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Assessing the Employment Effects of Processing Cocoa in Ghana

Shereen Abbadi, Bernardin Senadza, Maikel Lieuw-Kie-Song and Haile Abebe

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Abbreviations

BECE	Basic Education Certificate Education
CHED	Cocoa Health & Extension Division
COCOBOD	Ghana Cocoa Board
CPC	Cocoa Processing Company
CRIG	Cocoa Research Institute of Ghana
EmpIA	Employment Impact Assessment
EO	Employment to Output Ratio
EU	European Union
FTE	Full Time Equivalent
GCE	General Certificate of Education
GEPA	Ghana Export Promotion Authority
GHS	Ghanaian Cedi
GNFS	Ghana National Fire Service
GOG	Government of Ghana
GSS	Ghana Statistical Service
HND	Higher National Diploma
ILO	International Labour Organization
ISSER	Institute of Statistical, Social and Economic Research
ITC	United Nations International Trade Centre
KII	Key Informant Interviews
LBC	Licensed Buying Companies
LI	Labour Intensity
MSLC	Middle School Leaving Certificate
NADMO	National Disaster Management Organisation
NGO	Non-Governmental Organization
PPRC	Producer Price Review Committee
QCC	Quality Control Company
RME	Research Monitoring and Evaluation department of COCOBOD
SAM	Social Accounting Matrix
SHS	Senior High School
SPD	Seed Production Division
t	Metric Tonne
USD	United States Dollar
WAMCO	West Africa Mills Company

1. Executive Summary

Strengthening the Impact on Employment of Sector and Trade Policies (STRENGTHEN) is global project implemented jointly by the ILO and EU with the purpose of strengthening the capabilities of stakeholders in partner countries to analyse and design sectoral and trade policies and programs that would enhance employment creation in terms of quality and quantity. Ghana is one of the partner countries participating in the project. As Ghana is the second largest cocoa producer in the world, and cocoa is one of its most important sectors for employment and export revenue, the cocoa processing sector was selected as one of the areas to focus on.

One of Ghana's strategies to increase its export earnings is to export more processed cocoa, and this study assesses the impact on employment under two scenarios of increased exports of processed cocoa. These scenarios were:

i. Exports of processed cocoa exports to increase to USD1.5 billion from the current level of USD 758 million?

ii. Processed cocoa exports increase to 40 percent of the current cocoa yield from the current levels of 24%.

In scenario 2, it was assumed that no additional cocoa was produced from current levels, and that the increase in export of processed cocoa would come at the expense of export of beans.

Case studies of two cocoa processing companies were conducted as part of the study. As part of these case studies, key data was obtained on the employment in these companies, the structure quantity of their inputs as well as their export volumes. The two companies used different processing technologies which created slightly different employment effects. It was found that one company generated 9 Full Time Equivalent jobs (FTEs) for every 1,000 ton of cocoa processed and the second company 10 FTEs. However both companies created 5 FTEs for every million dollars of processed cocoa. Using these figures the direct employment effects of the two scenarios were estimated. For scenario 1, it was found that direct employment in cocoa processing would increase by up to 3400 FTEs. For scenario 2, a proportion estimation indicated that approximately 1400 additional FTEs would be created. However given that the processing capacity for achieving scenario is already in place and that during the study stakeholder indicated that it would not be realistic to expect proportional increased between amounts processed and employment, the additional employment for achieving this scenario was estimated to be limited to be between 400 and 800 FTEs.

The study also estimated the direct indirect and induced employment effects for both scenarios using multiplier analysis derived from the 2015 Social Accounting matrix for Ghana, which are presented in the table below. While the indirect and induced employment effects were found to be much larger in terms of potential amount of employment created than the direct effect, in particular for scenario 1, it must be noted that most by far the majority of the indirect employment is generated in sectors with currently low productivity and income, in particular agriculture.

However, the study and stakeholder engagements also identified some important constraints to increasing the production and processing of cocoa. These include the availability of land, attracting additional farmers into cocoa farming, effects of climate change, investment in trees with higher yields and stabilizing and increasing farm gate prices

	Employment effects of USD 1 Million (FTEs)		Scenario1: Employment effects of USD 1.5 billion (FTEs)		Scenario 2: Employment effects of a 40 % increase(FTEs)	
	Indirect	Induced	Indirect	Induced	Indirect	Induced
Using technology of company A	87	40	281,280	130,176	13,300	81,488
Using technology of company B	88	40	284,691	131,393	16,302	82,422

Based on these findings and the inputs received during validation workshops five key recommendations were arrived at, and are presented below.

Recommendation 1: It is recommended that the GoG encourages the utilization of partially automated cocoa processing facilities. This will result in the creation of more skilled jobs instead of unskilled jobs, reduce the capital investment required and will in general support the development of a more skilled labour force.

Recommendation 2: More demand for skills workers will, in turn, result in more decent jobs that will benefit the young and educated Ghanaian workforce. Special measures should take place to encourage the employment of youth and women in all job categories. Cooperation with universities and community colleges by offering on-the-job training for female students could result in increasing the number of female candidates interested in the jobs offered. Providing child care facilities or allowance by the companies could also increase the interest of women to work in technical jobs even if work takes place in shifts.

Recommendation 3: The policies put in place to attract investments in processing have been successful to the extent that there are currently continued high levels of investment in processing capacity, despite some of this being idle. For the sector to keep growing and increase export revenues, it is important to ensure that other policies to address other constraints, most notably the production of beans, are fully implemented. Doing this could result in hundreds of thousands of additional jobs, mostly in the cocoa production value chain.

Recommendation 4: It is recommended that the government of Ghana and local stakeholders, based on the findings from this study continue their policy and social dialogue to assess the costs and benefits of expanding cocoa processing in Ghana. This analysis should take into account any tax benefits and other investment incentives provided to processors, as well as ideas of how to address some of the key constraints.

Recommendation 5: The value added in the current predominant processing of beans to intermediates is limited. If Ghana would like to capture more of the value add (and employment) in the entire cocoa /chocolate value chain it needs to move into manufacturing further up the value chain such as confectionary and other products. It is encouraging that some processors are moving into this direction. This should be further encouraged and incentivized. This could also have positive effects on employment in sectors that provide material inputs and services to the manufacturing and sale of confectionary.

Due to the slightly low levels of debris and defective beans, higher-than average fat content as well as mild and rounded flavour (Kolavalli and Vigneri, 2011; USDA, 2012). The consistent superior quality allows Ghana to enjoy a 4-6 percent price premium on the international market (Mulangu et al., 2015).

Except in 2015 when the share of processed cocoa rose to 30 percent perhaps on account of imported light crop beans by the processing companies (see further elaboration of this at the tail end of this subsection).

Recommendation 6: While one of the rationales of the government to incentivise investments in cocoa processing, was job creation, it is clear that the number of jobs generated through these investments are limited. It is recommended therefore that in future the GoG conducts Employment Impact Assessments of such policies and incentives before they are adopted so as to quantify the potential employment effects and factor this into the final design of these policies.

1. Background

1.1 Study Background

Strengthening the Impact on Employment of Sector and Trade Policies (STRENGTHEN) is global project implemented jointly by the ILO and EU with the purpose of strengthening the capabilities of stakeholders in partner countries to analyse and design sectoral and trade policies and programs that would enhance employment creation in terms of quality and quantity. Consequently, STRENGTHEN, is supporting nine countries in building capacity for assessing the impact of their respective trade and sector policies on employment through the development of robust decision tools. The project consists of two components. Component A focuses on the impact of sector-related policies on employment through conducting Employment Impact Assessments (EmpIA). Ghana is one of the partner countries participating in the project.

Assessments by Ghana Export Promotion Authority (GEPA) and the International Trade Centre (ITC) indicate that there is good potential for increasing the export of processed cocoa including powder, liquor, paste, and butter rather than exporting only partially processed cocoa beans. As such, there is a strong interest in pursuing policies and promoting investments that would allow Ghana to increase the share of fully processed cocoa as part of its total cocoa exports. Consequently, and based on the request of GEPA, the STRENGTHEN project conducted this study to assess the employment impact of meeting certain targets for expanding the exports of processed cocoa. The two targets considered and associated employment considered were:

i. What would be the employment impact if processed cocoa exports were to increase significantly to USD1.5 billion?

ii. What would be the employment impact if Ghana processed and exported 40 percent of its cocoa yield over the next five years which is the target of the National Export Development Strategy?

This study was conducted by the ILO as part of the Strengthen project and was presented to cocoa stakeholders and social partners at two validation workshops in October 2018. The insights, information and feedback received at these workshops have as far as possible been incorporated into the report.

2.2 Sector Background

2.2.1 Overview of Cocoa Production and Processing in Ghana

Ghana is the second leading producer (after Cote d'Ivoire) of cocoa in the world, with a market share of about 20 percent (Goodman, 2017). In 2017, the country received USD2.71 billion from the export of cocoa. Ghana has a reputation for the high-quality of its cocoa beans in the international market (Roldan et al., 2013), however, the exports are predominantly in the form of raw beans. Until the year 2009, processed cocoa exports averaged about 12 percent of total cocoa beans output as indicated in Table 1 below. It however picked up in 2009, reaching about 18 percent and has since then ranged between 21

and 25 percent. Most of the value-added products are in the form of cocoa paste and cocoa butter (Goodman, 2017). Ghana's National Export Development Strategy envisages the export of at least 40 percent of its cocoa in processed form in the next five years.

Ghana exports its cocoa largely to Western Europe which accounts for about 68 percent. The main importing countries are The Netherlands (34 percent), United Kingdom (12 percent), Belgium (9 percent) and Germany (4 percent). Aside Europe, Ghana also exports to Japan (7 percent) and the United States (3 percent).

Cocoa contributes significantly to the country's total foreign exchange earnings, coming second after mineral exports. While the sector's overall contribution to national gross domestic product (GDP) is about 3 percent, it makes up about 20-25 percent of total export receipts, provides about two-thirds of cocoa farmers' incomes and supports the livelihoods of approximately four million farming households (Ghana Statistical Service, 2015; ISSER, 2017a). In addition, cocoa production has been crucial to poverty reduction in the country over the past decades. Poverty incidence among cocoa farmers fell from 64 percent in 1991 to 24 percent in 2006 compared with the national poverty incidence and poverty among non-export (food crop) farmers, which declined from 52 to 29 percent and 68 to 46 percent, respectively, over the same period (Ghana Statistical Service, 2007).

Table 1: Cocoa output, exports and earnings, 2006-2017

	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017*
Total cocoa output (000 t)	740	615	681	710	800	1,025	879	945	896	740	850	970
Total cocoa exports (USD million)	1,187	1,133	1,487	1,866	2,220	2,871	2,829	2,267	2,383	2,764	2,572	2,711
Total cocoa exports (000 t)	736	622	648	634	693	856	900	860	879	892	804	945
of which												
Cocoa beans (USD million)	1,041	976	1,225	1,422	1,594	2,028	2,193	1,612	1,619	2,014	1,923	1,953
Volume (000 t)	657	546	564	508	529	630	719	654	658	667	622	711
Unit price (USD/t)	1,584	1,787	2,172	2,799	3,012	3,218	3,051	2,464	2,460	30,22	3,095	2,748
Processed cocoa (USD million)	146	157	262	444	625	843	636	655	764	750	649	758
Volume (000 t)	79	76	84	126	164	226	181	206	221	225	182	234
Unit price (USD/t)	1,860	2,078	3,119	3,527	3,810	3,726	3,523	3,186	3,450	3,328	3,574	3,234
Share of processed cocoa in total exports volume	11%	12%	12%	18%	21%	22%	21%	22%	25%	30%	21%	24%

Source: All figures are from ISSER (various years), The State of the Ghanaian Economy Report.
Note 1: 2017 figures are provisional except for cocoa output which was obtained from COCOBOD at: https://cocobod.gh/weakly_purchase.php
Note 2: Total cocoa exports is larger than output in 2007, 2012, and 2015. This might be as a result of importing cocoa for processing or the time duration between production and exports, or both.
Note 3: The unit price of cocoa beans export (main crop) reported here is higher than the average unit cost of cocoa beans reported by the processing companies studied (See Table 3). The difference in the unit price is a result of the processing companies using predominantly the 'light crop' beans, whose price on the local market is some 20 percent lower than the price of the main crop on the world market. Even though Ghana's cocoa is generally high quality, whether main or light crop, the main crop beans are bigger in size whereas the light crop beans are too small for export. Thus COCOBOD, the government agency in charge of cocoa sells the light crop at a discount to local processors.

Cocoa production is predominantly a smallholder activity, with average farm sizes of not more than 4 hectares (Roldan et al., 2013). These smallholders account for about 90 percent of national output (ibid). Production takes place in the country's forest areas in six regions, namely, Ashanti, Brong Ahafo, Western, Eastern, Central, and Volta. The average yield is about 400 kilograms per hectare (Terazono, 2014). The crop year begins in October, with purchases of the main crop, while the smaller mid-crop (light or lean crop) cycle begins in July. Light crop beans are smaller in size than the main crop beans but both are of the same quality and grown on the same trees (USDA, 2012; Goodman, 2017). The main crop accounts for 90 percent of total annual cocoa bean production in Ghana, and the light crop accounts for the remaining 10 percent (ibid). Farmers produce cocoa (individually or collectively/both) and sell to Ghana Cocoa Board (COCOBOD) at prices determined by the Government of Ghana (GOG). The COCOBOD then sells the (main crop) cocoa beans on the global market at the internationally determined price. Thus, apart from the light crop beans which COCOBOD sells to local cocoa processing companies at discounted prices, the companies also purchase (main crop) cocoa beans directly from COCOBOD at prevailing international prices.

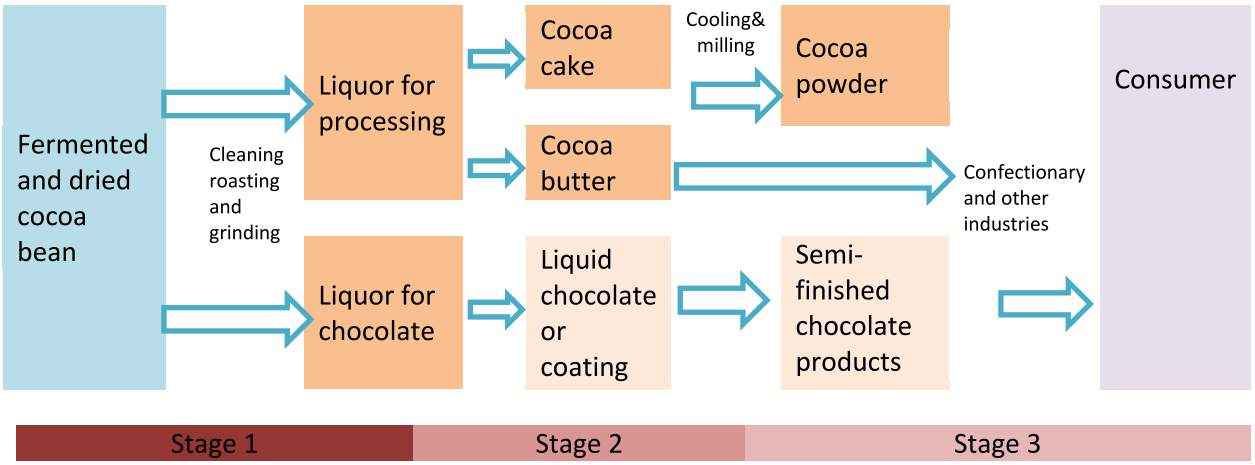
In terms of production, significant progress has been made over the years to sustain the country's dominance in total global production despite some substantial contractions especially in the 1980s due to a combination of falling prices, drought and political instability (Essegbey and Ofori-Gyamfi, 2012). The growth in the production of cocoa since the mid-1980s, according to Vigneri (2008), is attributed to increased extension services, increased use of fertilizers and the introduction of disease-resistant or improved species. Kolavalli and Vigneri (2011) also attribute the growing output to rising world prices, a set of interventions rolled out by COCOBOD to improve farm practices as well as policy reforms. As Table 1 shows, annual cocoa production is not stable, fluctuating from year to year within the range of 700,000 and 900,000 metric tonnes annually over the past decade. In 2011, output exceeded one million metric tonnes.

There are several stages of processing cocoa, which results in either semi-finished or finished products. From the farms, harvested cocoa beans are dried and fermented in order to reduce the moisture content. The farmers, through licensed buying companies (LBCs), sell the dried cocoa beans to COCOBOD. The processing companies purchase the fermented dried cocoa beans as the main raw material, which undergoes cleaning, shelling, winnowing, and roasting. The roasted nibs are grinded and refined to produce liquor. The liquor is either processed (pressed) further for butter and cake or undergoes storage as semi-finished product, which is sold to the confectionary industry or is moulded into finished chocolate products for consumers. Cocoa cake is further milled into cocoa powder for the confectionary industry (Figure 1).

COCOBOD is the state agency established to encourage and facilitate the production, processing and marketing of good quality cocoa, coffee and shea nut. With its subdivisions, it is in charge of providing inputs and delivering products to farmers, traders and buyers, as well as to register traders, Licensed Buying Companies (LBCs) to be able to buy from farmers and sell to its subsidiary, the Cocoa Marketing Company (CMC), high quality beans. Formerly called Cocoa Marketing Board (CMB), it was established by the GOG in 1947. The other four subsidiaries of COCOBOD are Cocoa Research Institute of Ghana (CRIG), Seed Production Division (SPD), Cocoa Health and Extension Division (CHED), and Quality Control Company (QCC).

The government's target is for cocoa farmers to receive not less than 70 percent of the world market price. The percentage has increased gradually from about 50 percent in the early 1980s to about 77 percent in 2016 (ISSER, 2017a).

Figure 1: Stages of cocoa processing



Prepared by authors based on field visits to processing factories

As indicated above, cocoa beans are first processed into liquor. The average yield of cocoa liquor from one tonne of processed cocoa beans is 80 percent. A tonne of cocoa liquor then results in .55 tonne of cocoa butter (55%) and .45 tonne of cocoa cake (45%). A tonne of milled cocoa cake produces 100 percent cocoa powder.

Historically, efforts at processing cocoa for export in Ghana can be traced to the 1960s when the West Africa Mills Company (WAMCO) was established through private initiatives. It was to process cocoa into cocoa paste, cocoa butter and other products (Essegbey and Ofori-Gyamfi, 2012; Goodman, 2017). Subsequently, the government established the Cocoa Processing Company (CPC), a subsidiary of COCOBOD, in 1965 to process cocoa into semi-finished and finished products. The CPC was privatised in the 1980s as part of economic reforms. Currently, there are a number of processing companies, including Touton Ghana Limited, Niche Cocoa Industry Limited, Plot Enterprise, Archer Daniels Midland (now Olam), BD Associates Ghana Limited, Real Products Limited, Barry Callebaut, Cargill and CPC, that add some form of secondary processing (confectioneries and chocolate) to the primary processing of cocoa into semi-finished products (butter, liquor, cake and powder). The total installed capacity for these companies is about 431,000 metric tonnes, out of which 229,693 metric tonnes (53 percent) is being utilised (Goodman, 2017). There is uncertainty about the availability of cocoa beans, as these companies are often left with no choice but to either pay higher prices for cocoa (international prices) or leave their machinery idle (Goodman, 2017). Interviews with the two cocoa processing companies that participated in the study corroborate this assertion. It is reported that cocoa processing companies had to import about 5,500 tonnes of light crop cocoa beans from Cote d'Ivoire in 2015/2016 to meet their operations as not enough local light crop beans were available (Goodman, 2017).

In terms of employment, it is difficult to obtain precise estimates of employment generated by export processing of cocoa. However, Goodman (2017) estimates that a little over 1,293 workers are directly employed by the major processing companies. On per-firm

See section 4.1 for the perspectives of the two companies.

The light crop is smaller in size than the main crop and so is sold by COCOBOD to local processors at a discount (of about 20 percent), i.e., at prices lower than the international market price. However, the quantity available is far lesser than the processing capacities of the processing companies. As a result there is competition among local processors for the limited supplies. See section 4.1.

basis, the number of employees has been declining as a result of increased automation of processing activities as well as the high price of cocoa beans (Goodman, 2017). One important policy measure to generate more employment in the processing of cocoa has been the quest to sell cocoa beans at discounted prices to local processers instead of the usual international price (Goodman, 2017).

2.2.2 The Cocoa Value Chain

Although it currently incorporates some elements of privatization, Ghana's cocoa value chain has a strong government presence through the activities of COCOBOD (World Bank, 2013; ISSER, 2017b). Prior to the introduction of the partial liberalization, COCOBOD held a monopoly on cocoa marketing in Ghana and controlled both domestic purchases and international exports. The structural reforms in the cocoa sector in the early 1990s introduced privatization in the internal marketing of cocoa, which has seen a number of private companies being licensed to purchase cocoa beans from farmers and deliver it to COCOBOD (Monastyrnaya et al., 2016). COCOBOD, however, continues to play a major role in the regulation of the cocoa value chain, including the export of cocoa and quality control. COCOBOD's subsidiary, CMC, still enjoys a monopoly as the sole exporter of cocoa beans. Price determination within the value chain is also subject to government regulation. In 1983, the Government of Ghana established the Producer Price Review Committee (PPRC) with the responsibility of determining yearly producer prices of cocoa. This committee is chaired by the Ministry of Finance and includes COCOBOD, Bank of Ghana, representatives of farmers, licensed buying companies (LBCs) and hauliers (Kolavalli et al., 2012; Monastyrnaya et al., 2016).

Generally, in traditional agricultural value chains, actors at the end of the spectrum receive a relatively larger proportion of the value compared to those actors at the upstream end of the chain. This has been the case of the Ghana cocoa value chain where cocoa farmers tend to receive the least share of the value (Roldan et al., 2013). It is the policy of the GOG to ensure that cocoa farmers receive not less than 70 percent of the international market price of cocoa beans. Thus, the producer price of cocoa is determined in accordance with this objective by the Producer Price Review Committee (PPRC) of government. The government, through COCOBOD, further ensures that the needed inputs such as fertilizers, insecticides and extension services are provided to farmers at either no cost or at a subsidised cost.

The actors in the value chain can be classified into main actors and supporting actors (Monastyrnaya et al., 2016). Main actors are actors contributing directly to production, processing, transportation and marketing of cocoa and cocoa products. This includes farmers, private input suppliers, licensed buying companies, haulers, CMC, processors, and retailers of cocoa products listed in Table 2. Supporting actors, on the other hand, do not participate directly in production, processing, transportation and retailing but rather provide various types of support to the value chain in the form of research, extension, quality control, financial and insurance services, disaster management, etc. They include cocoa research institutions, COCOBOD's Quality Control Company (QCC), farmers' groups, Non-Governmental Organisations (NGOs), formal and informal financial and insurance companies, amongst others.

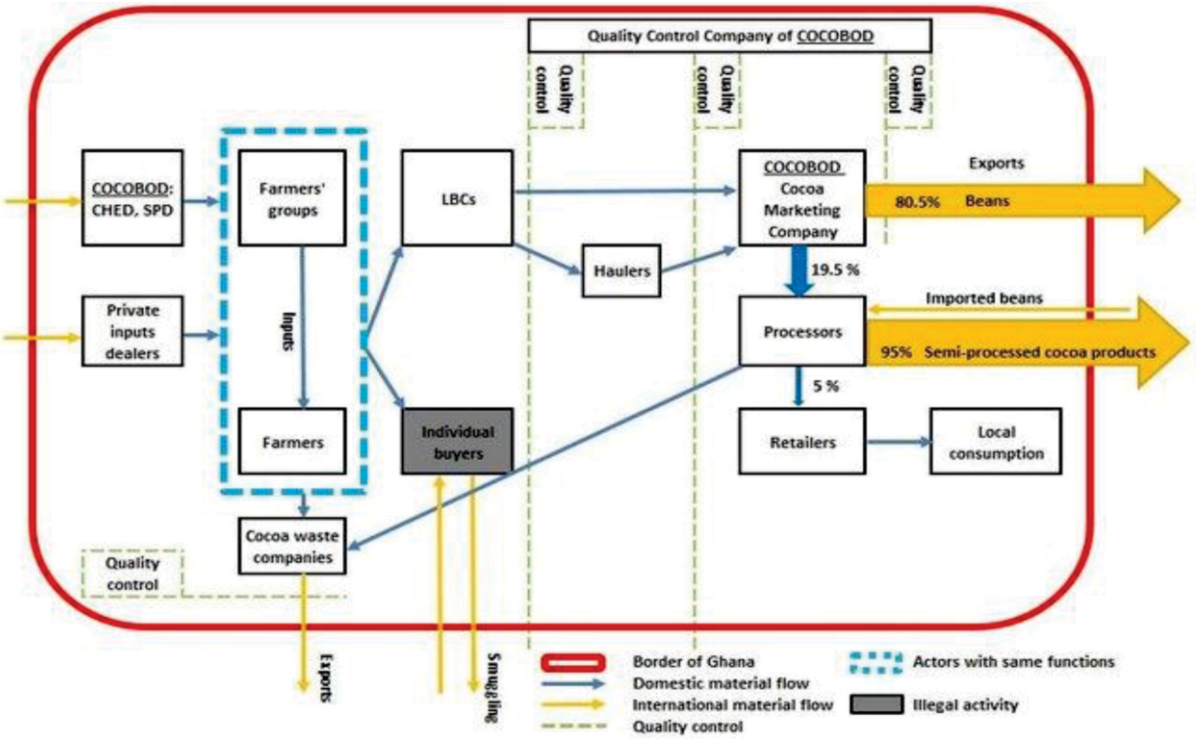
Table 2: Main and supporting actors in the cocoa value chain

	Actor	Function	Outputs
Main actors			
1.	Private input dealers, Cocoa Health and Extension Division (CHED), Seed Production Division (SPD)	Input supply	Seeds, fertilizers, pesticides, fungicides
2.	Farmers	Production	Cocoa beans
3.	Licensed Buying Companies (LBCs)	Internal marketing	Purchases of cocoa beans from farmers and delivery it to COCOBOD
4.	Haulers	Transportation	Transportation of cocoa beans
5.	CMC	Exports	Exporting of cocoa beans
6.	Processors	Processing	Cocoa powder, cocoa butter, liquor, cakes, beverages, chocolate
7.	Cocoa waste companies	Cocoa waste marketing	Exporting of inferior cocoa and cocoa waste
8.	Big supermarkets, small retailers	Retail	Delivering products to consumers
Supporting actors			
9.	COCOBOD (CHED and Cocoa Research Institute of Ghana (CRIG)), Research institutions, Farmers' groups, Processors and LBCs, NGOs)	Extension services and research	Research and transfer of knowledge
10.	COCOBOD (QCC)	Quality control	Stable quality of raw cocoa
11.	Formal and informal financial services institutions	Financing	Financial services
12.	Insurance organisations (public and private companies)	Insurance and social protection	Risk mitigation
13.	National Disaster Management Organisation (NADMO), Ghana National Fire Service (GNFS) and local disaster volunteer groups	Disaster management	Risk mitigation

Source: Monastyrnaya, E., Joerin, J., Dawoe, E., & Six, J. (2016). Assessing the Resilience of the Cocoa Value Chain in Ghana: Case Study Report.

Along the value chain (see Figure 2), from the smallholder farmers, are actors involved with buying, bulking, quality control and warehousing. There are other actors involved in transporting of cocoa from the farms to warehouses, and from the warehouses to the port of export. Supporting actors such as the Cocoa Research Institute of Ghana (CRIG) and the Research Monitoring and Evaluation (RME) department of COCOBOD carry out research on cocoa. At the end of the value chain are the activities of processing companies that process cocoa beans into intermediate products (liquor, butter and cake) or finished products (confectionaries, including chocolate) as well as the exporting activities of CMC (the export of raw beans).

Figure 2: Cocoa supply chain



Source: Monastyrnaya, E., Joerin, J., Dawoe, E., & Six, J. (2016).
Assessing the Resilience of the Cocoa Value Chain in Ghana: Case Study Report.

3. Study Approach and Methodology

There are three types of employment effects that are usually captured in employment impact assessment studies. The first is direct employment which refers to the labour input required for processing cocoa at the cocoa processing facility. This includes the workers employed by the cocoa processing facility in addition to the workers that provide services on the cocoa processing facility through outsourcing. The second is indirect employment which refers to the employment generated at the suppliers that provide inputs to the cocoa processing facility. The third is induced employment which refers to the employment generated elsewhere in the economy as a result of the consumption of those who worked directly or indirectly on the cocoa processing facility.

All three types of employment are captured in Full Time Equivalent (FTE) expressed as person-year or equivalent of number of workers employed on a full-time basis for the whole year. For direct employment, other indicators could be estimated including Labour Intensity (LI) and employment per million USD of outputs and exports. LI is calculated by dividing the labour wage bill by the total output. While employment per million USD is calculated by dividing direct employment in FTE by the total output in USD million.

This research used a case study approach to review two processing companies in more detail and assess direct employment. The findings from this were then used to be able to do a more detailed assessment of the indirect and induced effects. The approach was implemented in the following four stages.

1. **Defining the cocoa processing companies.** Prior to the start of this assignment, STRENGTHEN project, and in collaboration with GEPA, selected two cocoa processing companies for assessment. In this report, they are referred to as company A and company B.

2. **Developing data collection tools.** The research team developed semi-structured interview guides to be used during the meetings with the management team of the cocoa processing companies. The data collection tool also includes tables to captured detailed data on direct employment, in addition to supplies and materials used for production. Given that the data will be analysed to indicate employment per unit of output, the research team decided to collect and analyse employment and production for the full year of 2017.

3. **Data collection** through interviews and document review. The research team conducted Key Informant Interviews (KII) with the management team of both companies. The interviews were used to collect qualitative and quantitative data as well as explain the detailed tables related to employment and supplies to the interviewees. The interviewees then worked on completing the tables and returning them to the research team. During the interviews, the research team requested detailed data on the workers employed, and supplies used during 2017. The research team also walked through one of the processing facilities and observed the different stages of production. Relevant documents such as financial statements and production reports were also used to confirm the data collected during the interviews.

4. **Workers survey.** As part of assessing the induced employment effects, the research team designed and conducted a survey with the workers of the cocoa processing facilities to define the number of people employed in their households. A data collection tool was designed to define the number of domestic workers employed, their characteristics and the characteristics of their employment. The research team selected a random sample of the workers who earn more than GHS2,000 (about USD460) per month. A survey was conducted in each facility and data was logged to MS Excel and analysed.

5. **Data analysis** Qualitative and quantitative data collected was then analysed by the research team and presented in this report to answer the two main questions indicated above in relation to direct employment, and partially to induced employment.

   To estimate the indirect and induced employment effects, the study relied on a combination of macro data most importantly the Social Accounting Matrix (SAM) for Ghana for 2015 and the Labour Force Survey (LFS) for 2015. This data was complemented by the project data collected as described above. The methodology used is based on deriving multipliers and is described in section 5 and Annex X. Approach used for estimating indirect and induced employment

   The indirect and induced employment effects will be estimated using Input/ Output Tables/ SAM multiplier analysis. These methods are commonly used to estimate the impacts of investments on the rest of the economy. Combined with national employment data, it can be used to also estimate impacts on employment. They are commonly used as they are relatively simple and rely on data that is usually available in many countries.

   In this approach, indirect employment refers to the employment generated by the suppliers that provided materials and services to cocoa processing factories. The indirect effects (backward linkages) will be estimated using the output (Type I) multipliers. Induced employment refers to the employment generated elsewhere in the economy as a result of

increased consumption generated through increased income. This will be estimated using Type II multipliers which include the indirect and induced effect, and Type II multipliers are computed using the SAM. The method for computing the multipliers is presented in more detail in Annex 1.

As with all methodologies, there are limitations and implicit assumptions that need to be understood when applying multiplier analysis. For this type of analysis, the most important ones to be aware of are that:

- It is assumed that in general there are no supply constraints in the economy, and so in this case, the economy will be able to produce the additional inputs required by the increased cocoa procesing.
- Related to this, it is assumed that prices are constant, and the increased demand does not lead to price increases.
- Effects are assumed to be proportional- so for example if consumption of households increases, it is assumed that only the magnitude of consumption will increase, but the composition will remain in the same proportions. (i.e. if 25% of household consumption is on food, this is assumed to remain the same if income increases).

The net effect of these limitations is that the results may overestimate the effects and so the results need to be interpreted with this in mind. And while these limitations are acknowledged, addressing them requires the use of much more costly and data-intensive models.

Box 1: Multiplier effect and multipliers

- The **multiplier** refers to an economic concept that shows how much or by how many times the final output of a given sector would increase if some extra investment/spending is done in other sectors. It also provides an indication of how a change in one area, leads to changes in other areas.
- **Input-output (Type I) multipliers** are computed from the intermediated demand table of the SAM and capture the direct and indirect production effects only. They estimate the impact on the supply chain resulting from a producer of a certain product increasing their output to meet additional demand. These multipliers underestimate the effect on the economy as they do not estimate the induced effects.
- **SAM multipliers (Type II)** are calculated from the whole SAM and in addition to the direct and indirect effects, they include the effects of households spending based on the income earned from the direct and indirect effects – the induced effects. SAM multipliers, therefore, tend to be larger than input-output multipliers because they capture both production and consumption/income linkages.

6. The extent of the indirect employment effects, however, depends on the degree of both backward and forward linkages between the cocoa processing subsector and other sectors of the economy. Falling under the manufacturing sector, with higher backward than forward linkages (Nchor and Konderla, 2016), not only could expansion of processed cocoa exports create indirect employment in downstream industries (finished cocoa products such as confectionary and cosmetics) its main effect will be to potentially trigger output expansion and hence employment in upstream sectors in the cocoa value chain and in other suppliers to the cocoa processing industry, including materials (packaging, etc.), utilities, financial and related services.

1. Findings

1.1 Description

4.1.1 Establishment, Capacity, Products and Markets

Company A

Cocoa processing company A, is a wholly Ghanaian-owned cocoa processing company, and was established in 2011. It is located in the Ghana Free Zones Enclave in Tema. The company has an installed capacity of 60,000 metric tonnes (t) but currently operates at 60 percent. It processes cocoa beans into semi-finished products, namely, cocoa liquor, butter, cake, and powder. Recently a confectionary line has been added utilising 2 percent of processed cocoa. The remaining 98 percent is exported mainly to Europe (Netherlands, Germany, and Spain) which account for about 70 percent of its exports. Other notable destinations are the United States and China. Of the confectionary, 10 percent only is exported to countries such as Germany and Trinidad.

Company A employed about 340 Ghanaian workers in 2017. Unlike foreign cocoa processing companies, it uses partially automated lines which result in higher employment. The company uses partially automated production lines to reduce the capital intensity of its operations as fully-automated production lines also tend to be expensive. Additionally, fully automated production means that the company depends on a few highly skilled workers who code/programme the different units. This makes the company dependent on those workers and increases the risks of loss should these workers leave the company. All equipment was imported from recognised manufactures who installed them by their technical teams but also trained the local staff at Company A. Spare parts are in stock at the company.

The majority of the workers live in nearby communities (Tema and its environs) but it is not a policy followed by the company. There are no special policies to hire women or persons-with-disability. Company A is Food Safety System Certification (FSSC) 22000 certified, and thus is able to compete with the international companies. The company has been a recognised exporter for several years.

Company B

Also located in the Ghana Free Zones Enclave in Tema, Company B is 100 percent foreign-owned. It is a subsidiary of European company. It was established (registered) in 2006, with construction starting the same year. Construction was completed in 2012 with an installed capacity of 12,500 t. Production started in September of the same year. Installed capacity has increased incrementally and was at 25,000 t in 2017. The company is operating at more than 80 percent capacity currently. Company B's products are semi-finished, namely, liquor, butter, cake and powder. The capital intensity of its operations is high, with fully-automated production lines.

The employees of company B are all Ghanaian and its current staff strength is 96. Its products are also 100 percent exported and are sold through orders received by its parent company. The destination of exports is predominantly Europe, with about 99 percent of its

Employment as at July 2018 stood at 350.

products sold primarily to The Netherlands, Germany, Spain (Barcelona specifically). Newer European destinations include Russia, Estonia, Poland and Hungary. The remaining 1 percent of supplies go to the United States, Middle East, Asia and North Africa. The company gives priority to hiring persons with the required skills. There are no special policies for hiring youth, women or persons-with-disability. Unlike Company A, Company B outsources services such as security, cleaning, air-conditioner servicing and the loading of cocoa beans, which altogether employs 124 workers directly on its premises. Table 3 presents a summary of production, revenue and investment statistics for the two companies for 2017.

Table 3: Processing capacity and exports of both companies in 2017

Description	Company A	Company B
Installed capacity (t)	60,000	25,000
Processed cocoa bean (t)	36,066	21,665
Cocoa products (t)	29,351	16,649
Capacity utilisation	60%	87%
Exports	Liquor and powder: 98% Butter and cake: 100%	100%
Average unit cost of cocoa beans (USD/t)	1,769	1,891
Unit selling price cocoa products (USD/t)	Powder: 1,389 Butter: 3,326 Cake: 1,150 Liquor: 2,302	Powder: 1,400 Butter: 4,800 Cake: 1,200 Liquor: 2,400
Total export value (USD million)	65,099,886	42,586,800

Source: Author's interview notes.
Note: Company A used multipliers to define the selling price based on the prevailing world market price of the cocoa beans in 2017 as follows: Liquor: 1.27; Butter: 1.35; Cake: 0.68; Powder: 0.8.

The breakdown of production indicates that cocoa liquor makes up the largest share of the production volume and value of both companies. Considering the volume of production, cocoa liquor made up 43 percent and 58 percent of production for companies A and B, respectively, as indicated in Figure 3 and Figure 4 below. Figure 5 and Figure 6 include the breakdown of production by value based on prices paid per product in 2017 for both companies.

Figure 1: Breakdown of products in 2017 by volume, Company A

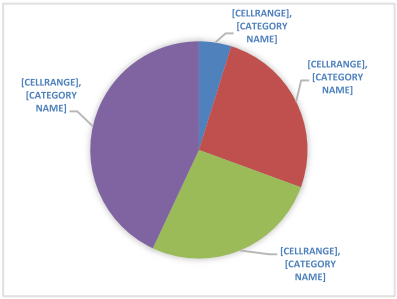


Figure 2: Breakdown of products in 2017 by value, Company A

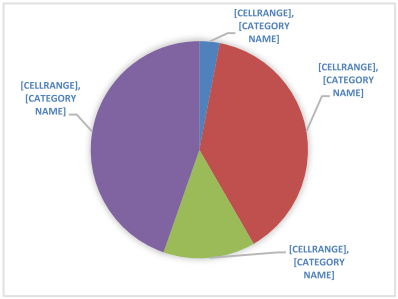


Figure 1: Breakdown of products in 2017 by volume, Company B

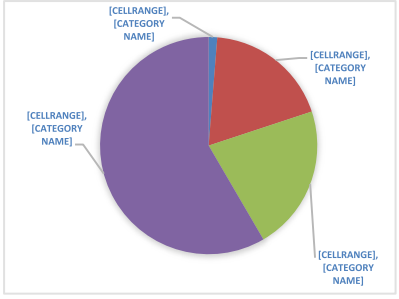
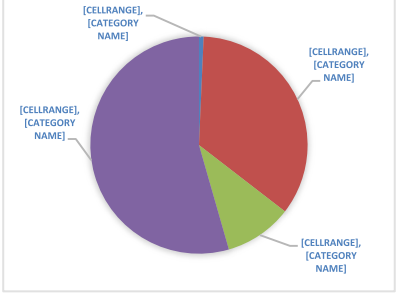


Figure 2: Breakdown of products in 2017 by value, Company B



As Table 3 indicates, the two companies report different average unit costs for cocoa beans purchased as well as different prices for the four products, namely, liquor, butter, cake and powder, in 2017. The lower average unit cost of cocoa beans for company A may be due it using a higher proportion of the light crop beans compared to company B. On the other hand, differences in selling prices is partly explained by the fact that the two companies engage in different pricing strategies for their products in order to optimize profits. Company A engages in forward sales of its products using price ratios (or multipliers). The multipliers are computed based on the prevailing world price of cocoa beans and the quality of the product that results from processed cocoa beans. Company B, on the other hand, sells through its parent company at prices negotiated with its customers. By engaging in forward sales, which is a form of hedging, company A tends to receive lower prices for all four products compared to company B (Table 3).

4.1.2 Expansion, opportunities, and challenges

There is an unmet demand in the global market (mainly the Netherlands, Germany, US, China and Spain) for semi-finished cocoa products (liquor, butter, cake and powder). As a result, both companies envisage future expansion of installed and operational capacities to take advantage of the excess demand. Company A projects to reach 100,000 t installed capacity by the end of 2018, while Company B has added an additional 5,000t to its 2017 capacity as at mid-2018. The following key quotes from the interviews buttress the point:

As we speak, we have sold 2018 and 2019 of most of our products already, so that means filling a form for [selling] our product is very easy. And if you want to sell 2020, we can sell. We could sell, because for now although we've sold 2018 and 2019, other customers are now knocking on our doors for more products so that's why we are increasing from 60,000 to 100,000 tonnes capacity. [Company A]

The market is out there because if you look at the capacity in this enclave, we see ourselves as neighbours, rather than competitors because we all sell to the same market and yet, the market is bigger than our capacity. [Company B]

The study sought to find out from the perspective of the companies how employment would be impacted both directly and indirectly when their operating capacities are expanded. Given the overall capital intensive nature of cocoa processing, however, direct employment on average is expected to increase by a less than proportionate increase in capacity expansion. For example, Company A projects an average of 30 percent increase in employment when it expands its capacity to 100,000 t (an expansion of 67 percent). However, the various employment categories will be impacted differently. There would be a greater relative increase in technical/skilled production workers and cocoa loaders compared to administrative and other staff. Similar projections were made by Company B. The quotes below summarise the direct employment effects of expansion from the perspective of the two companies.

We would be leveraging on the existing facility to be able to do that [increase capacity]. So it won't be like apples-to-apples or one-to-one. It may increase our staff to maybe 30 percent. That's what we anticipate because we are going to share the same administration, the same human resource and all other staff. [But] more technical [workers] would be required, and also the cocoa loaders, the packaging staff. [Company A]

If we have to double the capacity, there are certain areas that employment would be 100%. For instance, in terms of the loading team, because when the volume of raw materials that we are buying, i.e., cocoa beans increases, automatically you need to get equivalent number of workers to handle the volume. So if we increase or double our capacity, in terms of "the gangs" we will have to double. In terms of the casuals, we will have to double. In terms of the cleaners, because the more activity we do, the more waste or dirt that is generated and we need additional hands to clean it. But in terms of the [other categories of] employees, let's say the first category of employees, i.e., management, you may not need to double. You may have, let's say 50% increase because you need an additional two or three managers and certain units split into smaller units can be managed by these individuals. [Company B]

In terms of indirect employment, even though no quantitative projections were made, the two companies expect that their expansion would create additional employment at their suppliers.

The processors also see opportunities for adding more value by diversifying into confectionary. The major constraint to export expansion, however, is limited local production of light crop cocoa beans that is sold to local processers at discounted prices by COCOBOD. The total annual supply of the light crop is about 180,000 t, which is below the total local processing capacity of over 400,000 t. Using the main crop means buying it at market prices. Although it results in improved yield, the premium paid for the premium beans does lower the profitability of operations. For example, the companies had this to say:

The light crop is what the local processing companies end up using and that is actually what the government sells to us at a discount. The total production is about 180,000 metric tons a year and the installed capacity of processing companies is 450,000 metric tons. So if everybody is going in for the light crop, then there is no enough cocoa beans, the raw material for production. So the first threat is the availability of raw material because the installed capacity is more than the cocoa beans that is available for production. If the light crop and the main crop were being sold at the same price, then, we [the country] are producing close to 850,000 metric tonnes which is more than the installed capacity. Then there would be enough cocoa but the main crop, we don't want it is because is too expensive. [Company A]

In terms of expansion, we are also looking at the availability of the bean, because, that is the key bottleneck. .., the cocoa marketing company has to supply both to us, other local processors and also honour its obligation towards the foreign market. Now, in terms of processing, all the processors want a certain category of beans which is cheaper compared to the standard main crop that is traded on the market. Now the CMC cannot supply the cheaper one because it does not have additional capacity to supply, because we have the main crop, light crop, small beans and the others. Now, when you process and you are selling irrespective of which category of beans you use to process, you sell it at the same price. So, as a processor who is also a rational business person, you want to process the cheaper component which will give you the returns. Now, CMC provides a lot of main crop, but, cannot provide enough light crop to feed all the processors. So, there is something like you have to take a certain proportion of the small beans or the light crop that they can provide and then balance it with the main crop. And, you look at the cost benefit analysis [of] taking a lot of main crop to support your other cheaper ones, and expanding your capacity, if you are not going to earn a lot of returns, then it makes sense to just keep to this moderate capacity and process what you can get. [Company B]

The limited supply of the cheaper light crop has generated competition among processors. Companies with greater financial muscle are better able to offer more lucrative purchasing terms to COCOBOD in order to get the beans first. To meet the shortfall in the supply of the light crop, some companies resort to importing. Here is an excerpt from an interview with one of the companies:

Some companies normally bring some light crop from Ivory Coast, Nigeria into the country to be able to make up for that [the shortfall], but if we all have to fight for the [local] light crop, then whoever has got deep pockets would get it. So [in] the normal circumstance, it's supposed to be a 90 days credit facility; that's the supplier agreement but because they [COCOBOD] don't have enough light crop, the big guys [companies] would just go and say "well, we want to pay right away" so no need for the 90 days [credit], and because COCOBOD needs the money, they will give it to them. Then we all will say that we all can do the same thing. We don't want the [90 days] credit. Now they would also say "well, we will buy the beans, pre-finance it for the whole year", so if they need 60,000 metric tonnes, they will pay upfront, that's 120 million [USD], they will pay. We don't have 120 million [USD] so they [COCOBOD] have to serve them first and whatever is left, we will take. So that's where the banks come in. Now you have to go and talk to the local bankers, the following year, to liquid you with 120 million [USD]. So they will say they will pay 120 million, you too say you will pay 120 million. Then what would be the next strategy? Then, you keep on growing. I'm borrowing from local banks with high interest rate, for them [foreign-owned], they even borrow from their own [parent] company, Barry Callebaut, Cargill, OLAM, they even have internal funds that they are even borrowing at 1 percent interest. Then, it comes back to can I compete with them? Every year, you have to be clever, how you are going to have your raw materials. [Company A]

Other challenges, particularly, for the locally-owned processor is access to and cost of finance. Although quite reliable, high cost of electricity was also cited as a challenge. During power fluctuations, the firms must generate power from alternative sources and this impacts their operations adversely. This was especially the case during the 2016 power crisis. There is also the problem of getting labour with specialised skills, which encourages headhunting among processors in the enclave. In order to maintain their employees, the firms must pay higher wages for these specialised labour. This development, however, helps to maintain competitive wages in the industry. Excerpts from the interviews on some of the challenges noted above are recounted below:

Another challenge is the cost of doing business in the cocoa business. For example, our working capital base is almost more than half a million USD every month and to get half a million on top of your operating expenses is a lot and if you don't have deep pockets it will be very difficult to finance such operations. Electricity cost is about 0.17 cents compared to our neighbour Ivory Coast which is 0.11 cents, ... When you go to Europe, it goes down to 0.06, 0.09 so even competing with them is not good because [the cost of electricity] is a huge this thing. [Company A]

The issue of power crises. During that time, we had to use a lot of other fuels to support the operations. Because labour cost doesn't constitute a significant portion of our costs, at least it can be managed. But, when power fluctuations affect operations that is very significant. [Company B]

[In] the cocoa industry, you need specialised workers to be able to operate. Once somebody has got deep pockets and can pay a little bit higher, they would be able to take

[your workers]. So when [processor X] came in, they wiped us off; they took about maybe our top managerial skills and technical team, about maybe 30 percent went to [processor X]. [Company A]

1.3 Direct Employment

The two companies that were assessed had different operational capacities and utilization rates in 2017. Company A was operating at a lower utilization rate given that expansion of capacity was taking place. It processed about 27,000 t of cocoa beans and employed 340 workers. The majority of the workers were technicians and skilled labour accounting for 46 percent of the number of workers and 43 percent of wages (Figure 7 and Figure 8).

Figure 1: Direct employment by the number of workers per category, Cocoa processing company A

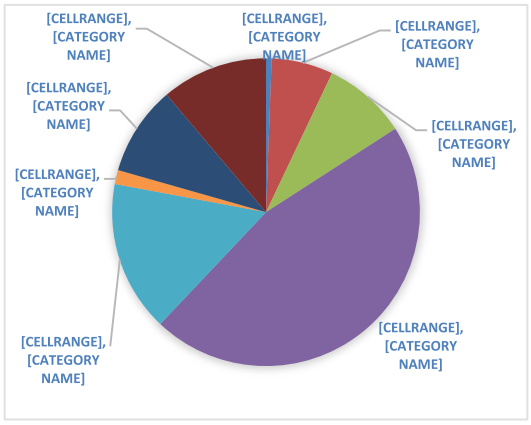


Figure 2: Direct employment by total monthly wages per category, Cocoa processing company A

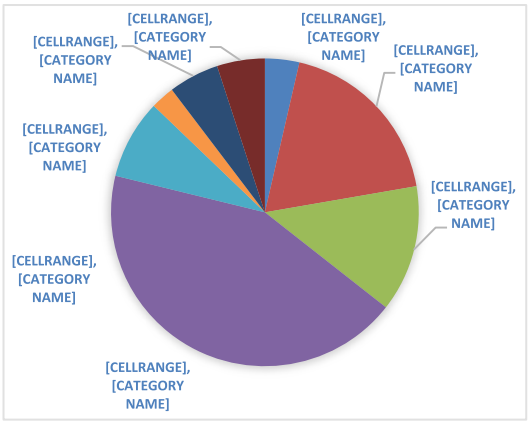


Figure 3: Direct employment by number of workers per category, Cocoa processing company B

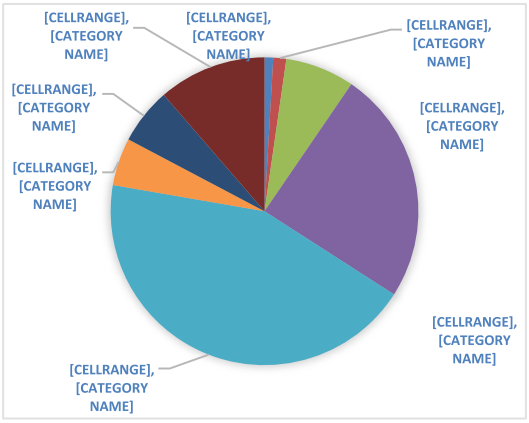
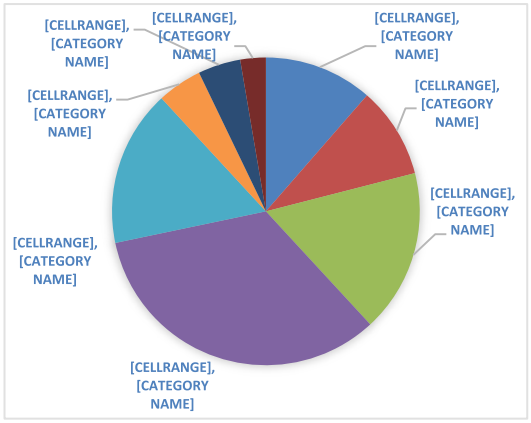


Figure 4: Direct employment by total monthly wages per category, Cocoa processing company B



Company B processed about 17,000 t of cocoa in 2017 and employed 220 workers. The largest number of workers was in the unskilled labour category including 96 workers which constitute 44 percent of the number of workers and 16 percent of the wages as indicated in Figure 9 and Figure 10 above.

As indicated in the previous section, the degree of automation between the two companies varies. Company A uses partially automated lines while Company B operates fully automated lines, resulting in estimated labour intensities of 3 percent for company A and 2 percent for Company B as indicated in Table 4 below. Thus, Company A's labour

intensity is 50 percent higher than Company B. Since, Company A uses partially automated lines it was expected to employ more workers. Although the expansion and partial installation in 2017 could have resulted in reducing the number of workers, considering the number of workers in 2018 indicates otherwise. Company A is operating at about 80 percent of its capacity in 2018 but the total number of workers stood at 350, which is only 10 more workers than in 2017. The degree of automation, consequently, is not affecting the number of workers significantly but it seems to have an effect on the composition of the workers. In Company A, the majority of the workers (55 percent) are supervisors, technicians and skilled workers. On the other hand, Company B that uses fully automated lines depends more on unskilled labour (44 percent) while supervisors, technicians and skilled labour constitute only 32 percent of the total number of workers.

The weighted average salary of all workers in both companies is very close; at USD 337 for Company A and USD 341 for Company B, per month. However, the salary range is much larger in Company B driven by the higher salaries of senior management and managers job categories (Table 4). The lowest wages are paid to the cleaners in both companies, at USD 80 per month in Company B, which is slightly higher than the minimum wage in Ghana in 2017 at USD60.14.

All of the workers of Company A, a total of 340, are on the company's payroll while Company B only have 96 of the 220 workers on its payroll. The remaining 124 workers are working on the company's premises through outsourcing contractors including cleaning services, loading and provision of factory hand (i.e. unskilled labour). Nevertheless, all workers are permanently employed and receive several benefits including social security coverage, health insurance and transportation.

With the exception of the senior management team, the workers in both companies are in their mid-twenties to their late-thirties as indicated in Table 4 below and the vast majority of the workers are men. The women within the technical employment categories are predominantly in the quality assurance unit, mainly in the laboratories.

Required educational attainment per job category appear realistic and although some of the unskilled labour do not have any education as indicated in Table 4 below, the majority of the workers have college or university degrees. The majority of the workers in administration, technical, supervision and management job categories possess a bachelor's or a professional degree, which is the general requirement for most of the jobs within these categories.

Both companies recruit their workers locally. Consequently, all of the workers are Ghanaians and most likely live in nearby areas. Nevertheless, given that transportation is provided and salaries appear appealing, some workers commute from farther cities on a daily or weekly basis. Both companies operate a continuous production process requiring workers in non-office jobs to work in shifts.

With the exception of highly technical jobs, both companies do not face challenges in attracting job seekers. In fact, job advertisements are not used since job seekers usually drop their resumes to the human resources departments of both companies. Consequently, when a vacancy comes up, the human resources department usually shortlists a few candidates from the resumes received earlier. Both companies provide training for management, technical

Minimum daily wage in Ghana for 2017 is GHS9.68 and the monthly salary is estimated based on 27-day month (https://mywage.org/ghana)

and administrative workers including on-the-job training in addition to training outside the facilities, mainly for management roles. One of the companies provide training for the national service persons on annual basis and recruit the trainees who prove to be capable by the end of the training period.

With regards to the indirect effects of the companies on the economy and employment, from the perspectives of the two companies studied, they expect that their expansion would create additional employment at their suppliers. For instance, increasing processing capacity could result in purchasing of more cocoa beans, and this would require additional logistics to transport the beans and the final product. Similarly, demand would grow for packaging materials, more electricity and other inputs will be demanded.

Company A

Direct employment		Employment characteristics				Characteristics of the workers					
Employment category	Person-year[1]	Wage[2] (USD/month)	Salary range[3] (USD/month)	Benefits[4]	Contract type[5]	Age (years)	Gender[4]	Education level[6]		Experience[7] (years)	Nationality[8]
								required	actual		
Senior management	2	2,069	1,379-2,299	SS, PS, HI, TA, PL, AP	100% P	34-45	100% M	B	B, M	3-9	100% G
Managers	22	973	460-1,069	SS, PS, HI, TA, PL, AP	100% P	25-36	90% M, 10% F	B, P, T	B, P, T	3-5	100% G
Supervisors	30	509	276-804	SS, PS, HI, TA, PL, AP	100% P	25-38	87% M, 13% F	B, P, T	B, P, T	3	100% G
Technicians and skilled labour	157	316	195-575	SS, PS, HI, TA, PL, AP	100% P	25-35	96% M, 4% F	B, P, T	B, P, T	3	100% G
Unskilled labour	54	177	115-207	SS, PS, HI, TA, PL, AP	100% P	25-28	100% M	B, P, T, S, C, N	B, P, T, S, C, N	2-3	100% G
Administrative	5	575	460-690	SS, PS, HI, TA, PL, AP	100% P	28-37	100% M	B, P, T	B, P, T	1-3	100% G
Security guards	32	190	184-220	SS, PS, HI, TA	100% P	28	100% M	B, P, T	B, P, T	3	100% G
Cleaners	38	152	138-195	SS, PS, HI, TA	100% P	25	100% M	B, P, T	B, P, T	3	100% G
Total	**340**	**337**	**115-2,299**				**96% M, 4% F**		**Labour intensity[9]**		**2.6%**

Company B

Direct employment		Employment characteristics				Characteristics of the workers					
Employment category	Person-year[1]	Wage[2] (USD/month)	Salary range[3] (USD/month)	Benefits[4]	Contract type[5]	Age (years)	Gender[4]	Education level[6]		Experience[7] (years)	Nationality[8]
								required	actual		
Senior management	2	4,287	3,678-4,643	SS, PA, HI, TA, PL, AP	100% P	40	100% M	M, B, P	M, B, P	3	100% G
Managers	3	2,402	2,184-2,620	SS, PA, HI, TA, PL, AP	100% P	36	67% M, 33% F	M, B, P	M, P	3	100% G
Supervisors	16	804	690-919	SS, PA, HI, TA, PL, AP	100% P	35	81% M, 19% F	B, P	B, P	1	100% G
Technicians and skilled labour	54	467	259-644	SS, PA, HI, TA, PL, AP	100% P	34-37	94% M, 6% F	B, P, T, S, C	B, P, T, S, C	2	100% G
Unskilled labour	96	129	115-147	SS, PA, HI, TA, PL, AP	100% P	25	100% M	C, N	C, N	1	100% G
Administrative	11	322	230-414	SS, PA, HI, TA, PL, AP	100% P	37	64% M, 36% F	B, T, C	B, T, C	2	100% G
Security guards	13	259	172-345	SS, PA, HI, TA, AP	100% P	38	100% M	S, C	S, C	2	100% G
Cleaners	25	80	80	SS, HI, TA	100% P	24	100% M	S, C	S, C	1	100% G
Total	**220**	**341**	**80-4,643**				**95% M, 5% F**		**Labour intensity[9]**		**2.1%**

1: Since all workers were employed for the full year, each worker is equivalent to a person-year or 12 person-month
2: Weighted average of wages of each employment category. The average exchange rate for 2017 was used (1 USD=4.3506 GHS)
3: Range between the minimum and maximum monthly wage within the employment category. The average exchange rate for 2017 was used (1 USD=4.3506 GHS)
4: Benefits assessed including SS: Social security, PA: Paid annual leave, PS: Paid sick leave, HI: Health insurance, TA: Transportation provided or transportation/fuel allowance, PL: Prenatal leave, AC: Provision of accommodation or partial payment of accommodation, AP: Annual performance bonus, MP: Monthly performance 4: Percentage of male (M) and female (F) workers in each employment category.
5: Percentage of each contract type within each employment category P: Permanent through the project duration, T: Temporari ly, D: Casual/daily
6: Required or actual educational attainment within each employment category: D: Doctorate, M: Master's, B: Bachelor's, P: Professional, T: qualifications midway between secondary and bachelor's, such as agriculture colleges, HND or technical certificates from polytechnics, S: Secondary, Technical/Vocational/Commercial including SHS, GCE O and A level, technical schools, C: BECE/MSLC, N: No education
7: Years of experience in the company.
8: Percentage of each nationality within each employment category where G: Ghanaian, O: Other.
9: Total wages divided by total production value.

5. Estimating Indirect and Induced Employment

5.1 An overview of Ghana 2015 social accounting matrix

The indirect and induced employment effects of cocoa-processing presented in this report are estimated based on the latest social accounting matrix (SAM) available for Ghana, the 2015 SAM. While the SAM was constructed with detailed transaction data on 55 production sectors and 56 commodities accounts, the output of cocoa-processing sector was not included in the SAM as a separate account.

According to the International Food Policy Research Institute (IFPRI), one of the institutes which participated in the preparation of the SAM, the outputs of the cocoa-processing was captured in the "other foods" account of the SAM. However, upon closer analysis of the SAM, it became clear that this was not accurate. It was found that the total output for "other foods" processing as captured in the SAM is much smaller than the current total cocoa processing output. Upon further consultation, it was indicated that the underlying Supply Use Table used to construct the SAM was of 2004 at which time only 3% of cocoa was processed in Ghana. However, as indicated in the previous section, around 25 percent of the cocoa production is processed locally. The current SAM was not fully updated.

Thus, in order to estimate the indirect and induced employment effects of increasing the output of cocoa-processing, it was decided not to use the multipliers of "other foods" as this would provide inaccurate results. In order to overcome this limitation, it was decided to create two separate cocoa processing accounts in the SAM, one for each of the two companies and based on the data collected as part of this study. Table 5 shows the list of accounts included in the SAM and how the two cocoa processing companies were integrated into the SAM.

Table 5 Ghana SAM activities and commodities

Code	Description	Code	Description	Code	Description
maiz	Maize	fore	Forestry	petr	Petroleum
sorg	Sorghum and millet	fish	Fishing	chem	Chemicals
rice	Rice	coal	Coal and lignite	nmet	Non-metal minerals
ocer	Other cereals	coil	Crude oil	metl	Metals and metal products
puls	Pulses	ngas	Natural gas	mach	Machinery and equipment
gnut	Groundnuts	omin	Other mining	oman	Other manufacturing
oils	Other oilseeds	meat	Meat, fish and dairy	elec	Electricity, gas and steam
cass	Cassava	fveg	Fruit and vegetable processing	watr	Water supply and sewage
root	Other roots	foil	Fats and oils	cons	Construction
vege	Vegetables	gmll	Grain milling	trad	Wholesale and retail trade
sugr	Sugar cane	sref	Sugar refining	tran	Transportation and storage
toba	Tobacco	CocoP com A	Cocoa Procesing Company A	hotl	Accommodation and food services
cott	Cotton and fibers	CocoP com B	Cocoa Procesing Company B	comm	Information and communication
frui	Fruits and nuts	food	Other foods	fsrv	Finance and insurance
coco	Cocoa	beve	Beverages	real	Real estate activities
coff	Coffee and tea	ptob	Tobacco processing	bsrv	Business services
ocrp	Other crops	text	Textiles	padm	Public administration
catt	Cattle	clth	Clothing	educ	Education
poul	Poultry	leat	Leather and footwear	heal	Health and social work
oliv	Other livestock	wood	Wood and paper	osrv	Other services

Source: Ghana SAM 2015 and data collected form the case studies

5.3 The technical coefficient matrix

Computing the technical coefficients is the first step to calculate both Type I and Type II multipliers. The coefficients show the amount of material and service input needed to produce one cedi worth output of a given account in the SAM. As the other food account of the SAM was deemed to be inaccurate, the technical coefficients were estimated from the data on inputs obtained from the two companies. The input data obtained are presented in Tables 6 and 7. In addition to the supply inputs data obtained, the wage and profit data of the companies were obtained from the wage bills and financial statements of the two companies where available. These figures were also used to determine the cocoa stock levels of the two companes, and these were allocated to the savings and investment account.

Table 6: Supplies including materials and services utilized by cocoa processing company A, in 2017

Supply type	Description	Material source	Total (USD[1])
Material	Cocoa beans	Domestic	63,800,754
Material	Packaging	Domestic	869,917
Service	Insurance	Domestic	36,935
Service	Financial audit and related fees	Domestic	24,000
Service	Food catering	Domestic	104,680
Service	Logistics and transportation	Domestic	308,254
Utility	Electricity	Domestic	2,195,125
Utility	Diesel	Domestic	913,197
Utility	Liquefied petroleum gas	Domestic	312,004
Other	Laboratory consumables	Imported	46,504
Other	Machine parts and consumables	Imported	835,780
	Wages (Factor labour)		1,720,237
		Supplies cost in USD[1]	**71,167,387**
		Profit (Factor Capital)	**6,568,259**
		Reported capital investments in USD[1]	**14,049,698**

1: Using the average exchange rate of 2017 (1 USD=4.3506 GHS).

Table 7: Supplies including materials and services utilized by cocoa processing company B, in 2017

Supply type	Description	Material source	Total (USD[1])
Material	Cocoa beans	Domestic	40,965,482
Material	Packaging	14% Imported	790,194
Material	Other materials	Domestic	7,081
Service	Certification	Domestic	61,175
Service	Fees and licenses	Domestic	7,185
Service	Financial and other audit and related fees	Domestic	66,939
Service	Maintenance and repair	Domestic	64,897
Service	Warehouse and transport of raw material	Domestic	152,570
Service	Other services	Domestic	210,927
Utility	Electricity	Domestic	1,689,740
Utility	Liquefied petroleum gas	Domestic	618,718
Utility	Water	Domestic	143,064
Other	Laboratory consumables	Domestic	79,269
Other	Machine parts and consumables	Domestic	469,901
	Wages (Factor labour)		901,531
	Profit (factor capital)		4,301,261
		Supplies cost in USD[1]	**50,529,940**
		Reported capital investments USD[1]	**64,780,767**

1: Using the average exchange rate of 2017 (1 USD=4.3506 GHS).

These inputs were then matched with the most appropriate sectors in the SAM and technical coefficients for the two companies were calculated and presented in Table 8.

Table 8 The technical coefficient of Company A and Company B

SAM Sectors	The technical coefficient		
	Company A	Company B	Other foods
Agriculture, forestry and fishing	0.705	0.701	0.228
Agro-processing	-	-	0.265
Wood and paper	0.010	0.010	0.006
Petroleum and Chemicals	0.014	0.011	0.043
Machinery and equipment	-	-	0.008
Electricity, gas and steam	0.024	0.029	0.012
Water supply and sewage	0.000	0.002	0.004
Wholesale and retail trade	0.000	0.010	-
Transportation and storage	0.003	0.003	0.013
Accommodation and food services	0.001	0.000	-
Information and communication	-	-	0.003
Finance and insurance	0.001	0.001	0.001
Other services	0.000	0.006	-
Labor - urban primary	0.002	0.003	-
Labor - urban secondary	0.002	0.001	-
Labor - urban tertiary	0.016	0.012	-
Capital Account	0.073	0.074	0.289
Saving and Investment	0.141	0.136	-
RoW	0.010	0.004	
Total	1	1	1

Source: Computed based on the study data

Despite the different technology used for processing, the input structure of the two companies and their technical coefficients are quite similar. Based on this, no major differences would be expected from the indirect effects of the two companies.

5.4 Type I and Type II multipliers

Using the SAM in which the technical coefficients of the two cocoa-processing companies were integrated, Type I and Type II multipliers for the two processors were computed. They are presented below and compared with the multipliers for the other food account.

Table 9 Type I and Type II multipliers

	Company A	Company B	Other Food Processing
Type I	2.22	2.25	2.30
Type II	2.93	2.96	2.63

These multipliers show by how much other sectors should increase their output in order to meet the additional input demand from the cocoa processing sector. As such, the Type I multipliers for the two companies were found to similar at 2.22 and 2.25 respectively.

These multipliers capture the direct and indirect (suppliers) impacts. What these multipliers show is that an increase in the final demand by one GHc in Company A and Company B would increase the total output of other sectors by 2.22 GHc and 2.25 GHc respectively.

In order to estimate the induced effects, the study uses multipliers computed using the SAM, the Type II multipliers. The third column of Table 9 presents Type II multiplies of both companies and they include, the direct, indirect and induced effects of increasing cocoa-processing. With the induced effect included, the total output multiplier for Company A increased to 2.93, and multipliers of Company B also increased to 2.96. As indicated in Table 10, in this component of multiplier, sectors which hardly show any increase when only looking at the indirect effects (Type I), such as wholesale and retail trade, transportation and storage, financial services, accommodation and food services, and education has now increased significantly. This provides an indication of how the induced effects transmit into other sectors, which is through households' consumption spending. Table 10 below shows the sectoral breakdown of multipliers. The difference between the Type I and Type II multipliers captures the induced effects.

Table 10 Sectoral breakdown of Type I and Type II output multipliers of Company A and Company B

	Company A		Company B	
Sectors	Type I Multipliers	Type II Multipliers	Type I Multipliers	Type II Multipliers
Agriculture, forestry and fishing	0.751	0.799	0.747	0.797
Mining and quarrying	0.071	0.060	0.073	0.062
Agro-processing	0.016	0.083	0.016	0.083
Company A cocoa processing	1.000	1.000	0.000	0.000
Company B cocoa processing	0.000	0.000	1.000	1.000
Other foods processing	0.001	0.007	0.001	0.007
Textile and clothing	0.013	0.011	0.013	0.011
Wood and paper	0.019	0.018	0.020	0.019
Petroleum and Chemicals	0.121	0.082	0.122	0.083
Non-metal minerals	0.005	0.003	0.005	0.003
Metals and metal products	0.028	0.004	0.029	0.004
Machinery and equipment	0.029	0.000	0.032	0.000
Other manufacturing	0.002	0.002	0.002	0.002
Electricity, gas and steam	0.042	0.081	0.047	0.088
Water supply and sewage	0.004	0.036	0.007	0.039
Construction	0.004	0.011	0.004	0.012
Wholesale and retail trade	0.013	0.189	0.022	0.199
Transportation and storage	0.030	0.200	0.034	0.204
Accommodation and food ser	0.002	0.067	0.001	0.067
Information and communication	0.004	0.052	0.005	0.053
Finance and insurance	0.018	0.047	0.020	0.049
Real estate activities	0.011	0.039	0.011	0.039
Business services	0.019	0.019	0.020	0.020
Public administration	0.001	0.005	0.001	0.005
Education	0.001	0.038	0.001	0.038
Health and social work	0.012	0.015	0.012	0.015
Other services	0.000	0.056	0.006	0.062
Total	**2.217**	**2.924**	**2.251**	**2.961**

5.5 Sectoral employment data and employment-output ratio

The sectoral employment data as presented in FTEs - used in this analysis are based on the Labour Force Survey 2015 which are discussed and presented in the 2015 Labour Force Report (GSS 2016) and the Labour Force Survey data which is available from the GSS. The sectoral output is obtained from the Ghana SAM 2015. The sectoral employment data used are hours worked by those who have their primary occupation in the sector. The total hours worked were then converted into Full Time Equivalents (FTE). The definition of FTE used is that one FTE is equivalent to 1800 hours worked. Based on the sectoral employment and output data, the employment to output ratios were computed as presented in Table 11.

Table 11 Employment data and employment-output ratios

	Sectoral employment primary occupation (LFS 2015)	Average weekly hours worked (LFS report 2015)	Total weekly hours worked	FTEs	Sectoral output in million GHS (SAM 2015)	Employment - output ratios (FTES per million GHS)
Agriculture, forestry and fishing	3,330,089	33.4	111,224,973	3,213,166	29,956	107
Mining and quarrying	74,663	26.3	1,963,637	56,727	30,803	2
Agro-processing	618,175	*33.7*	*20,832,498*	601,828	9,598	63
Other food processing	1159	*33.7*	*39,058*	1,128	892	1
Textile and clothing	56,279	*33.7*	*1,896,602*	54,791	1,155	47
Wood and paper	78,426	*33.7*	*2,642,956*	76,352	3,516	22
Petroleum and Chemicals	16,430	*33.7*	*553,691*	15,996	10,351	2
Non-metal minerals	29,511	*33.7*	*994,521*	28,731	1,205	24
Metals and metal products	21,704	*33.7*	*731,425*	21,130	1,265	17
Other manufacturing	9,730	*33.7*	*327,901*	9,473	355	27
Electricity, gas and steam	11,105	37.4	415,327	11,998	8,526	1
Water supply and sewage	29,630	33.7	998,531	28,846	4,537	6
Construction	316,368	30.8	9,744,134	281,497	28,370	10
Wholesale and retail trade	1,925,943	39.2	75,496,966	2,181,023	20,067	109
Transportation and storage	252,215	45.4	11,450,561	330,794	22,119	15
Accommodation and food services	405,658	39.3	15,942,359	460,557	11,215	41
Information and communication	46,052	37.2	1,713,134	49,491	8,179	6
Finance and insurance	71,591	42.1	3,013,981	87,071	7,890	11
Real estate activities	6,103	38.3	233,745	6,753	6,068	1
Business services	128,279	41.8	5,360,308	154,853	10,745	14
Public administration	182,442	45.7	8,337,599	240,864	14,831	16
Education	534,379	29.2	15,603,867	450,778	9,039	50
Health and social work	241,238	40.5	9,770,139	282,248	3,576	79
Other services	383,274	33.6	12,878,006	372,031	5,932	63

Note that in order to compute the employment-output ratios, the structure of the sectoral employment data should be the same as the SAM in terms of sectoral classification. However, in the Ghana SAM, there are output data for detailed agricultural crops, forestry, and fishing separately, but there is only one employment dataset containing the sum of all workers in these activities. To resolve the mismatch in the aggregation levels, the output data in the SAM were aggregated up to the level of the employment data. And the implicit assumption in doing so is that, within a group of activities whose output has been aggregated up, the labour intensities of all activities in that group are the same.

After the employment sectors and sectors in the SAM were matched, the employment to output ratios could be calculated by dividing total employment by total output of the sector. As the output is captured in millions of GHC, it provides the average amount of labour required to produce one million worth of output for each sector. The inverse of this ratio is also referred to as apparent productivity as this shows the average output for unit of labour. It is however not the same as labour productivity as labour productivity is calculated without including the inputs into the sector.

It is important to note the large differences in employment output ratios between sectors, and in particular to note the low apparent productivity of the agriculture sector (107 FTEs per 1 million GH output) and wholesale and retail (109 FTEs per 1 million GH output) compared to other sectors. This low apparent productivity in agriculture and wholesale and retail will have important implications for estimating employment effects because any increase in the output will result in a large increase in the estimated number of additional labour required. Given that such low productivity- low income employment is not generally the policy priority, estimations of high employment generation in these sectors should be treated with caution.

5.6 Findings on indirect employment effects Type I (Indirect) multipliers

To estimate the indirect employment effects of the cocoa-processing investments, first the Type I multipliers of company A and B which we computed in the previous section were used to obtain the resulting changes in the output of all sectors that produce goods and services that are utilized by the cocoa processing companies. Then these output changes were used to estimate the employment effects by applying the employment-output ratios. This was done for both companies to estimate the indirect employment effects of investing 1 million GHS in both cocoa processing companies.

In order to differentiate between employment creation in the different sectors which have very different labour productivity, the sectors were divided into three categories based on the EO ratio. It should be remembered here that the EO ratio is the inverse of apparent productivity. So, sectors with a high EO ratio have low apparent productivity and vice versa. For ease of reference, we will use the terms low, medium and high productivity instead of EO ratios as it is more familiar. Sectors with an EO ratio above 100 FTE/ GHS million were categorised as low productivity. Those between 100 and 25 as medium productivity. And those with an EO ratio of below 25 as low productivity. While there are no hard criteria for these three categories, the main objective is to be able to differentiate from employment created in more productive sectors from that created in sectors that are less productive, generally of poor quality and thus less desirable. Using this breakdown, agriculture and wholesale and retail are high EO sectors with the lowest productivity and most likely lower wages.

As Table 12 shows, the total indirect employment effects expected as a result of 1 million GHS in company A and B would be around 88 and 87 FTE respectively. Most of the additional jobs created are in the agriculture sector. Other sectors such as agro-processing, wholesale and retail trade also contribute to the indirect FTEs created.

Table 12 Findings on indirect employment effects

	Type I Multipliers		Indirect employment Effects in FTEs	
Sectors	**Company A**	**Company B**	**Company A**	**Company B**
Agriculture, forestry and fishing	0.751	0.747	81	80
Mining and quarrying	0.071	0.073	0	0
Agro-processing	0.016	0.016	1	1
Company A cocoa processing	1.000	0.000	0	0
Company B cocoa processing	0.000	1.000	0	0
Other foods processing	0.001	0.001	0	0
Textile and clothing	0.013	0.013	1	1
Wood and paper	0.019	0.020	0	0
Petroleum and Chemicals	0.121	0.122	0	0
Non-metal minerals	0.005	0.005	0	0
Metals and metal products	0.028	0.029	0	0
Machinery and equipment	0.029	0.032	0	0
Other manufacturing	0.002	0.002	0	0
Electricity, gas and steam	0.042	0.047	0	0
Water supply and sewage	0.004	0.007	0	0
Construction	0.004	0.004	0	0
Wholesale and retail trade	0.013	0.022	1	2
Transportation and storage	0.030	0.034	0	1
Accommodation and food services	0.002	0.001	0	0
Information and communication	0.004	0.005	0	0
Finance and insurance	0.018	0.020	0	0
Real estate activities	0.011	0.011	0	0
Business services	0.019	0.020	0	0
Public administration	0.001	0.001	0	0
Education	0.001	0.001	0	0
Health and social work	0.012	0.012	1	1
Other services	0.000	0.006	0	0
Total	**2.22**	**2.25**	**87**	**88**

5.7 Findings on induced employment effects Type II (Induced) multipliers

To estimate the induced employment effects of increasing cocoa processing, first Type II multipliers of the two companies were computed using the SAM, then Type I multipliers were deducted to exclude the direct and indirect effects. The multipliers which contain induced effects are presented in the second column of Table 13 and they were used with the employment to output ratios to estimate the induced employment effects. The last two columns of Table 13 show, the induced employment effects were estimated for both Company A and B using one million GHS investment. As such, around 47 and 52 FTEs of induced employment would be created using the technology of Company A and Company B respectively.

As can be expected the sectoral breakdown for the induced employment effects looks different from the indirect effects. And while employment is in the agriculture, agro-processing and wholesale and retail trade, again feature prominently in terms of the magnitude of employment creation, and important difference is a strong induced effect on employment in the medium apparent productivity sectors (EO) such as accommodation and food services, textile and clothing, education, and other services sectors. While employment in medium EO sectors accounts for 40 percent of induced jobs created, jobs in low and high EO ratio sectors account for 10 and 50 percent respectively.

Table 13: Estimating induced employment effects using SAM 2015

	Type II Multipliers		Induced employment Effects in FTEs	
Sectors	**Company A**	**Company B**	**Company A**	**Company B**
Agriculture, forestry and fishing	0.799	0.797	5	5
Mining and quarrying	0.060	0.062	0	0
Agro-processing	0.083	0.083	4	4
Company A cocoa processing	1.000	0.000	0	0
Company B cocoa processing	0.000	1.000	0	0
Other foods processing	0.007	0.007	0	0
Textile and clothing	0.011	0.011	0	0
Wood and paper	0.018	0.019	0	0
Petroleum and Chemicals	0.082	0.083	0	0
Non-metal minerals	0.003	0.003	0	0
Metals and metal products	0.004	0.004	0	0
Machinery and equipment	0.000	0.000	0	0
Other manufacturing	0.002	0.002	0	0
Electricity, gas and steam	0.081	0.088	0	0
Water supply and sewage	0.036	0.039	0	0
Construction	0.011	0.012	0	0
Wholesale and retail trade	0.189	0.199	19	19
Transportation and storage	0.200	0.204	3	3
Accommodation and food services	0.067	0.067	3	3
Information and communication	0.052	0.053	0	0
Finance and insurance	0.047	0.049	0	0
Real estate activities	0.039	0.039	0	0
Business services	0.019	0.020	0	0
Public administration	0.005	0.005	0	0
Education	0.038	0.038	2	2
Health and social work	0.015	0.015	0	0
Other services	0.056	0.062	4	4
Total	**2.92**	**2.96**	**40**	**40**

5.8 Employment effects from simulating the two scenarios

As indicated in the background section, the main purpose of this study is to assess the employment impact of expanding the exports of processed cocoa by exploring the following questions:

1. What would be the employment impact if processed cocoa exports were to increase significantly to USD1.5 billion?

2. What will be the employment impact if Ghana processed and exported 40 percent of its cocoa yield over the next five years which is the target of the National Export Development Strategy?

In order to approach these two questions, we will elaborate them further as two possible scenarios, with the first question informing scenario 1 and the second, scenario 2.

Scenario 1 involves increasing the value of exports of processed cocoa to USD1.5 billion per year. In 2017, Ghana exported USD 758 million of processed cocoa export- hence, the study will estimate the employment effects of exporting an additional USD 742 million. In this scenario, it will be assumed that the production of cocoa beans will also be increased sufficiently so that all the additional cocoa processed is also from additional cocoa grown, and as a result, there is no decrease in the export of cocoa beans. This scenario would thus have a large indirect employment effect in the agriculture sector as the production of the additional cocoa would demand a lot of additional labour.

For Scenario 2, it will be assumed that the share of processed cocoa exported will increase to 40 percent of the cocoa yield which is the target of the National Export Development Strategy. As the share is currently only 24 percent, this approach would require increasing the export share of processed cocoa by USD 464 million. As part of this scenario, it will also be assumed that there will be no increase in current levels of cocoa production. Rather in this scenario, the increase of cocoa processing will come at the expense of export of cocoa beans. This will result in far fewer indirect employment effects, and in particular, there will be no increased employment in the production of cocoa, as there is no increase in its production. The indirect effects will be limited to the inputs of other suppliers to the cocoa processors.

In this section, we will present the findings from the simulation of these two scenarios. Given the finding that different processing technologies, with different direct employment effects and indirect employment effects, were found was decided to do simulations for both these processing technologies, thus in resulting in four sets of results: Scenario 1 using technology A and B, and Scenario 2 using technology A and B. This will allow for comparisons of not only the two scenarios but also what kinds of differences one can anticipate if the two types of technologies are used.

Scenario 1: Processed cocoa exports were to increase significantly to USD1.5 billion

Consequently, to reach USD1.5 billion of exports of processed cocoa, the quantity will differ based on the unit price used. Current exports are USD 758 million, so an increase of USD 742 million is required.

i. Direct Employment Effects for companies A and B

If the average price of Company A is used, then this would main an additional 335,000 tonnes of processed cocoa is to be exported. Given the assumption of scenario 1 and a yield of 80%, this would mean an additional 419,000 tonnes of cocoa is to be processed. At 9 FTE per tonne, that would result in additional 3,771 direct FTE using company A parameters.

If the average price of Company B is used, then this would main an additional 290 000 tonnes of processed cocoa is to be exported. Given the assumption of scenario 1 and a yield of 80%, this would mean an additional 363,000 tonnes of cocoa is to be processed. At 10 FTE per tonne, that would yield an additional 3630 FTE using company B parameters. It is important to note also that based on the findings presented earlier, the skills composition of the workers taking up this employment would be different between the two companies.

Table 14 Direct effects of increasing exports to USD 1500 million per annum

Description		***Company A***	**Company B**
Total export value USD million	*1500*		
Current export value	*758*		
Increased exports	*742*		
Average selling price (USD per tonne)		*2218*	*2558*
Additional exported volume of processed cocoa		*335*	290
Additional volume of beans to be processed (000 t)		*419*	*363*
FTEs per tonne of beans processed		***9***	**10**
Number of additional jobs (person-year)		***3771***	**3630**
Average wage (monthly)		***337***	**341**
Additional wages paid per year (USD million)		***15.2***	**14.9**
	Source: Author's estimates assuming a linear relation between the volume of processed cocoa and jobs. *1: ISSR, The State of the Ghanaian Economy Report, the price per t in 2016 was USD3,574.*		

ii. Indirect and Induced employment effects

As shown earlier the indirect and induced effects of either company increasing their production would be quite similar. For Company A the indirect employment effects of increasing cocoa processing to 1.5 billion would be around 281,000 FTEs and the induced employment effect approximately around 130,000 FTEs as shown in Table 15.

Table 15 Indirect and induced employment effects of scenario 1 company A

	Multipliers		Employment effects of 1.5 billion	
Sectors	**Type I Multipliers**	**Type II Multipliers**	**Indirect**	**Induced**
Agriculture, forestry and fishing	0.751	0.799	260,033	16,620
Mining and quarrying	0.071	0.06	422	0
Agro-processing	0.016	0.083	3,239	13,561
Company A cocoa processing	1	1	0	0
Company B cocoa processing	0	0	0	0
Other foods processing	0.001	0.007	4	25
Textile and clothing	0.013	0.011	1,991	0
Wood and paper	0.019	0.018	1,332	0
Petroleum and Chemicals	0.121	0.082	604	0
Non-metal minerals	0.005	0.003	385	0
Metals and metal products	0.028	0.004	1,510	0
Machinery and equipment	0.029	0	0	0
Other manufacturing	0.002	0.002	172	0
Electricity, gas and steam	0.042	0.081	191	177
Water supply and sewage	0.004	0.036	82	657
Construction	0.004	0.011	128	224
Wholesale and retail trade	0.013	0.189	4,561	61,749
Transportation and storage	0.03	0.2	1,448	8,207
Accommodation and food ser	0.002	0.067	265	8,617
Information and communication	0.004	0.052	78	938
Finance and insurance	0.018	0.047	641	1,033
Real estate activities	0.011	0.039	40	101
Business services	0.019	0.019	884	0
Public administration	0.001	0.005	52	210
Education	0.001	0.038	161	5,956
Health and social work	0.012	0.015	3,057	764
Other services	0	0.056	0	11,337
Total	**2.217**	**2.924**	**281,280**	**130,176**

For Company B the indirect employment effects of increasing cocoa processing to USD 1.5 billion would be approximately 285,000FTEs. Looking at the induced employment effects, the total employment created is estimated to be around 131,000 FTEs.

It must be emphasized however that the indirect employment created is predominantly in sector with low apparent productivity, in particular agriculture and wholesale and retail trade contributing more than 93 percent of the jobs. For the induced FTE, this is less prominent, with around 60 percent of the FTEs in the low apparent productivity (EO ratios) sectors.

Table 16 Indirect and induced employment effects of scenario 1 company B

	Company B technology		Employment effects of 1.5 billion	
Sectors	**Type I Multipliers**	**Type II Multipliers**	**Indirect**	**Induced**
Agriculture, forestry and fishing	0.747	0.797	258,648	17,312
Mining and quarrying	0.073	0.062	434	0
Agro-processing	0.016	0.083	3,239	13,561
Company A cocoa processing	0.000	0.000	0	0
Company B cocoa processing	1.000	1.000	0	0
Other foods processing	0.001	0.007	4	25
Textile and clothing	0.013	0.011	1,991	0
Wood and paper	0.020	0.019	1,402	0
Petroleum and Chemicals	0.122	0.083	609	0
Non-metal minerals	0.005	0.003	385	0
Metals and metal products	0.029	0.004	1,564	0
Machinery and equipment	0.032	0.000	0	0
Other manufacturing	0.002	0.002	172	0
Electricity, gas and steam	0.047	0.088	214	186
Water supply and sewage	0.007	0.039	144	657
Construction	0.004	0.012	128	256
Wholesale and retail trade	0.022	0.199	7,719	62,100
Transportation and storage	0.034	0.204	1,641	8,207
Accommodation and food ser	0.001	0.067	133	8,749
Information and communication	0.005	0.053	98	938
Finance and insurance	0.020	0.049	712	1,033
Real estate activities	0.011	0.039	40	101
Business services	0.020	0.020	930	0
Public administration	0.001	0.005	52	210
Education	0.001	0.038	161	5,956
Health and social work	0.012	0.015	3,057	764
Other services	0.006	0.062	1,215	11,337
Total	**2.251**	**2.961**	**284,691**	**131,393**

Scenario 2: What is the impact if Ghana process and export 40 percent of its cocoa yield

i. Direct Using Technology of Company A and B:

As the current export level was estimated Using the average price of the two companies, the 40 percent would main an additional 160, 000 tonnes of processed cocoa is expected to be processed. Using the number of FTEs per tonne, this scenario would create around 1440 direct FTEs would be created if the technology of company A was used. The estimated number of direct FTEs would slightly increase to 1600 using the technology of company B.

Table 17: Estimated direct employment of processing 40% cocoa beans: Company A and B technologies

Description	*Company A*	Company B
Total cocoa beans produced (000 t)	*999*	*999*
Processing 40% of total production (000 t)	*400*	*400*
Current Processing (24%)	*240*	*240*
Additional processed volume	*160*	*160*
Additional Processed cocoa, yield at 80% (000 t)	*128*	***128***
FTEs per tonne of beans processed	***9***	**10**
Number of additional jobs (person-year)	***1440***	**1600**
Average wage (monthly)	***337***	**341**
Additional wages paid per year (USD million)	***5.8***	**6.5**
Average selling price (USD per tonne)	**2218**	**2558**
Value of exports using selling price of company (USD million)	**284**	**327**
Value of exports using average selling price in 2016[1] (USD million)	**457**	**457**

Source: Author's estimates assuming a linear relation between volume of processed cocoa and jobs.
1: ISSR, The State of the Ghanaian Economy Report, price per t in 2016 was USD3,574.

i. Indirect and Induced Using technology A and B

Using the technology of company A, the indirect employment effect of processing 40 percent of the annual cocoa production is estimated to be around 13,300 FTEs. Sectors such as wholesale and retail trade, agro-processing, and health and social works are contributing the majority of the indirect jobs. Since in this scenario, the increased processed cocoa export comes at the expense of cocoa beans export than growing additional beans, there will not be indirect jobs created in the agriculture sector. Looking at the indirect FTEs estimated using the technology company B, the indirect jobs created would be around 16,300 FTEs.

The study also estimated the induced employment effects of this scenario using the technology of both companies. The effect found to be around 81,500 FTEs and 82,500 FTEs of induced employment estimated using the technology of company A and company B respectively. As Table 18 shows the sectoral breakdown for the induced employment effects looks different from the indirect effects. And while employment is in the agriculture, agro-processing and wholesale and retail trade, again feature prominently in terms of magnitude of employment creation, and the important difference is a strong induced effect on employment in the medium EO ratio sectors such as, accommodation and food services, textile and clothing, education, and other services sectors.

Table 18: Estimated indirect and induced employment scenario 2: Company A and B technologies

	Company A technology		Company B technology	
Sectors	**Indirect**	**Induced**	**Indirect**	**Induced**
Agriculture, forestry and fishing	-	10,404	-	10,837
Mining and quarrying	264	0	272	0
Agro-processing	2027	8,489	2027	8,536
Company A cocoa processing	0	0	0	0
Company B cocoa processing	0	0	0	0
Other foods processing	3	15	3	17
Textile and clothing	1246	0	1246	0
Wood and paper	834	0	878	0
Petroleum and Chemicals	378	0	381	0
Non-metal minerals	241	0	241	0
Metals and metal products	945	0	979	0
Machinery and equipment	0	0	0	0
Other manufacturing	108	0	108	28
Electricity, gas and steam	119	111	134	114
Water supply and sewage	51	411	90	416
Construction	80	140	80	149
Wholesale and retail trade	2855	38,654	4832	38,869
Transportation and storage	907	5,137	1027	5,142
Accommodation and food services	166	5,394	83	5,486
Information and communication	49	587	61	584
Finance and insurance	401	647	446	649
Real estate activities	25	63	25	63
Business services	553	0	582	0
Public administration	33	131	33	157
Education	101	3,729	101	3,789
Health and social work	1914	478	1914	469
Other services	0	7,097	760	7,118
Total	**13,300**	**81,488**	**16,302**	**82,422**

5.9 Disaggregating employment effects by gender, age, locality, informality and skills

In addition to the employment data by economic sectors, the 2015 LFS provides detailed information on the percentage distribution of sectoral employment by gender, age, locality, informality and skills. Based on this distribution a breakdown of the indirect and induced employment effect can be estimated. The key assumption behind this is that additional employment created in these sectors will follow a similar pattern as was found in the LFS. In the short-term this assumption seems reasonable. Using the estimated employment created as a result of increasing earnings from processed cocoa to USD 1.5 billion, this section estimates the proportion shares of the above categories. Note that the employment effects used for this analysis are indirect and induced FTEs computed using the technology of company A. These results were then compared with national averages and presented in tables 20 and 21.

Table 20: distribution of indirect and induced effects

	Indirect and Induced effects		National Averages*	
Age	Youth	Non-Youth	Youth	Non-Youth
Percentage	*38*	*62*	*43*	*57*
Gender	Male	Female	Male	Female
Percentage	*49*	*51*	*47*	*53*
Location	Urban	Rural	Urban	Rural
Percentage	*35*	*65*	*53*	*47*
Formality	Formal	Informal	Formal	Informal
Percentage	*11*	*89*	*13*	*87*

**Computed, based on hours worked data from LFS 2015*

Table 21: Indirect and induced employment for different skill levels.

	Indirect and Induced effects			National Averages*		
Skills	Level 1	Level 2	Levels 3&4	Level 1	Level 2	Levels 3&4
Percentage	7	89	4	6	83	11

** Computed, based on hours worked data from LFS 2015*

Looking at the share of youth employment created, the indirect and induced employment created tend to significantly favour the non-youth category over the youth workers. With regards to gender, the employment effects seem to be distributed proportionally among males and females. This is also reflected in the national averages. The jobs are also inclined to be more rural than urban. In terms of in/formality of jobs created, it appears that the indirect and induced employment tends to follow a similar pattern with the national average. Compared to the national average, cocoa processing creates slightly higher jobs for skills level 2 and less for skills level 3 and 4.

6 Findings and Recommendations

6.1 Summary of employment related findings

The findings indicate that the direct employment generated in cocoa processing is significant, not so much in terms of the number of jobs created, but more in terms of the quality of jobs. The labour intensity, estimated as the share of labour wages to output, was estimated by the study team at about 3 percent. It should be kept in mind however that the cost of cocoa beans accounts for about 80 percent of production costs and that processing cocoa requires extensive capital investment. Labour intensity is a proxy for the induced employment effects, and it indicates that 3 percent of the total value of cocoa product exports goes to wages which are mostly used for local consumption.

Other indicators of direct employment are presented in Table22 below. The findings of this study indicate that for every thousand metric tonnes of exported processed cocoa, 12 to 13 person-year of employment are generated (i.e. 12 to 13 workers are employed for a year). Utilizing the value of exports of both companies in 2017, it is estimated that for each million USD of exports, five person-year of employment is generated (i.e. 5 workers are employed for a year).

Table 22: Direct employment per production value and volume for both companies

Description	Company A	Company B
Installed capacity (t)	60,000	25,000
Processed cocoa bean (t)	36,066	21,665
Cocoa products (t)	29,351	16,649
Total export value (USD million)	65,099,886	42,586,800
Number of workers	340	220
Worker (FTE) per (000 t) of cocoa beans processed	9	10
Worker (FTE) per (000 t) of cocoa products exported	12	13
Worker (FTE) per USD million in exports	5	5

Source: Author's interview notes.

The average selling price of processed cocoa in 2017 by the companies that were assessed was USD2,388 per t, but the average selling price per t of processed cocoa in 2016 based in ISSR report was USD3,574.

If the future additional processing capacity in Ghana utilizes partially automated lines, most of the additional jobs that will be created will be skilled jobs concentrated in the job categories of supervisors, technicians and skilled labour which also tend to pay higher wages as indicated in Table 23. The same table indicates that if fully automated cocoa processing facilities are used, the majority of the additional employment will be created in the unskilled labour category.

Table 23: Breakdown of estimated direct employment of processing cocoa beans

Job category	Partially automated[1]	Fully automated[2]	Wage range[3] (USD/month)
	Number	Number	
Senior management	24	40	2,069-4,287
Managers	260	40	973- 2,402
Supervisors	352	280	509 -804
Technicians and skilled labour	1,848	1,000	316-467
Unskilled labour	636	1,760	129 -177
Administrative	60	200	322-575
Security guards	376	240	190- 259
Cleaners	448	440	80 -152

1: Based on breakdown of employment in Company A which is partially automated.
2: Based on breakdown of employment in Company B which is fully automated.
3: Monthly salary range based on both companies assessed.
Source: Author's estimates assuming 4,000 person-year of employment.

The estimated indirect and induced employment effects are also summarised in Table 24. The estimates were done using the production technologies of the two companies. The effects are quite similar, but Company tends to have a slightly higher employment effect in term of estimated quantum of employment created.

Table 24: Estimated indirect and induced employment effects of processing cocoa beans

	Employment effects of USD 1 Million (FTEs)		Scenario1: Employment effects of USD 1.5 billion (FTEs)		Scenario 2: Employment effects of a 40 % increase(FTEs)	
	Indirect	Induced	Indirect	Induced	Indirect	Induced
Using technology of company A	87	40	281,280	130,176	13,300	81,488
Using technology of company B	88	40	284,691	131,393	16,302	82,422

6.2 Key findings and Recommendations

Significant variations were reported in the price of processed cocoa. This variation is the main factor that explains the different employment effects. The variation in prices is partially explained by the different composition of the processed products exported (butter, liquor, paste and powder). However the main difference is due to the differences in the different pricing strategies the companies employ. These strategies involve fixing prices for certain products and quantities in advance to hedge against fluctuations of the world market price.

In general, it can be assumed that about 5 person-year of direct employment is created per million USD of exported processed cocoa. Similarly, for every additional thousand tonnes of processed cocoa exported by Ghana, about 12 to 13 person-year of direct employment will likely be created

At an aggregate level, the difference between the number of jobs generated per unit of output by companies A and B is not large. The main difference lies in the skill levels of the

ISSR, The State of the Ghanaian Economy Report

people employed. Economically the main difference is that the capital outlay for the fully automated approach is much larger and created fewer skilled jobs. Given that comparable outputs can be achieved with a partially automated line and that the capital and hard currency is scarce, the partially automated approach would seem preferable for the Ghanaian economy.

It was also concluded from the case studies and discussions with stakeholders during the validation of these studies that scenario 1 is the more ambitious scenario and less likely in the short term, as it would require significant increases in the production of cocoa beans. This would require addressing a number of current production constraints including the availability of land, attracting additional farmers into cocoa farming, investment in trees with higher yields, effects of climate change and stabilizing and increasing farm gate prices. Separate efforts are under way to address some of these constraints, perhaps most notably the recent cooperation with the government of Cote d'Ivoire to set a minimum export price for their cocoa beans at USD 2,600 per tonne. However if the government and cocoa stakeholder would manage to address these constraints, large employment effects could be anticipated. Most of these effects would be in agriculture- in the growing of cocoa. However ideally such increases would be done using improved farming and rural processing methods that would result in higher productivity and wages for farmers, as well as improved rural processing of beans, but without compromising quality.

With regards to scenario 2, the study found that processing companies are optimistic about the prospects of increased processing and are taking advantage of some of the incentives offered by the GOG by continuing to invest in their processing capacity. The result has been investments in the processing capacity to the extent that there currently is spare capacity, and the current installed capacity of 400,000 tonnes is already sufficient to process 40% of total beans produced. (999,000 tonnes). It was found that the bottleneck to increasing local processing is currently quantity of the light crop, which is sold at a discount to normal crops. Local processors are competing for buying this limited quantity of light crop, and some prefer importing additional light crop to purchasing beans at the normal export price. Continuing to increase the quantity of processed cocoa will thus require a change in the overall pricing structure so that processing standard beans becomes more profitable for the local processors.

Were this to be achieved the estimated employment effects are that an additional 400 to 800 full time long term jobs will be created. This figure is relatively low as the installed capacity is already sufficient to process 40% of cocoa. In addition to this, an estimated 95,000 indirect and induced FTEs would be created, albeit mostly in sector with low productivity and low income jobs such as agriculture retails trade.

The recommendations emanating from this study, and the inputs received during it validation are presented below. The first two recommendations relate to enterprise specific interventions to further enhance employment within the cocoa processing sector. The last four recommendation are sector level policy recommendations to address some of the key constraints identified in this study.

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https://www.reuters.com/article/us-cocoa-ivorycoast-ghana/cocoa-buyers-agree-to-floor-price-proposed-by-ghana-ivory-coast-idUSKCN1TD20G

Recommendation 1: It is recommended that the GoG encourages the utilization of partially automated cocoa processing facilities. This will result in the creation of more skilled jobs instead of unskilled jobs, reduce the capital investment required and will in general support the development of a more skilled labour force.

Recommendation 2: More demand for skills workers will in turn result in more decent jobs that will benefit the young and educated Ghanaian workforce. Special measures should take place to encourage the employment of youth and women in all job categories. Cooperation with universities and community colleges by offering on-the-job training for female students could result in increasing the number of female candidates interested in the jobs offered. Providing child care facilities or allowance by the companies could also increase the interest of women to work in technical jobs even if work takes place in shifts.

Recommendation 3: The policies put in place to attract investments in processing have been successful to the extent that there are currently continued high levels of investment in processing capacity, despite some of this being idle. For the sector to keep growing and increase export revenues, it is important to ensure that other policies to address other constraints, most notably the production of beans, are fully implemented. Doing this could result in hundreds of thousands additional jobs, mostly in the cocoa production value chain.

Recommendation 4: It is recommended that the government of Ghana and local stakeholders, based on the findings from this study continue their policy and social dialogue to assess the costs and benefits of expanding cocoa processing in Ghana. This analysis should take into account any tax benefits and other investment incentives provided to processors, as well as ideas of how to address some of the key constraints.

Recommendation 5: The value added in the current predominant processing of beans to intermediates is limited. If Ghana would like to capture more of the value add (and employment) in the entire cocoa / chocolate value chain it needs to move into manufacturing further up the value chain such as confectionary and other products. It is encouraging that some processors are moving into this direction. This should be further encouraged and incentivized. This could also have positive effects on employment in sectors that provide material inputs and services to the manufacturing and sale of confectionary.

Recommendation 6: While one of the rationales of the government to incentivise investments in cocoa processing, was job creation, it is clear that the number of jobs generated through these investments are limited. It is recommended therefore that in future the GoG conducts Employment Impact Assessments of such policies and incentives before they are adopted so as to quantify the potential employment effects and factor this into the final design of these policies.

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Annex 1: Methodology for calculating multipliers

To compute multipliers used in this report, the study followed the Leontief multipliers analysis and the steps are presented a follow.

A simple SAM structures

	Activities	Commodities	Factors	Households	Government	S&I	RoW	Total
Activities	A11	A12	A13	A14	A15	A16	A17	X_i
Commodities	A21	A22	A23	A24	A25	A26	A27	X_i
Factors	A31	A32	A33	A34	A35	A36	A37	X_i
Households	A41	A42	A43	A44	A45	A46	A47	X_i
Government	.	.	.	.	.	.	.	
S&I	.	.	.	.	.	.	.	
RoW	.	.	.	.	.	.	.	
Total	X_j	X_j	X_j	X_j	X_j	X_j	X_j	

Each element in SAM is represented as A_{ij}, where i= 1, 2, 3...n is the row elements of the SAM, j =1, 2, 3…n represents the column elements. For instance, in the Ghana SAM Annex X, A_{21} = 127,563 which is an intermediate consumption paid by commodities to activities, and A_{45} = 22,455 which is an income received by households form the government.

The sum of column cells represents total payment made by a given sector j which is denoted as X_j .

$$X_j = \sum_{j=1}^{n} A_{ij}$$

Likewise, the sum of rows represents total income received by given sector i, or in other words the total output of a given sector i, and represented as X_i .

$$X_i = \sum_{i=1}^{n} A_{ij}$$

As indicated earlier, in every standard SAM, the sum of the row elements of a given account or sector should be equal to the column sum of the account.

$$X_j = \sum_{j=1}^{n} A_{ij} \quad = \quad X_i = \sum_{i=1}^{n} A_{ij}$$

Based on these two equations, we can now compute the proportional ratio of each input used to produce the total output of a given sector j. This is often referred to as technical coefficient, which is a ratio of inputs required to generate one unit of production of a given sector j. This ratio is given by the quantity of specific inputs A_{ij} which is required for production of sector j divided by the total expenditure X_j of sector j. This proportion is represented as a_{ij} .

$$a_{ij} = \frac{A_{ij}}{X_j}$$

Since this ratio shows the proportion of input required to generate one unit of production in a given sector$j$, the sum of total a_{ij} should be equal to 1. This is especially should always be the case if the whole SAM is being considered in the analysis instead of the input-output table.

$$\sum_{j=1}^{n} a_{ij} = 1$$

In the Rwandan specific example as previously presented in table X, we will have technical coefficient matrix as follows. In most SAM and input-out based multiplier analysis this matrix is referred to as the *A matrix*.

Technical Coefficients Matrix (Matrix A)

	Activities	Commodities	Factors	Households	Government	S&I	Row
Activities	a11	a12	a13	a14	0	0	0
Commodities	a21	a21	a23	a24	0	0	0
Factors	a31	a32	a33	a34	0	0	0
Households	a41	a42	a43	a44	0	0	0
Government	a51	a52	a53	a54	0	0	0
S&I	a61	a62	a63	a64	0	0	0
Row	a71	a71	a73	a74	0	0	0
Total sum	1	1	1	1	0	0	0

To compute SAM based multiplier analysis, one or more accounts in the Technical coefficient matrix should be an exogenous account. Traditionally, the Government account, saving and investment account, and rest of the world accounts of the SAM are considered to be exogenous. This is because the expenditure from these three accounts is exogenous (Round 2003). Determining our exogenous accounts will also make the matrix invertible in order to calculate multipliers. In order to compute the Leontief inverse, identity matrix[1] we have created an identity matrix which is identical to the matrix to the technical coefficient matrix.

Identity Matrix (Matrix ***I***)

	Activities	Commodities	Factors	Households	Government	S&I	Row
Activities	1	0	0	0	0	0	0
Commodities	0	1	0	0	0	0	0
Factors	0	0	1	0	0	0	0
Households	0	0	0	1	0	0	0
Government	0	0	0	0	1	0	0
S&I	0	0	0	0	0	1	0
Row	0	0	0	0	0	0	1

[13] An identity matrix is a square matrix (with same number of rows and columns) with 1 in all of its diagonal cells and zero elsewhere. It has properties identical to those of the number 1 in scalar algebra. In scalar algebra any number multiplied by 1 remains unchanged. In the same way any matrix multiplied by an identity matrix remains unchanged.

From these two matrixes we can now calculate the conventional Leontief inverse in order to understand compute output, GDP multipliers and income multipliers. The Leontief multipliers are presented in the table 8 below.

$$L_a x = (I - A)^{-1} * x$$

$L_a x$ = Leontief inverse SAM multipliers

$(I - A)^{-1}$ = The inverse of identity matrix ($\boldsymbol{I}$) minus the technical coefficient matrix ($\boldsymbol{A}$).

$\boldsymbol{x}$ = The vector of exogenous injections

Leontief inverse SAM multipliers

	Activities	Commodities	Factors	Households	Government	S&I	Row
Activities	L11	L12	L13	L14	0	0	0
Commodities	L21	L21	L23	L24	0	0	0
Factors	L31	L32	L33	L34	0	0	0
Households	L41	L42	L43	L44	0	0	0
Government	L51	L52	L53	L54	0	0	0
S&I	L61	L62	L63	L64	0	0	0
Row	L71	L71	L73	L74	0	0	0

Output multiplier = $L21$,

GDP multiplier (Value-Added) = $L31$

Income multiplier= $L41$