form of the alternative supply chain.

3.3 Ghana's Unique Cocoa Production Industry

The entire cocoa industry in Ghana is an example of a successful private-public partnership. While the public sector takes responsibility for quality assurance, pest and disease control, research and development, and marketing; the private sector takes responsibility for planting, harvesting, cocoa bean collection and collation, haulage, warehousing and processing (COCOBOD, 2009).

Ghana's status as the best producer of quality cocoa beans can be attributed to the unique nature of the supply chain. At certain stages of the chain, there are measures put in place to assess the quality of the beans. At the cocoa bean production stage which is undertaken by smallholder farmers, the Cocoa Research Institute of Ghana (CRIG), Seed Protection Unit (SPU) and Cocoa Swollen Shoot Virus Disease Control Unit (CSSVDCU) ensure that farmers are provided with materials which will guarantee successful growth of quality beans (COCOBOD, 2009).

CRIG undertakes agronomic research into problems relating to the production of cocoa and other related tree species which produce fats similar to cocoa butter and also provide scientific and technical advice on matters relating to production of cocoa (COCOBOD, 2009). CSSVDCU is responsible for control of cocoa swollen shoot virus disease whilst SPU is responsible for the multiplication and distribution of improved cocoa planting material to farmers (COCOBOD, 2009). These activities by CRIG, CSSVDCU and SPU are funded by the COCOBOD.

The next step in the Ghana supply chain is the collection and bagging step which is undertaken by Licensed Buying Companies (LBCs) on behalf of COCOBOD. These companies purchase cocoa directly from farmers and bag it for delivery to COCOBOD. COCOBOD in turn pays these LBCs for each bag of cocoa delivered to them (COCOBOD, 2009).

Before the beans are transported from the villages to city centers by haulage companies, Quality Assurance by the Quality Control Division (QCD) of COCOBOD must determine the quality of the cocoa beans. At this stage the bags from the LBCs are inspected, graded, bagged and sealed by QCD. A marking on the bag identifies the grade of the beans, the inspector who graded the beans and the LBC which bought the beans from the farmer. This enables each bag to be traced to its origin (COCOBOD, 2009). After this, private haulage companies transport the beans to the city centers. The haulers are paid by COCOBOD based on the number of tonnes transported per mile.

Cocoa Marketing Company (CMC), a subsidiary of COCOBOD stores, sells and exports the beans. Before storage and sales occurs, the beans are re-inspected and re-graded by QCD. Also, before the beans are exported by CMC, the quality inspection is repeated at the port prior to shipment.[5]

3.4 Trends in Cocoa Production

Currently, worldwide cocoa production is said to be about three million tonnes a year. 70% of this production is by small scale farmers in West Africa. Asia is estimated to produce about 20% of cocoa and about 10% by

[5] Appendix E shows the diagrammatic form of the Ghanaian supply chain

the Americas (International Cocoa Initiative, 2008). These small scale farmers are mostly handicapped by outdated farming practices and 'limited organizational leverage' (World Cocoa Foundation, 2009).

Total production over the years has increased. Cocoa production has increased from 1.5 million tonnes in the 1970s to over 3 million tonnes in 2008 (Wikipedia, 2009). There have however been fluctuations in production over the years due to unfavorable weather conditions. The International Cocoa Organization (ICCO) projects cocoa production to grow over the next five years with highest growth in Ghana, Dominican Republic and Malaysia (World Cocoa Foundation, 2009).

Other trends in cocoa production include incentives to increase production. In Ghana, effective and sustained control of diseases and pests, encouragement of farmers to rehabilitate and replant old and moribund farms, improving cultural practices on existing old commercial plots and improving soil fertility through application of fertilizer are efforts that are being put in place to increase production (Amoah, 2009).

Other incentives for farmers that were noted by Amoah (2009) include payment of at least 70% of the net projected freight on board to farmers, bonus scheme to cushion them financially during off-seasons, farmers day celebrations, promoting health through national insurance scheme, establishment of cocoa clinics, inclusion of farmers on producer price review committee and scholarship schemes for wards of farmers. If these efforts are

successful, there will be more cocoa for processing so as to increase revenues in the industry.

3.5 Ghana's Cocoa Processing Industry

3.5.1 Factors which have deterred large scale processing

Currently only about 30% of cocoa is processed locally for export. Management at COCOBOD and CPC believe that since independence, large scale processing and exporting of cocoa products have been limited mostly because of the huge capital investment required. In order to sustain such a mechanized system, access to water and electricity is essential. Since water and electricity is a problem in the Ghana, costs incurred in utilizing other sources of electricity such as the use of generators becomes extremely costly.

Also, processing of cocoa has been on a lower scale in Ghana due to the low consumption of cocoa products and their derivatives in Ghana and in other West African countries. For this reason, marketing of cocoa products are to the western countries and Asia where competition is intense especially with the presence of huge western processing companies (Awua, 2002). Apart from the intense competition that processed Ghanaian cocoa is likely to face in western countries, processors in western countries are strategically better placed to market end cocoa products to end consumers relative to Ghanaian processors. This is because the major consumers of cocoa products are easily accessible to the major processors of cocoa since they are typically close to each other geographically (Awua, 2002).

In addition, improved packaging techniques by giant western processors as well as automation and large scale processing are such that economies of scale can be applied to reduce the unit operational cost of processing (Awua, 2002). Unfortunately in Ghana, the packaging techniques employed by the west would require increased capital; the poor electricity generation system and low scale processing would cause some difficulty in applying economies of scale to the extent that unit operation costs would be as low as the competing western countries. For this reason, high profits will not be gained by Ghana as compared to the west hence deterring large scale processing in the country.

The case of small scale processing capacity of our plants should not be a shortcoming. While large scale plants need to be installed by multinationals and big companies the experience in Indonesia and other countries has shown that small scale plants could equally be profitable. This would also assist in reducing the poverty in our rural areas. Since cocoa is mainly produced by small scale rural communities, they should be assisted with borrowed capital to establish many small scale plants to boost employment and incomes in these communities.

3.5.2 The current processing industry

The Cocoa Marketing Company sells cocoa beans to local processing companies at the same price as on the international market. There are seven local processing companies with a total installed processing capacity of 308,000 tonnes. Of these seven processing companies, only Cocoa Processing Company is wholly Ghanaian owned. The table below shows a list

of processing companies, their processing capacities and the different categories of processed output.

Name of Processing Company	**Processing Capacity (tonnes)**	**Category of processed Output**
Cocoa Processing Company	65,000	Chocolate, Liquor, Butter, Cake, Powder
Barry Callebaut Ghana Limited	65,000	Liquor
Cargill Ghana Limited	65,000	Liquor, Butter, Cake, Powder
West African Mills Company Limited	50,000	Liquor, Butter, Cake
Archer Daniels Midland	30,000	Liquor, Butter, Cake
Commodities Processing Industries Limited	18,000	Liquor
Afrotropic Cocoa Processing Company	15,000	Liquor

Source: Ghana Cocoa Marketing Board (COCOBOD)

The main reason why these foreign companies are encouraged to set-up in Ghana is because of the increased foreign exchange which the country generates from their activities (COCOBOD, 2009). In addition, there is the inability of government to provide adequate capital for the establishment of processing factories (Awua, 2002). For this reason, foreign companies with the required capital would rather be encouraged to establish such capital intensive ventures. Also, according to COCOBOD, the foreign processing companies in Ghana enable the transfer of technology and create employment for many Ghanaians. However, some staff at Cocoa Processing

Company believe these foreign processing companies have increased competition in the cocoa industry since their arrival in the country.

The processing company used as a case study for the processing side of the Cocoa sector is Cocoa Processing Company (CPC). This company is used because it produces all the categories of the products from processed cocoa. In addition, this company has been in existence for decades hence more data could be collected from this company as compared to the other companies which only recently joined the cocoa industry. The processing of cocoa beans into liquor, butter, cake, powder and chocolate involves a combination of cleaning, micronising, roasting, winnowing, alkalization, debacterisation, grinding, pressing, filtration, kibbling, pulverization, and packaging (Awua, 2002).[6]

3.6 Advantages and Disadvantages of Moving up the Supply Chain

There are a number of advantages to moving up the cocoa supply chain. Adding value to raw materials is known to increase the usefulness, worth and price of the final product. Even at the primary processing level, the discarded by products can often be transformed to become a lucrative product in the local markets of the producing countries (Sukha, 2003).

Cocoa pod husk, cocoa beans and shells have nutritive value and can be used as animal feed materials. Soap can also be made from the husks. They can also be used to manufacture fertilizers or composts and used as mulch to slow soil moisture loss and retarding weed growth (Sukha, 2003). Juice extracted from the pressing of beans before fermentation can be used

[6] Appendix F and Appendix G shows the flow chart for cocoa processing and confectionary

to produce jams and jellies. The pulp and juice can also be fermented to give wine and liquor. Unfermented cotyledons can be pressed to extract cocoa butter which is used in food, cosmetic and pharmaceutical industries. These value adding products occur during primary processing of cocoa. This additional use of cocoa beans and residues can provide some employment and income for rural communities when sold (Sukha, 2003).

Apart from these benefits gained from primary processing, movement up the supply chain into major large scale processing will create jobs for people and due to the value added to the processed goods, more foreign exchange will be earned. Revenue would also be earned through taxes and duties from the operations of processing companies. As more money is earned from cocoa, better infrastructure will be built in the country, and the constant deficits on the country's balance of payments would be reduced.

With the introduction of mass processing, other factories such as manufacturers of packaging materials will evolve to meet the packaging needs of processing companies. Through this a service will be provided for processing factories and more jobs will be created for Ghanaians.

Unfortunately there are a number of disadvantages or drawbacks with regards to processing of cocoa. Processed cocoa products are used for manufacturing of other products such as chocolate, which are perceived to be luxury products. The demand for luxury goods normally grows with increased incomes. For this reason there will be a lower demand for such processed products at least in Ghana since its citizens are not major consumers of

chocolate products. In this light it may seem as though there is no need to support such an industry.

Moving up the cocoa supply chain would mean that Ghana will have to compete with the processing giants such as Cargill, Barry Callebaut and Archer Daniels Midland. If Ghana was to move further up the supply chain into chocolate manufacturing, cosmetics and liquor industries, it would have to compete with Nestle, Cadbury and others. This would suggest that ingredients such as milk and sugar et cetera, which are needed to manufacture chocolate, would have to be imported. In addition, many chocolate manufacturers use a blend of different cocoa beans and liquor to produce the variety of chocolate on the market. Therefore Ghana would have to import beans and liquor from other producing countries so as to create variations of cocoa in order to compete in the international market (Benjamin, 2007). These imports will increase cost of production.

Indonesia is the third largest producer of cocoa. Cocoa production was increased by creating an abundance of land for cocoa production, knowledge and capital dissemination by farmers, government policy, adequate transport infrastructure, highly competitive marketing system and low cost of production. Much of the low production cost was due to efficient production methods, inexpensive labor and ideal climate and soil conditions. The government policies resulted in a higher return for farmers and this served as incentives to increase production (Case study: cocoa production in Sulawesi, 1996).

CHAPTER 4: Methodology

This chapter discusses the details of the cost benefit analysis as well as the methods used in the data collection and data analysis processes. It includes an explanation of the procedure employed in the cost benefit analysis, the area of study, the sources of data, types of data collected, techniques and procedures used in data collection and data analysis, and the problems encountered during the data collected period.

4.1 Details of Cost Benefit Analysis

The strategy for the cost benefit analysis that compares the profitability of processing to production of beans for export is a sequential one as follows:

(i) Compute total costs involved in the different stages of production of beans for export for each year and the average total cost of production over time.

(ii) Compute total revenues obtained from export for each year and the average total revenue of production over time.

(iii) Subtract total cost from revenue to obtain profit per tonne from production for export for each year and compute average profit over time.

(iv) Compute total costs involved in the different stages of processing cocoa beans for each year and hence average total cost of processing.

(v) Compute total revenues obtained from export for each year and hence average total revenue of production.

(vi) Subtract total cost from total revenue to obtain profit per tonne for each year from processing and compute average profit over time

(vii) Graph the annual profits from (iii) and profits from (vi) over time

(viii) Graph the difference in annual profits between the profits from (iii) and profits from (vi) over time to identify if there are years where it makes sense to move up the supply chain.

(ix) Subtract the average profits from (iii) and profits from (vi) to obtain a more long run appreciation of whether it makes sense to process cocoa or to keep exporting majority of the cocoa.

4.1.1 Area of Study

In the process of ascertaining whether or not it would be beneficial to produce and export raw cocoa beans, or process and export the finished and semi-finished products of cocoa, this study covers a few of the major players in the Ghanaian cocoa industry. These major players can be divided into two major sections; the production side of cocoa and the processing side of cocoa.

With regards to production, there are two major players, the Ghana Cocoa Board (COCOBOD) and Cocoa Research Institute of Ghana (CRIG). The Licensed Buying Companies (LBCs), Quality Control Division (QCD), Cocoa Haulers and Cocoa Marketing Company are under the control of COCOBOD;

whilst the Seed Production Unit (SPU) and Cocoa Swollen Shoot Virus Disease Control Unit (CSSVDCU) are under CRIG.

CRIG mainly handles research into problems relating to the production of cocoa and provides scientific and technical advice on matters relating to production. For this reason, they were not useful with regards to provision of information which would be relevant to this study. However, COCOBOD has details on the costs involved in establishing and maintaining a cocoa farm and this data was more relevant to this study. Also, COCOBODs overall cost of operations includes the costs incurred by LBC's in delivering bags of cocoa on their behalf, costs incurred by Haulage companies per tonne per mile and the costs incurred by the QCD. Hence the overall costs of production of cocoa which incorporates every stage along the supply chain explained in the previous chapter would be represented by the total cost of operations of COCOBOD. In addition, COCOBOD has figures on revenues from exports of cocoa hence making that institution a better source of data with regards to the production and exports side of this study.

On the processing side, there are seven major players, namely the Cocoa Processing Company Ltd (CPC), Barry Callebaut Ghana Ltd, West African Mills Company Ltd, Afrotropic Cocoa Processing Company, Commodities Processing Industries Ltd, Cargill Ghana Ltd, and Archer Daniels Midland. The oldest processing company and the largest with regards to categories of processed output is Cocoa Processing Company Ltd.

In order to attain the objective of assessing the possibility of large scale processing of cocoa to its final product, we must assess the costs and

revenues of processing from cocoa liquor to cocoa butter, powder and chocolate. The company chosen for this segment of the study is Cocoa Processing Company. This is because they are the oldest processing company and was easier to collect data from this institution compared to the others. In addition, CPC was the only company which processed cocoa beans to confectionary products. Unfortunately, documentation of segmented costs and profits to each stage of processing only began in 2008. For this reason, the most profitable stage of processing cannot be found however the total revenues, costs and profits for processing from semi-finished product to the final product can be found. This means we can still effectively determine whether it is more profitable to produce cocoa beans for export or to process cocoa beans into other finished products which is the objective of the paper.

4.2 Data Collection

Data was collected from COCOBOD and CPC. Data of a qualitative and quantitative nature in its secondary and primary form were collected. Staff in management positions from the selected institutions provided the information needed for this study.

4.2.1 Cocoa production for export

All data on the entire structure of the Ghanaian cocoa industry was provided by the Research, Monitoring and Evaluation Department of COCOBOD. The Deputy Director and Research Manager of this department provided both primary and secondary information of a qualitative and quantitative nature. These two individuals were provided with a list of

questions which enabled them provide the data that was needed for this study.[7]

Secondary quantitative data from COCOBOD included, cost estimates for establishing and maintaining a cocoa farm, processing capacities of processing companies, costs per tonne of cocoa bought by LBC's from farmers, cost per tonne per mile of cocoa delivered by Haulage companies, costs of operations by COCOBOD, profits from exports of raw cocoa beans, percentages of cocoa produced for export for a five year period and revenue for cocoa bean export for the same five year period. These costs, revenues and profits were used in determining whether or not it would be beneficial to move from production of cocoa beans for export to processing of cocoa beans for export. Secondary qualitative data included information on the categories of processed output of different processing companies, the cocoa value chain in Ghana and Ghana's cocoa marketing systems and pricing systems amongst others.

Primary qualitative data which mainly supports and gives reasons for the current situation in the cocoa industry included problems associated with the cocoa industry, strategies to maximize cocoa production and the costs and benefits of having foreign processing companies in the country amongst others.

4.2.2 Cocoa processing

Cocoa processing Company Ltd (CPC) was selected for detailed data on the costs and benefits of cocoa processing. The chief accountant was

[7] List of questions can be found in the appendix to the paper

provided with a list of questions which enabled him provide the data that was needed for this study.[8] Secondary quantitative data such as the costs, revenues and profits of all processing activities for a five year period were provided. Unfortunately segmentation with regards to the costs of processing into chocolate, butter, liquor and powder as well as segmented profits for these products was not available. For this reason it will be difficult to ascertain which semi-finished product is most profitable. However, the revenues gained from processing into chocolate, butter, liquor and powder was provided. CPC only started recording the costs for only confectionary products in 2008. They however intend to begin documentation of the costs for cocoa liquor, cocoa butter and cocoa powder in the future.

Other primary qualitative data from CPC included the problems associated with cocoa processing, reasons for the lack of Golden Tree Chocolate on the international market and the costs and benefits of having foreign processing companies in the country amongst others.

4.2.3 Data Collection Problems

The data needed from COCOBOD on cocoa production for export, was quite bulky. Hence the Research Manager and Deputy Director of the Research, Monitoring and Evaluation department needed some time to gather the financial data. Unfortunately, at the time the list of questions were provided to them, most of their staff were on leave as a result it took over a month to receive data from them. Once data was received, there was the realization that more data was needed to be collected from other institutions

[8] List of questions can be found in the appendix to this paper

such as CPC. This other institutions also needed about two weeks to gather their data hence prolonging the progress of this study. Also some of the data required for this study had not been documented by these institutions hence making it difficult to answer some objectives which were initially made for this study.

4.3 Data Analysis Procedure

The costs, revenues and profits from production for export were provided by COCOBOD however with regards to processing, the costs and revenue figures on processing was used to find profits from processing in the different years under study. The costs, revenues and profits per tonne over time were found by dividing the total cost, revenue and profit figures by the tonnes produced or processed. Microsoft Office Excel was used to make a profit analysis based on the profit figures deduced from the data received. Graphs and tables which assisted in the data analysis were used to visually display the findings.

A profit analysis was made where total profit per tonne from processing was compared to the total profit per tonne from production. This was used to ascertain whether one processing company could make profits which would be close to the profits gained from production for export. Based on the different relationships made, the results of the data was interpreted and used to draw conclusions and make recommendations.

4.4 Limitations of the Study

There were some limiting factors in this study. Some limitations include:

1. Bias of some institutions. Each major player in the industry presented their information in a manner which will give the impression that everything in their sector works efficiently
2. Unwillingness of these institutions to give financial data on costs, revenues and profits.
3. Misplaced and lost data from databases which delayed the data collection process.

Despite these limitations, data collected was sufficient to perform a comprehensive analysis.

CHAPTER 5: DESCRIPTION OF THE DATA AND DISCUSSION OF RESULTS

The primary objective of this study is to determine whether it would be beneficial for Ghana to move from mainly production of cocoa for export to processing of cocoa beans into its semi-finished and finished products. To facilitate the achievement of our main objective, in this chapter, the data collected from the various institutions related to this thesis are presented, analyzed and discussed. The trends in the data are described and various comparisons are made to in order to reach a concise and prudent result. This quantitative analysis will be supported with the qualitative data received from the various institutions visited.

5.1 Production of cocoa beans

Data collected for production of cocoa for export was obtained from the Ghana Cocoa Board (COCOBOD). Data provided by this institution included the total number of tones of cocoa beans produced, exported and delivered to local processing factories. This data was provided from 2004-2008. The percentage of beans exported and percentage processed was also provided for the given number of years. The total revenue from exports of beans as well as the total cost of operations of COCOBOD and profits from exports was also made available.

5.1.1 Production in tonnes

Over the five year period studied in this thesis, the highest number of tonnes of beans produced was in 2005 and the largest fall in tonnes of beans produced was from 2005 to 2006. In these years, the number of tonnes of

beans produced decreased from 740,458 in 2005 to 614,531 in 2006. After this fall in 2006, beans produced increase in the following years. A similar fall from 2005 to 2006 was experienced with the number of tonnes of beans exported. Exported beans fell from a high of 642,650 tonnes to 582,316 tonnes and these export values continued to fall till 2008. As the number of tonnes of beans exported fell, the number of beans delivered to local processing factories increased slightly. However, the rate of decrease in export was not proportional to the rate of increase in deliveries to processing factories. The graph below compares the trend in tonnes of beans produced, exported and delivered to processing factories.

Figure 5.1: Trend in beans produced, exported and delivered to processing factories

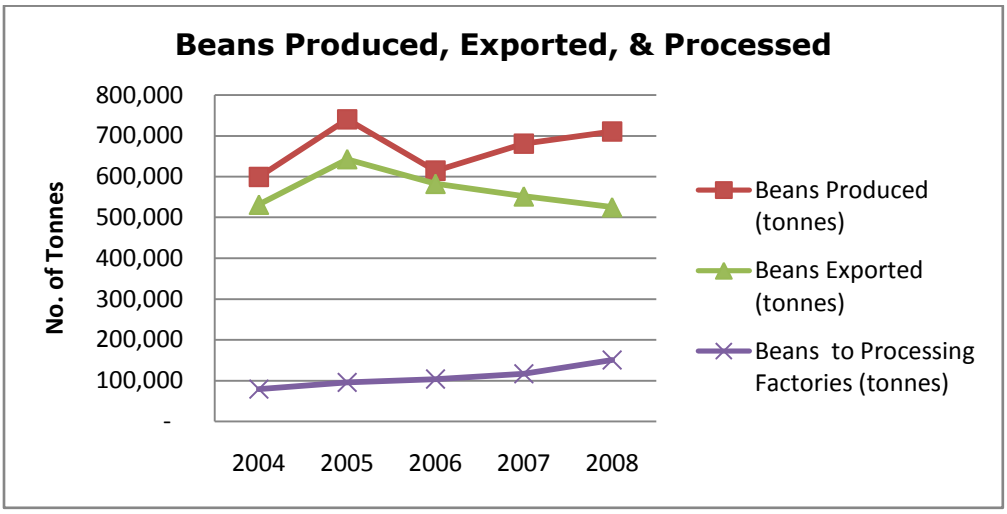
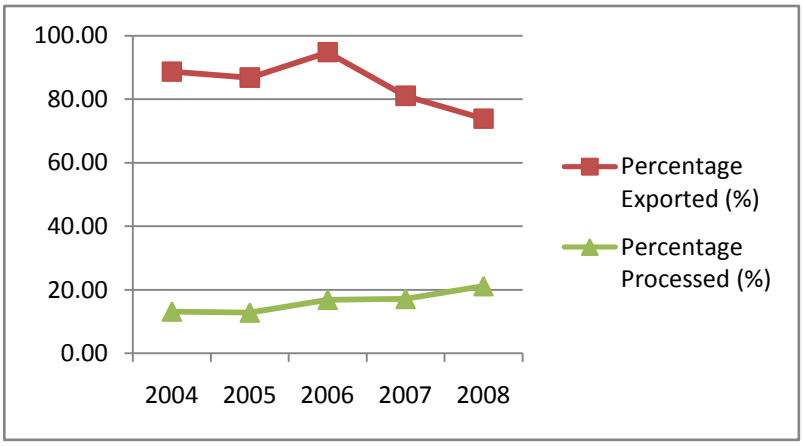


Figure 5.1 shows that beans produced increased from 2006 to 2008, and beans exported decreased, however deliveries to processing factories did not increase significant. Also, in 2006 beans delivered to factories should have been very small since beans produced and beans exported were almost the same. This was mostly because according to the Research Manager at

COCOBOD, processing factories do not process all the beans that are delivered to them and also COCOBOD keeps some inventory of cocoa. They may decide to process beans received in 2005 in 2006 due to the changes in world demand of cocoa products. Therefore it is possible that although production may be rising and exports may be decreasing, COCOBOD would store some of the beans that were not sent to processing companies which possibly already have a stock of beans.

With regards to percentage of cocoa exported and locally processed, one would expect that as exports reduced, percentage of cocoa delivered to local processors would increase by the same margin. However from 2004 to 2005 as percentage exported dropped by 1.87%, percentage processed also dropped by 0.32%. From 2005 to 2006 percentage exported increased by 7.97% whilst processing increased by 4.01%. Although from 2006 to 2007 percentage of cocoa exported decreased largely by 13.73%, percentage of cocoa processed locally increased by only 0.26%. Figure 5.2 below displays this trend in percentages over five years.

Figure 5.2: Trend in Percentage Exported and Percentage Processed



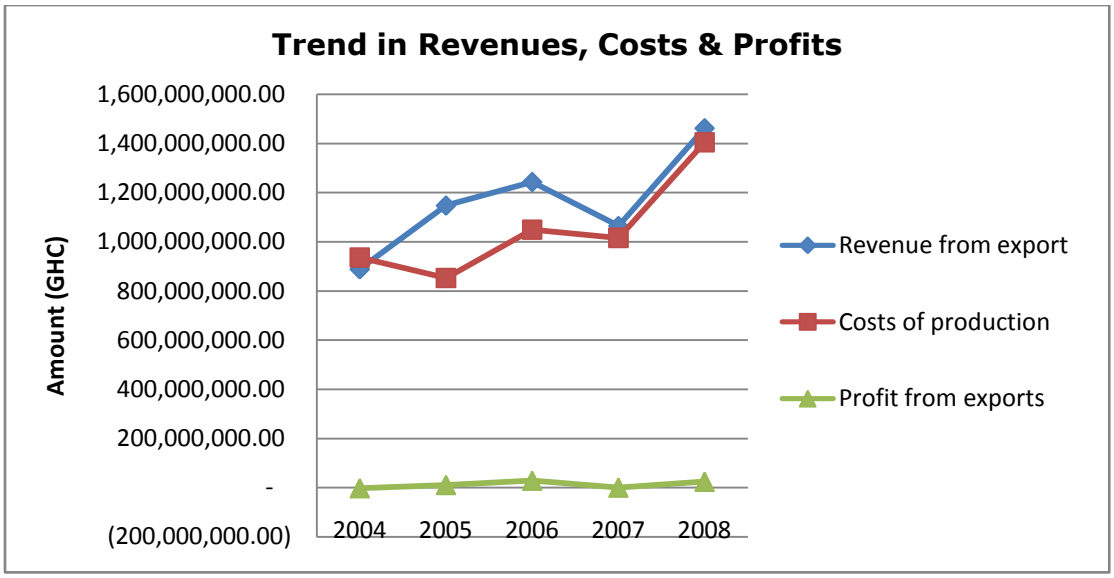
Due to this trend, the total of the percentage exported and the percentage processed may be greater than 100% because the beans which were probably stored in the previous year. Also, the total of the percentage exported and percentage processed may be less than 100% and that could be as a result of the decreased demand for cocoa products which would force either COCOBOD or CPC to store some of their beans. The deficit could also be as a result of some amount of spoilage which could occur due to poor storage conditions for the beans. The overall trend in Figure 5.2 seems consistent with a long term strategy to move up the supply chain from production into domestic processing because the percentage processed is clearly trending up at the expense of the proportion of beans produced for export. COCOBOD confirmed in its 2010 report that their long term strategy is to shift focus to domestic processing to enjoy premiums due to the value added from processing.

5.1.2 Revenue, Cost and Profit from production

Data on revenue, costs and profits are plotted in Figure 5.3 below. Figures received from COCOBOD were all nominal. From the graph, it can be seen that cost of production for export in 2004 was about forty-seven million Ghana Cedis higher than revenue received for the same year thus creating a negative profit value for that year. Most often, in election years, prices of many products and services rise. Since 2004 was an election year, it is possible that the cost of materials for production could have gone up within the year causing higher costs in production. Also according to the CIA World Fact book, inflation was extremely high at 26.7% in 2004. With such a rate,

prices of all goods would be high. On the world market however, a general price of raw cocoa prevails regardless of the inflation rates of producing countries. Hence this market price did not reflect the inflation rate of Ghana resulting in lower revenues for 2004. The years 2005 and 2006 were much better years with revenue exceeding costs significantly however this difference in revenues and costs did not increase the profits significantly for those years. In 2007 and 2008, the difference in revenues and costs was minute resulting in lower profits for those years.

Figure 5.3: Trend in revenues costs and profits for production of cocoa for export



Profit is usually defined as the difference in revenues received and costs incurred. In the data received, profits are not simply the difference in revenues and costs. This was because the difference in revenues would be jus the Gross Profit however after subtracting other expenses the net profit retained would not be equal to the difference between revenues and expenses. With regards to the loss incurred in 2004, the revenue minus cost

equation would have resulted in a huge loss of over forty-seven million Ghana Cedis however the loss was just about 2.5 million Ghana Cedis. This could be as a result of the loans given to the COCOBOD to support its activities. Likewise, profits gained from the revenue minus costs equation from 2005 to 2008 were much high than stated due to the use of some of the profit for repayment of debt, grants to farmers and other institutions, et cetera. Data on extra sources of income and debt were probably not carefully tracked and were not were not provided by COCOBOD making it difficult to accurately compute profits.

The data described above shows little consistency in the results for production of cocoa beans for export. Although in Figure 5.3 the number of tonnes of beans exported rose in 2005 and then decreased gradually, profits varied significantly between lows and highs whiles revenues rose to some peak, fell and rose again. This haphazard trend in costs, revenues and profits was mostly the result of inflation, changes in world prices for cocoa beans and effects of the world financial crisis on the cocoa industry. With such inconsistency in the data, it would be extremely difficult to make predictions or estimations for the future. The only guide to future estimations of revenues would be to estimate world market demand for cocoa beans which affects prices per tonne of beans. Future costs of production could also be estimated using the predictions of inflation in Ghana.

5.2 Processing of cocoa beans

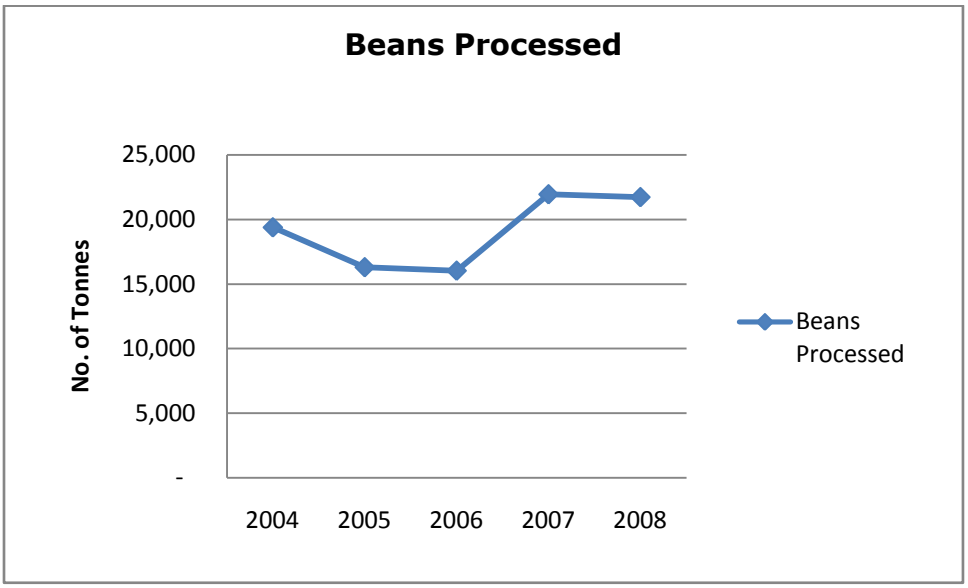
Data collected for processing of cocoa beans was from the Cocoa Processing Company (CPC). Data provided by this institution included the

total number of tonnes of cocoa beans processed as well as the costs, revenues and profits from processing. This data was given from 2004 to 2008. The results from analyzing the cocoa processing related data are summarized below:

5.2.1 Tonnes, Revenues, Costs and Profits from processing

From the year 2004 to 2008 the number of tonnes processed by CPC fluctuated wildly. Beans processed dropped from 19,378 tonnes in 2004 to 16,290 tonnes in 2005. The beans processed then increased from about 16,000 tonnes in 2006 to over 21,500 tonnes in 2007. This trend is shown in the graph below.

Figure 5.4: Trend in beans processed from 2004 to 2008

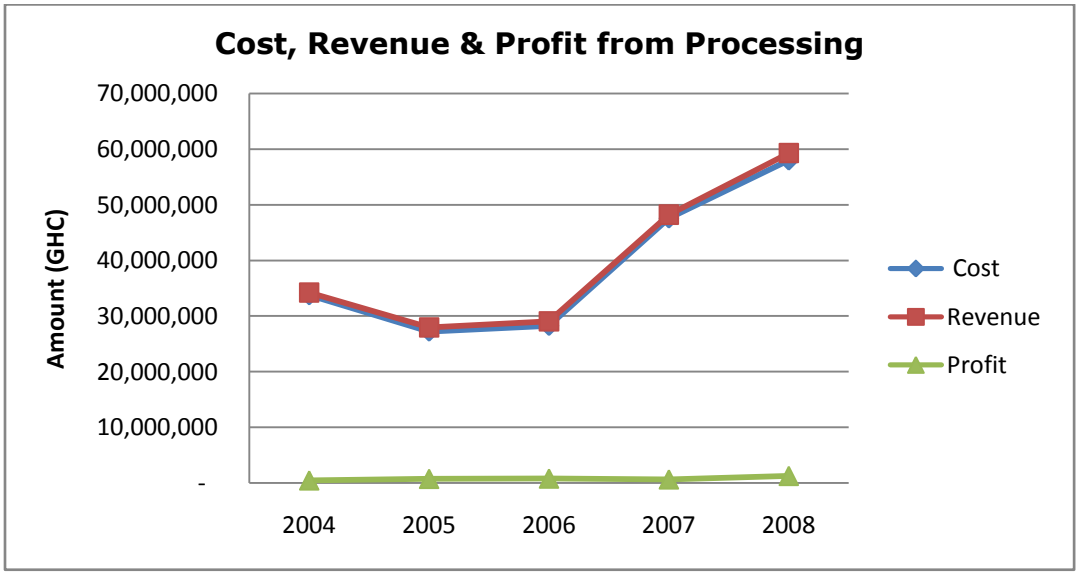


Majority of the fluctuations shown above in Figure 5.4 in tonnes processed was due to increased demand for the products of cocoa. Due to difficulty in storage of processed cocoa beans into its semi-finished products

domestically, processing of cocoa should be in line with the demand for the products from processing hence as demand rose, the tonnes processed rose.

The difference between average total cost and revenue from processing was very small for the years under study. This difference in costs and revenues was extremely small such that there was little increase or decrease in profits over the period. Figure 5.5 below shows the trend in revenues, costs and profits from processing.

Figure 5.5: Trend in Revenues, Costs and Profits from Processing of Cocoa Beans



The price of most cocoa products, largely depend on the market price of the products. Also due to the competition in the processing market locally and internationally, CPC is not in full control of the price at which it can sell its products. For this reason, a large margin could not be put on the costs from processing therefore resulting in the small profits shown in Figure 5.5. Prices of products from CPC must be consistent with the average market

price of products and should be low or competitive enough to have a large clientele.

The data received from processing shows a lot more consistency as compared to data received on production for export. The number of tonnes processed was quite inconsistent however with regards to revenues and costs there was some consistency. Revenue and cost dropped slightly in 2005 and gradually rose each year till 2008. At all times revenues were slightly higher than costs. Profits did not follow this upward trend. Similar to that of production for exports, the values for processing were also haphazard therefore making estimations of future profits difficult. The difference between revenues and costs was quite slim mainly because of the higher cost in processing and the market size for cocoa products. Due to competition, CPC cannot put a large margin on their prices so as to earn more profits compared to the other processing companies.

5.3 Revenues, Costs and Profits per tonne

In order to arrive at a firm conclusion regarding whether it is more profitable to process or export cocoa beans on a per tonne basis based on the data received, one would have to compute, average total cost, average total revenue and hence average total profit values per tonne respectively for cocoa produced or processed over time. With the aid of these values, a better comparison of profit can be made on a per tonne basis over time. The revenue, cost and profit values per tonne from production for export (exported cocoa) are calculated as follows:

Revenue, Cost, Profit per tonne for exported cocoa:

Revenue/ Cost/ Profit (GHC)

Cocoa beans exported (tonnes)

With regards to revenue, cost and profit values per tonne from processing cocoa, it was calculated as follows:

Revenue, Cost, Profit per tonne for processed cocoa:

Revenue/ Cost/ Profit (GHC)

Cocoa beans processed (tonnes)

Where the revenue, cost and profit values per tonne of cocoa beans produced are divided by the cocoa beans produced. The difference in profit per tonne between the cocoa processed and the cocoa is a good estimate of the margin that was put on the beans produced. If this margin is consistently positive over time then the case for moving up the cocoa supply chain is clear. Even if the margin is negative in some years but positive over the whole time range, a case can still be made for moving up the cocoa supply chain

5.3.1 Cost per tonne

The data received from COCOBOD and Cocoa Processing Company was manipulated to determine the costs per tonne for processing as well as the cost per tonne for production. Processing costs showed a gradual upward curved trend in the data whilst the production costs varied largely over the five years studied. In 2004 cost per tonne for processing was about GHC19.20 lower than cost per tonne for production. This was because of the high inflation rate in that year. Units for processing were therefore higher than for production hence creating such a trend. However in 2005 cost per

tonne produced decreased considerably by GHC344.43. From 2006 to 2008, cost per tonne for both production and processing increased however in 2007 processing costs per tonne was much higher than that for production per tonne. The graph below displays this trend in costs.

Figure 5.6: Trend in Costs per Tonne Processed and Produced

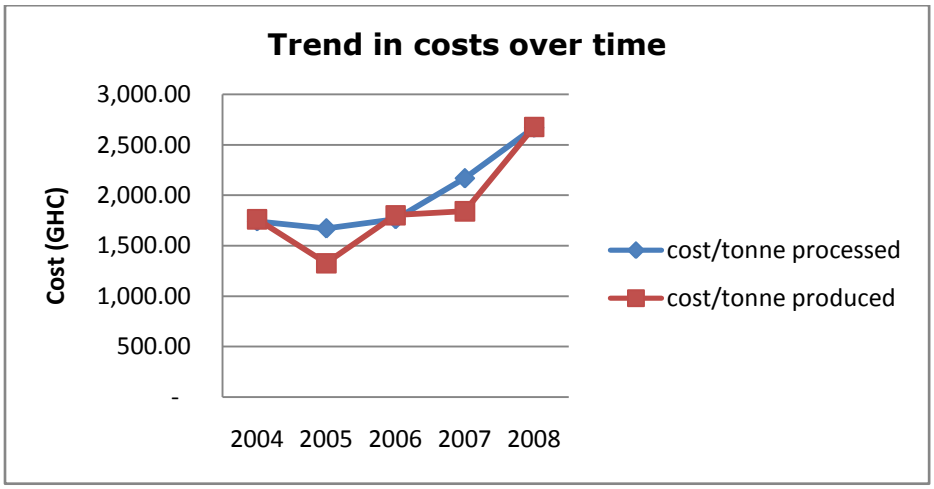
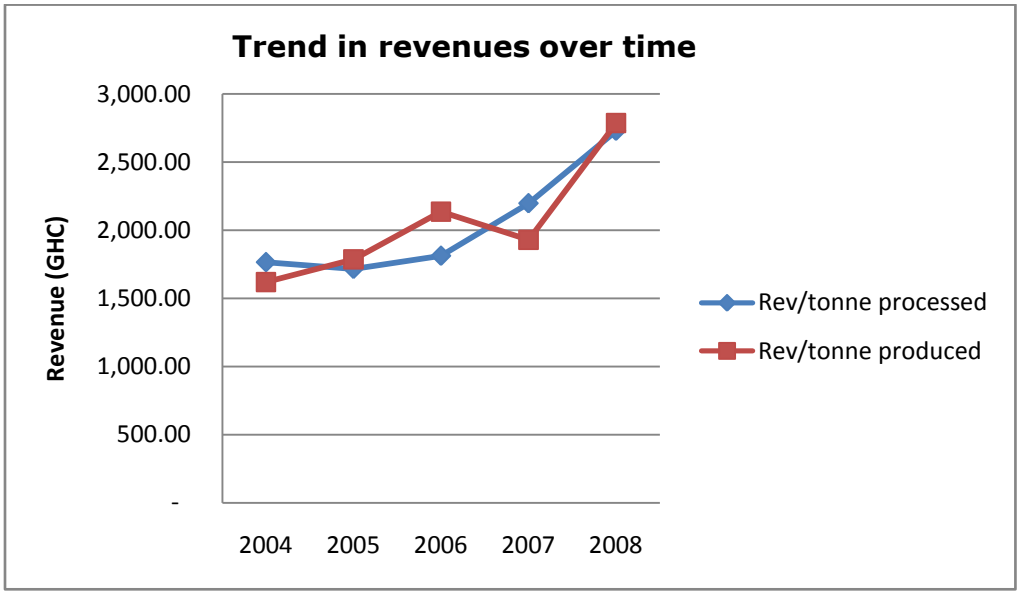


Figure 5.6 shows that in the three years where processing costs were lower than production costs, the difference was minuscule. However in 2005 and 2007 when processing costs were larger than production costs, the difference was huge. This shows that costs of production per tonnes are fairly lower than costs of processing per tonne. This is mostly due to the huge capital required in processing compared to production. Cost of machinery and maintenance for processing is much higher than costs incurred in production which uses fewer bulky machinery. This is only natural because as one adds value to a product, the costs incurred rises.

5.3.2 Revenue per tonne

Revenues per tonne processed had a general upward trend whiles that of production relative to processing varied largely. In three years out of five, revenues per tonne of cocoa processed was lower than that of cocoa produced. In 2004 and 2007 revenues from processing were higher than that of production by GHC147.19 and GHC268.51 respectively. It was only in 2006 that production revenues were significantly higher than processing revenues. Although this picture gives the impression that production revenues are mostly higher than processing revenues over the period, one must take note that with the exception of 2006 production revenues were only slightly higher than processing revenues. Figure 5.7 below is the graphical display of the trend in revenues per tonne.

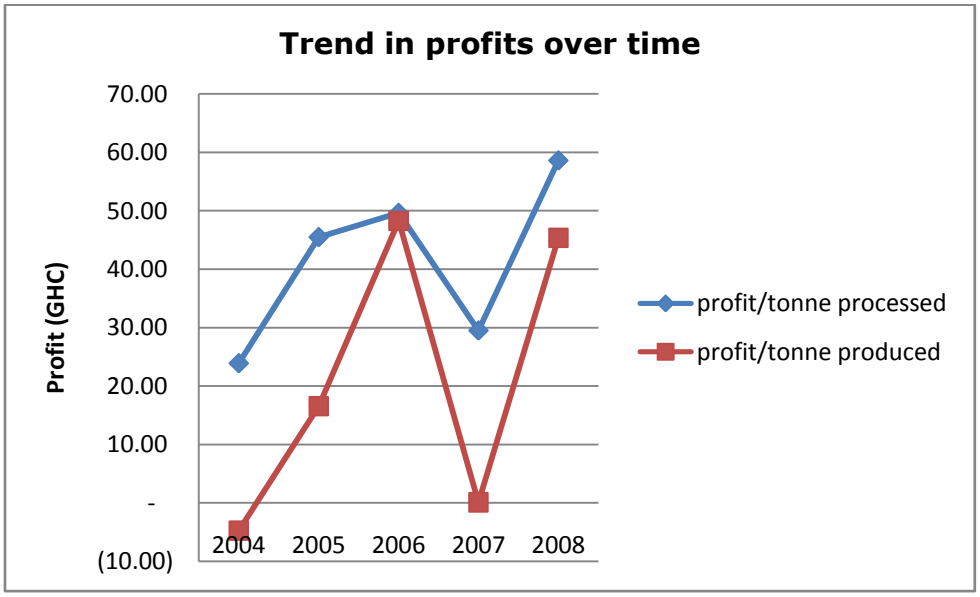
Figure 5.7: Trend in Revenues per Tonne Processed and Produced



5.3.3 Profit per tonne

The profits gained over the five years under study, show that although costs are lower in production and revenues seem to be higher on more occasions with production, profits are higher in all occasions with processing. In the year 2006, profits from processing and production are only GHC1.36 apart. In 2007 where profits declined, the fall in profits for production was much greater than the fall in profits for processing. However production profits show a much sharper and bigger rise as compared to profits from processing. There graphical display of the variation in profits is shown below.

Figure 5.8: Trend in Profits per Tonne Processed and Produced



From Figure 5.8 above, it can be seen that profits from both processing and production are both variable although the profits from production vary slightly more compared to profits from processing. The overriding result from Figure 5.8 is that profits per tonne from processing are higher than profits per tonne from production for exports in every year in the

range. This means that the margin from moving up the supply chain from production to processing is positive. Given this result COCOBOD's long-term strategy of gradually increasing the percentage of the cocoa it processes relative to the cocoa it exports makes sense. This is true notwithstanding the significant quality premiums COCOBOD enjoys by exporting cocoa.

CHAPTER 6: Conclusion and Recommendations

6.1 Conclusion

As the second largest producer and exporter of the most quality cocoa beans the world over, revenue from the sales of raw cocoa beans is a major source of foreign exchange and a major contributor to the Gross Domestic Product of Ghana. Since independence Ghana has maintained its status of exporting majority of its cocoa beans and is currently processing less than 30% of the beans locally.

Historically, Ghana's economic growth rose as cocoa revenue increased (Armah, 2008). Some economists such as Prebisch-Singer (1950) argue that adding value to agricultural produce would be a beneficial long term strategy. Therefore if the raw cocoa beans were to be processed on a larger scale, there is the possibility that revenues would be much higher and lead to a higher economic growth.

For this reason this thesis sought to investigate this theory using Ghana's Cocoa Industry as a case study. The primary objective of this study was to identify whether it would be more beneficial for Ghana to process more of its cocoa for export, instead of exporting the raw cocoa beans. By moving from mass production to mass processing, Ghana would be moving up its Cocoa Supply chain.

In the processes of reaching this primary objective, the basics of cocoa production and processing were identified. In addition, it was realized that the entire Ghanaian cocoa production sector was to a large extent managed

by the Ghana Cocoa Board (COCOBOD). The supply chain which contains many quality control checks explained Ghana's status as the producer of the best quality cocoa beans. The study also identified the huge capital investment required in processing as the major factor which deterred Ghana from engaging in large scale processing.

With the aid of mostly quantitative data on revenues, costs and profits from production and processing, the main objective of this study was reached. Data on production was received from COCOBOD while data on processing was from Cocoa Processing Company (CPC). Revenues, costs and profits per tonne from production of cocoa for export were compared with the revenues, costs and profits per tonne from processing. The cost-benefit method of analysis showed that when costs of processing were higher than for production, the difference was huge however when processing costs were lower than production costs, the difference was quite small. Hence in general costs were higher for processing. This is only natural since in the case of processing, much more capital is being used.

With regards to revenues, the data demonstrated that in the years when processing revenues were higher, the difference was quite significant however with the exception of 2006, when production revenues were higher, it was only by a small margin. Hence with the exception of the enormous revenue gained from production in 2006, revenues were mostly higher with processing. Since value has been added to the raw cocoa, it is reasonable for revenues from processing to be greater than that from production.

The data analysis also revealed that at all times, although the difference was small, profits from processing were higher than from production. Therefore although costs were high with processing, and the difference in revenues for processing and production were slim, higher profits were gained when beans were processed into semi-finished and finished cocoa products.

The data therefore proves that financially, it would be more beneficial to move from just production of raw cocoa beans for export to mass processing. Thus this thesis supports the literature from Breisinger et al (2008) and from Awua (2002) that processing should be increased so as to reduce poverty and increase returns into the country. This study also asserts with support from literature by Kaplinsky (2004) and Bass (2005), that over a long period of time, prices of traded commodities would fall hence it would be profitable to move from exports of just raw cocoa beans to the finished and semi-finished products. Finally the results obtained are consistent with the objectives of COCOBOD as stated in its 2010 report that it is pursuing a strategy of moving up the supply chain by processing more of the cocoa beans it produces over time.

6.2 Recommendations

Although processing should be increased, the dynamics of the country should also be taken into consideration to ascertain whether it would be possible to increase processing. In order to increase processing a huge capital investment will be required. In addition, the entire processing system is fully mechanized and this would require a constant supply of electricity and

water. To utilize such equipment a culture of maintenance must be developed and highly qualified technicians will have to be employed. To lower costs economies of scale will have to be adopted. Also, packaging equipment which is of the same or better standard as the western competitors would have to be purchased in order to meet the world standards.

The above needs and factors surrounding the processing industry are not farfetched however they may be slightly difficult to attain. There is the lack of the huge capital investment required. Currently, the supply of electricity and water is not regular, maximum processing capacities are not utilized, culture of maintenance is poor, certified technicians are few and the beans are bought at the same premium price as the international market. For these reasons the ability of a company such as CPC to gain large economies of scale from production are slim.

Thus some recommendation would be for a CPC to apply for a loan which would pay for the capital investment required. Since this thesis proves that processing is fairly profitable, CPC can be sure of gaining revenues to service the loan. A constant water supply could be facilitated with the use of a borehole. Water from the borehole could be filtered and purified to generate a constant supply to the factory. The problem would be with the generation of electricity. Generators are costly and would not be a suitable long term plan. Hence a more affordable method of electricity generation could be employed. A biogas plant could be developed and would be serviced with all waste materials generated from the factory's operations. This plant

could generate electricity instead of the use of a generator of the dependence of Electricity Company of Ghana.

To adopt economies of scale, electricity and water costs must be low and processing must be high thus CPC would have to endeavor to process at maximum capacity to reduce unit costs employees must strive to develop a sense of maintenance. Hence machines would be serviced on a regular basis since it will be used at its maximum potential. Employees especially technicians should be trained on a regular basis and given incentives to enable them to work more efficiently. If the technicians are comfortable, engineering graduates from institutions such as Kwame Nkrumah University of Science and Technology would want to work at processing factories hence increasing the human capital.

As indicated above, small processing plants can be installed at communities in cocoa farming areas to process their beans. Farmers and communities can form cooperatives. Government can guarantee loans for these cooperatives. They can be assisted with technical support to enable them run these firms profitably.

There is the possibility that operating processing equipment at full capacity would result in excess cocoa products. Although products of processed cocoa depend largely on the demand for the products, the company could purchase storage facilities which could store the excess products or seek a greater clientele. In addition to chocolate day on Valentine's Day, shops such as Shoprite should be enticed to sell chocolate

products from Ghana by giving incentives like a bulk purchase discount to sell chocolate products from Ghana instead of their current large variety of chocolate products from South Africa and the West.

It is important to note that tastes are developed. Several examples in industrialized countries have shown that advertising has developed tastes that did not exist. It has been established that cocoa powder and other products have high nutritional and health values. These should be promoted through the media to create more demand for such products in Ghana. Furthermore, Ghana could explore markets in the ECOWAS sub region and the rest of Africa since there is demand in all African countries.

On the issue of packaging, an increase in processing would result in the proper development of the packaging industry where companies would develop solely for the creation of packaging material of an international standard. The main clients of such companies would be the processing companies. Such an industry would also add to the job creation motives of this mass processing option.

Most importantly if the government was to seriously encourage mechanization in Ghana, electricity generation would need to be stabilized. Since the government cannot engage in manufacturing it would be best to facilitate such activities for the private sector and foreigners since they would better manage their activities and taxes, duties and foreign exchange will be gained by the country. However if electricity costs are so high such that it prevents these foreigners and individuals from making their profits the

likelihood of these companies staying in business would be small, resulting in a gap in that sector of the economy and a loss of revenue from the manufacturing sector.

Literature by Kaplinsky (2004) and Fold (2001) which was reviewed attributed the centralization of cocoa processes to strong economies of scale and the increased efficiency of such a system. However all cocoa processes could be made more efficient even if they were situated in the same location. Currently in Ghana, COCOBOD and the government handle the production side whilst foreigners, individuals and private entrepreneurs handle the processing side. This system should be maintained such that the COCOBOD and government would focus on increasing production and making the process more efficient; whilst private processors focus on attaining economies of scale and increasing the efficiency of their processes.

High tariffs and numerous barriers to trade were identified by Bass (2005), Yeats et al (1996) and Regmi et al (2005) as the impediments faced by many cocoa producing countries with regards to exports of semi-finished and finished goods. Since most of these cocoa producing countries are members of the World Trade Organization, they should insist on cuts in tariffs and reduced barriers to trade for such goods given that a shift to exports of processed goods would increase price stability, create jobs and increase earnings in their respective countries.

Also, if large scale processing was commenced in Ghana, producers would have to ensure that concessions are not made on the superior quality

of its beans especially since this would be the major advantage that the country might have against its competition. When bean quality is high, the end product would be of a better taste and quality than the technologically modified chocolates. While quality is kept high, there should also be a focus on circulation time, volume as well as costs savings through economies of scale.

Currently, organic outputs and products with premium like Ghana's cocoa can be branded. Ghana could collaborate with countries in Europe on eco-labeling so that Ghana's cocoa products could be certified and labeled to earn higher prices.

Although this paper suggests that Ghana should engage in more processing, the country should however maintain its methods of compensating the players on the supply chain so as to increase the cocoa produced. As Philips and Tallontire (2007) noted, sustainable purchasing practices should be adopted and maintained. If there is a focus on facilitating processing, farmers, LBCs, Hualiers and quality control personnel will not ensure that processing companies or beans exported will be of the quality required. The incentives in place such as payment of at least 70% of the net projected Freight On Board to farmers, bonus scheme to cushion them financially, farmers day celebrations, promoting health through national insurance scheme, inclusion of farmers on producer price review committee and scholarship schemes for wards of farmers should be maintained or increased.

Since all cocoa pods do not reap big superior quality beans, the smaller low quality beans could be sent to Ghanaian processors at a much larger discount than the current 20% discount on smaller beans. However if processing companies choose to purchase the main crop beans they would have to pay the premium that is paid on the international market such that revenue from this premium is not lost.

Mechanizing the cocoa production process would cause some loss of jobs however it would make the process more efficient and would enable technologically advanced farmers to reap larger profits. Once production has reached millions of tonnes of cocoa, a mixture of mass production for export and mass processing locally would be the best strategy. All poor quality beans would be processed locally with a mixture of the main crop beans while only superior quality beans would be sold on the international market. The loss of jobs through mechanization could be compensated for by the establishing of more small scale plants that would employ many people in communities.

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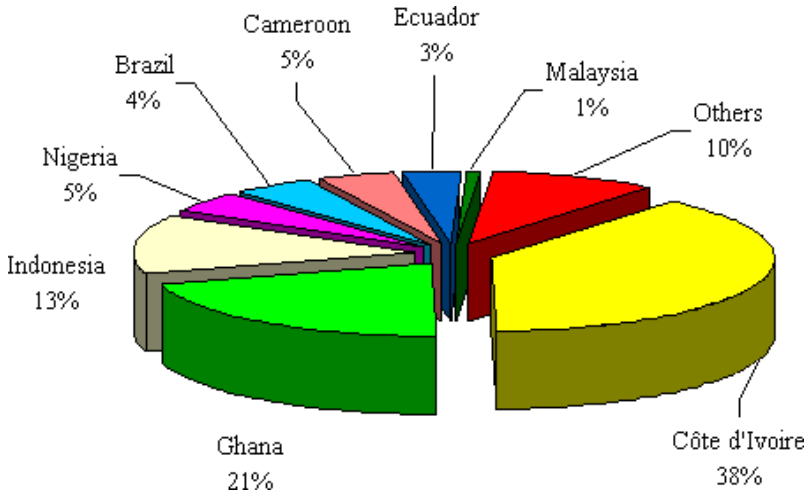
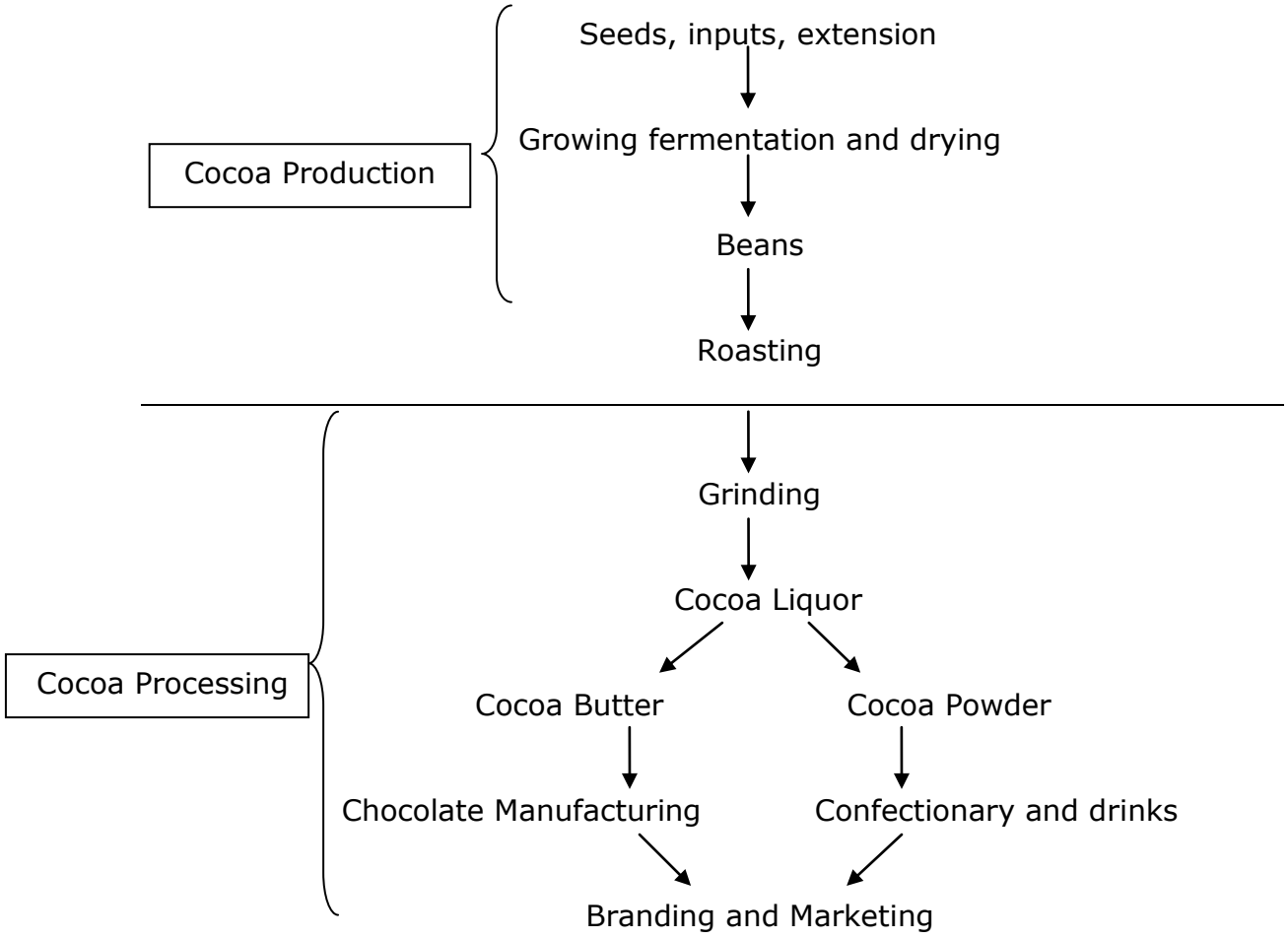
APPENDIX A: Share of countries in total cocoa beans production (2005/06 crop year forecasts)

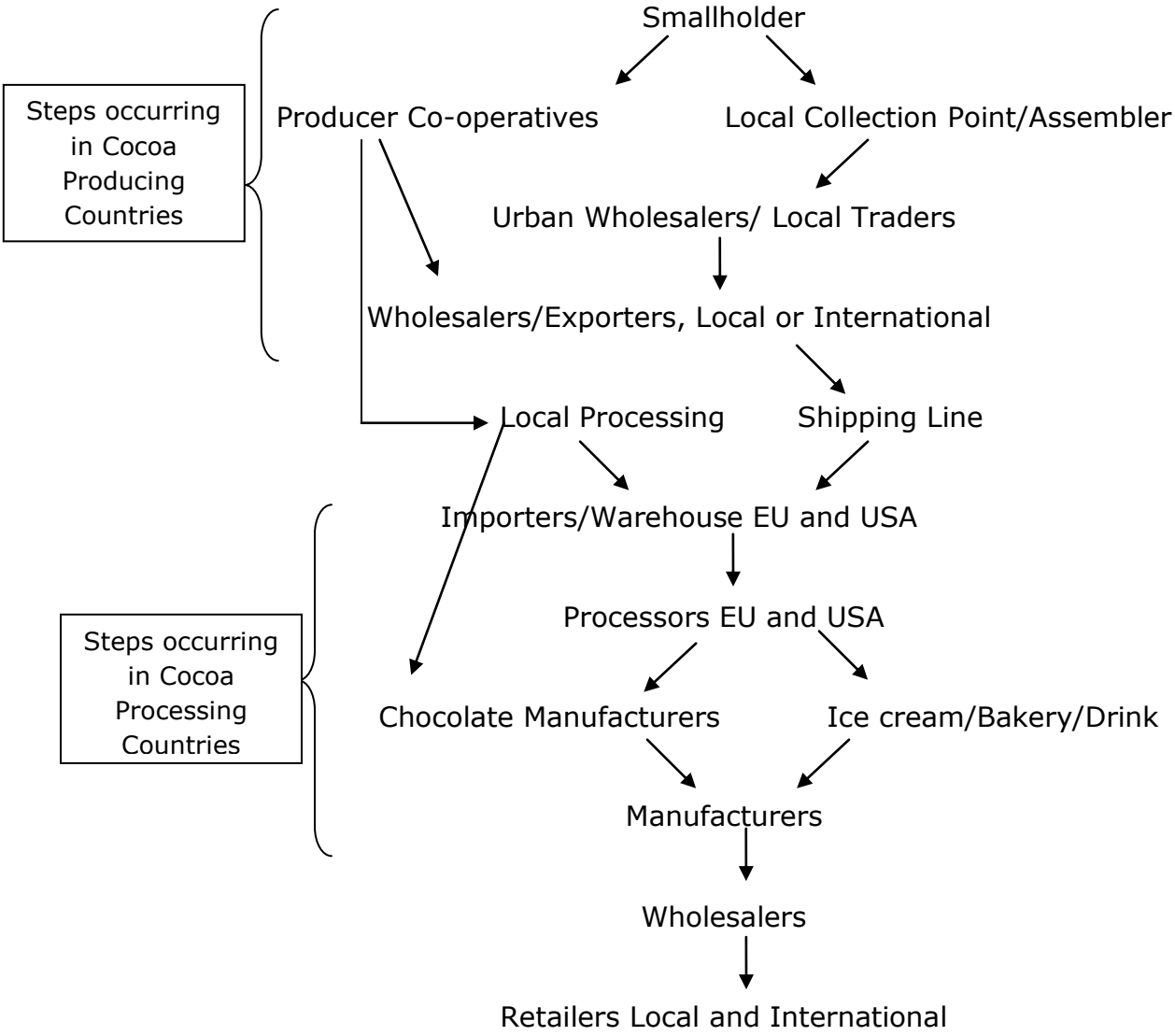


Source: UNCTAD based on the data from International Cocoa Organization, quarterly bulletin of cocoa statistics

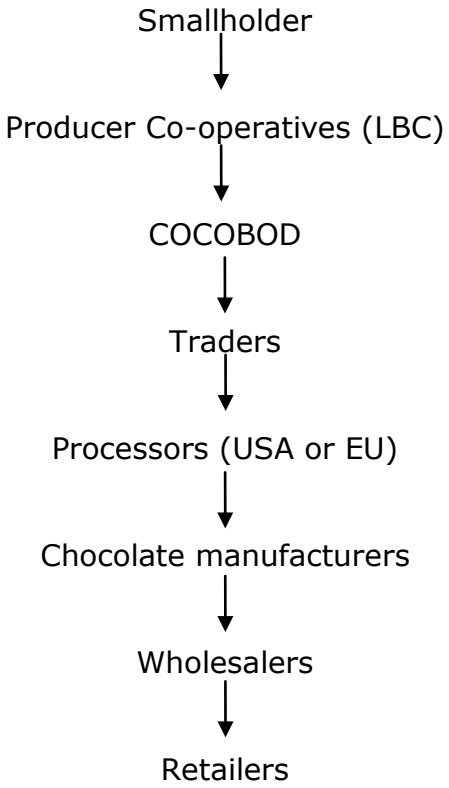
APPENDIX B: The cocoa production and processing chain



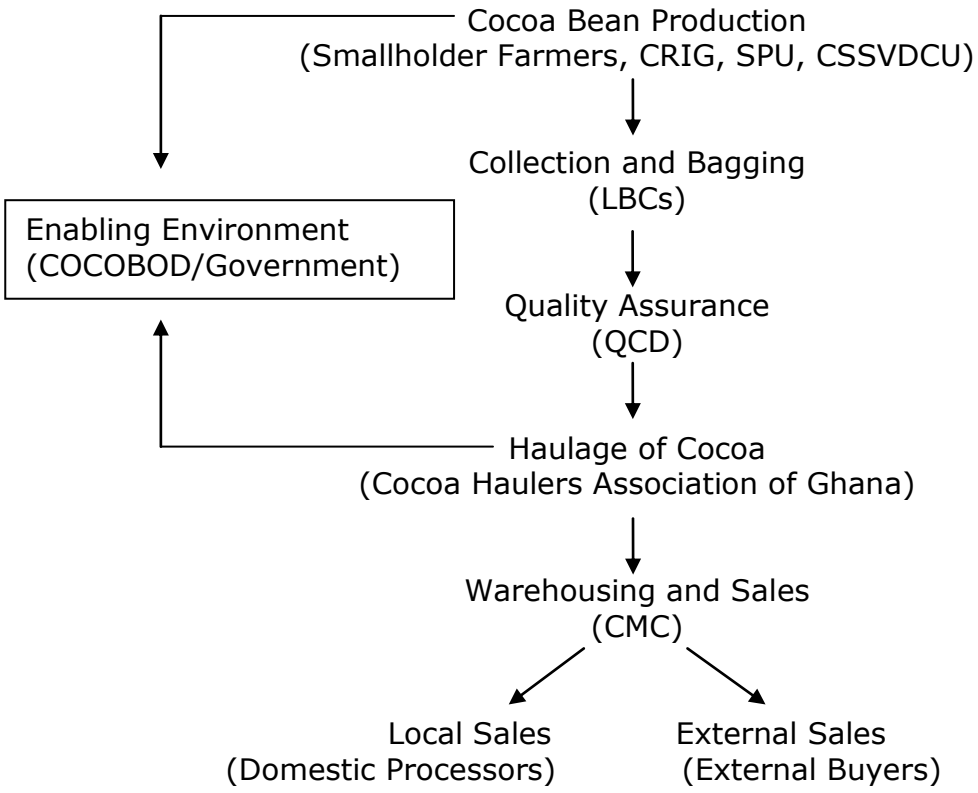
APPENDIX C: The General Cocoa Supply Chain



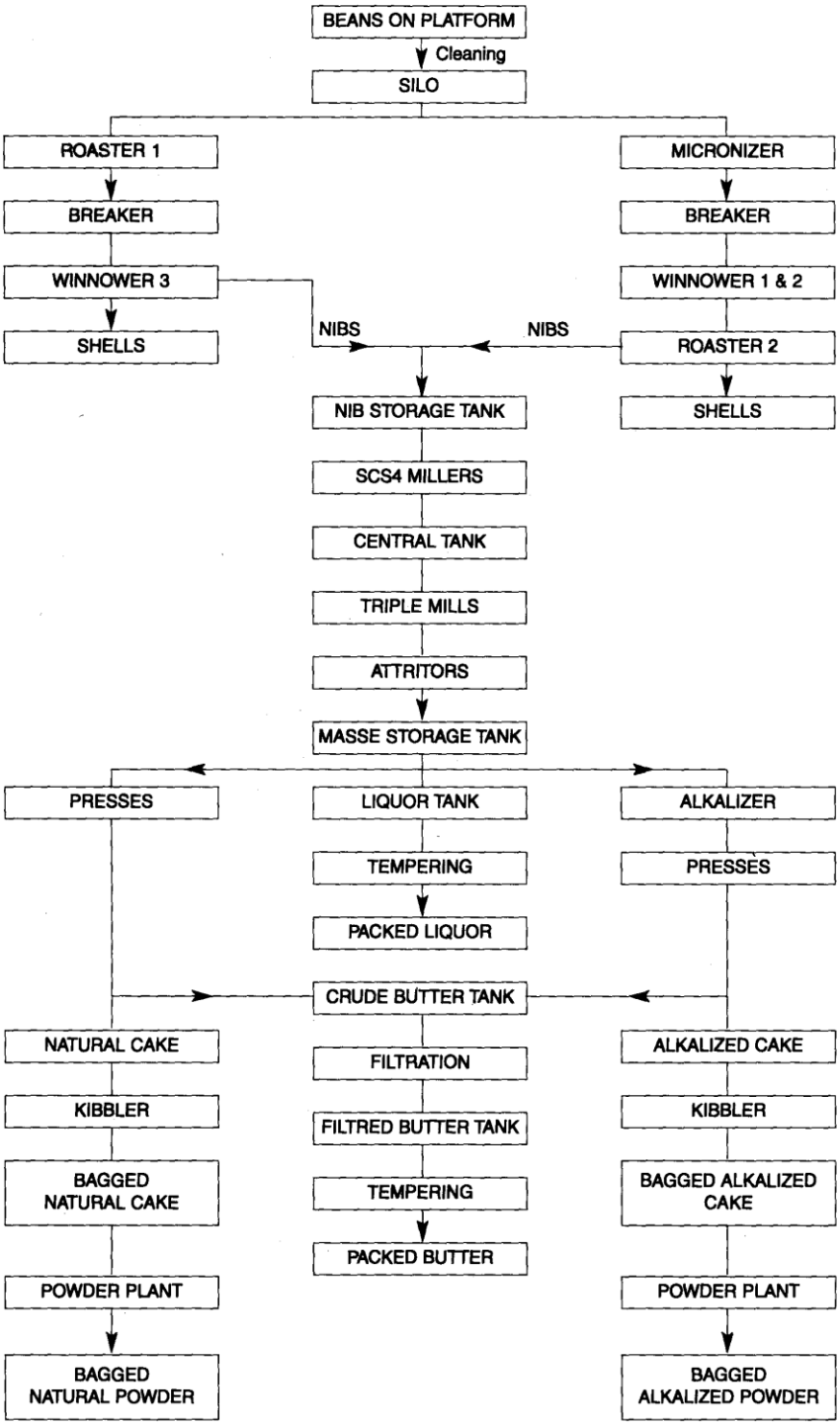
APPENDIX D: Alternative Cocoa Supply Chain



APPENDIX E: The Unique Ghana Cocoa Supply Chain

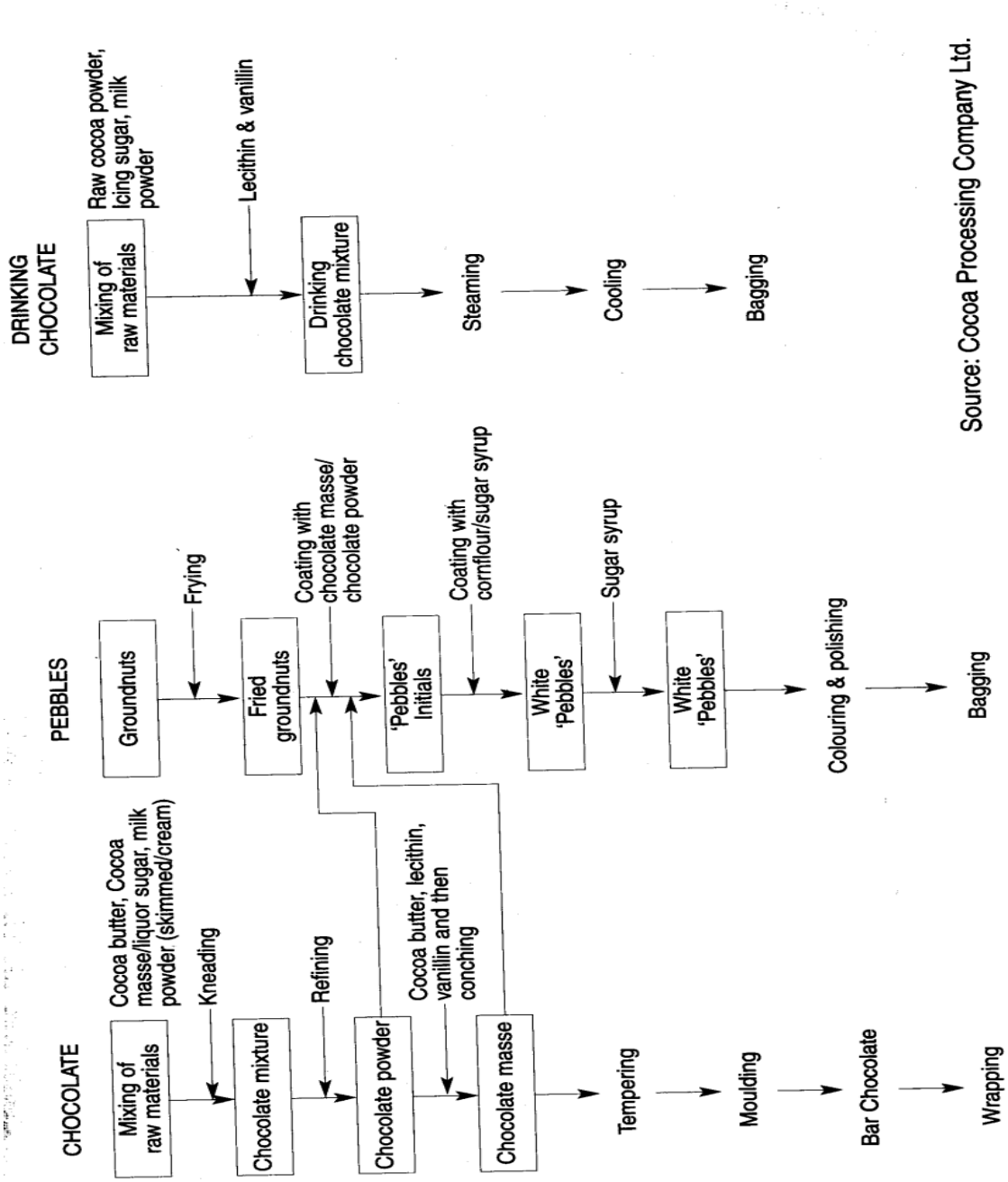


APPENDIX F: Flow Chart for Cocoa Processing



38 Source: Cocoa Processing Company Ltd.

APPENDIX G: Flow Chart for Confectionary



APPENDIX H: List of Questions for COCOBOD

Thesis Topic: An Empirical Investigation of the costs and benefits from moving up the Supply Chain: The case of Ghana Cocoa

Objective of Thesis: Analyze the costs and benefits of processing and exporting cocoa instead of the current focus on exporting of raw beans.

My data analysis section will include the following:

- Costs of production of beans
- Revenues from exports of beans
- Profits from exports
- Cost of processing in Ghana (Any of the Processing companies can be used here as an example)
- Revenues from exports of processed products such as cocoa liquor, cocoa paste and production of chocolate
- Profits from processing
- Export revenues vs. processing revenues

Other information needed:

- Details on cocoa production for export
- Details on cocoa processing in Ghana
- What is Ghana's current supply chain? Who are the participants?
- What percentage of total cocoa produced in Ghana is exported by the Cocobod?
- What percentage of total cocoa produced in Ghana is exported by private companies?
- What percentage of total cocoa produced in Ghana is used by private processors?
- What are the current strategies for maximizing profits from cocoa?
- Why has Ghana not moved from just exporting of raw beans to processing and exporting of cocoa products?
- Are there any future plans of processing and exporting cocoa products?

- What are the problems associated with production of cocoa?
- Why is Golden Tree Chocolate not exported or sold on international markets?
- Is it beneficial for the economy to encourage foreign processing companies such as Archer Daniels Midland into Ghana?
- What are the costs or benefits of having foreign processing companies in the country?
- % of total Ghana national foreign exchange from cocoa compared to other countries
- What is cocoa revenue used for?
- % of Ghana's total labor force in cocoa
- % of Ghana's agricultural labor force in cocoa. The industry's contribution to reduction in poverty
- How cocoa helps Ghana economy grow

APPENDIX I: List of Questions for Cocoa Processing Company

Thesis Topic: An Empirical Investigation of the costs and benefits from moving up the Supply Chain: The case of Ghana Cocoa

Objective of Thesis: Analyze the costs and benefits of processing and exporting cocoa instead of the current focus on exporting of raw beans.

Information needed:

- Average total cost of processing per tonne since 2004
- Average total revenue from all processed products
- Profits from all processing since 2004
- Total cost of processing into chocolate since 2004
- Total cost of processing into liquor since 2004
- Total cost of processing into butter since 2004
- Total cost of processing into powder since 2004
- Total revenue from processing into chocolate since 2004
- Total revenue from processing into liquor since 2004
- Total revenue from processing into butter since 2004
- Total revenue from processing into powder since 2004
- Do processing companies export any raw cocoa beans?
- Why has Ghana not moved from just exporting of raw beans to processing and exporting of cocoa products?
- Does COCOBOD or the Ghana government gain revenue from processed cocoa products or exports of processed cocoa products?
- What are the problems associated with processing of cocoa?
- Why is Golden Tree Chocolate not exported or sold on international markets?
- Is there another brand of chocolate made by CPC that is sold on the international market?
- Is it beneficial to the Ghanaian economy to encourage foreign processing companies such as Barry Callebaut, Cargill and Archer Daniels Midlands into Ghana?
- What are the costs or benefits of having foreign processing companies in the country?

Table 1: Average Total Revenue, Cost and Profit over time for Production

Year	Revenue from export (GHC)	Costs of production (GHC)	Profit from exports (GHC)
2004	888,601,997.54	935,883,200.00	(2,507,300.00)
2005	1,147,454,145.60	852,634,700.00	10,648,900.00
2006	1,243,267,952.64	1,049,217,900.00	28,100,600.00
2007	1,064,132,741.64	1,015,799,642.00	62,131.00
2008	1,461,961,428.48	1,404,391,421.00	23,814,780.00

Table 2: Number of beans produced, exported and delivered to processing factories

Year	Beans Produced (tonnes)	Beans Exported (tonnes)	Beans to Processing Factories (tonnes)
2004	599,318	531,350	78,987.00
2005	740,458	642,650	95,211.00
2006	614,531	582,316	103,673.20
2007	680,781	551,626	116,595.00
2008	710,642	524,985	150,318.26

Table 3: Percentage distribution of Cocoa Processed and Cocoa Exported

Year	Percentage Exported (%)	Percentage Processed (%)
2004	88.66	13.18
2005	86.79	12.86
2006	94.76	16.87
2007	81.03	17.13
2008	73.87	21.15

Table 4: Average revenue, cost and profit per tonne produced over time

Year	revenue/tonne produced (GHC)	cost/tonne produced (GHC)	profit/tonne produced (GHC)
2004	1,618.84	1,761.33	(4.72)
2005	1,784.62	1,326.75	16.57
2006	2,135.04	1,801.80	48.26
2007	1,929.08	1,841.46	0.11
2008	2,784.77	2,675.11	45.36

Table 5: Average Total Revenue, Cost and Profit over time for Processing

Year	Beans Processed	Cost	Revenue	Profit
2004	19,378	33,758,991	34,222,091	463,100
2005	16,290	27,223,500	27,964,400	740,900
2006	16,021	28,248,700	29,043,600	794,900
2007	21,941	47,570,040	48,217,233	647,193
2008	21,721	57,991,699	59,264,796	1,273,097

Table 6: Average revenue, cost and profit per tonne processed over time

Year	revenue/tonne processed (GHC)	cost/tonne processed (GHC)	profit/tonne processed (GHC)
2004	1,766.03	1,742.13	23.90
2005	1,716.66	1,671.18	45.48
2006	1,812.85	1,763.23	49.62
2007	2,197.59	2,168.09	29.50
2008	2,728.46	2,669.84	58.61