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A study of the cocoa-chocolate supply chain in Côte d'Ivoire

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ABSTRACT

This paper provides an in-depth study of the cocoa-chocolate supply chain in Côte d'Ivoire, the world's largest producer of cocoa. This research is focused on the threats and opportunities within the supply chain, and how they are being addressed. A secondary purpose is to provide insight relevant to any commodity-based African supply chain. These chains present challenges not typically encountered in Western supply chains, especially poverty and lack of infrastructure, and require a high level of involvement on the part of stakeholders that depend upon the chain. This research draws on stakeholder interviews, primary and secondary sources, and direct observation.

KEYWORDS: Global operations, Supplier relationship management, Supply chain vulnerability, Agriculture, Sustainability

INTRODUCTION

This study provides a comprehensive analysis of the cocoa industry in Côte d'Ivoire. It identifies opportunities to improve profitability, implement more effective agricultural practices, and assure fair labor practices. The study includes an investigation of the feasibility of forwardly integrating value-added activities in the cocoa-chocolate value chain as suggested by de Boer et al. (2011). Forwardly integrating the value chain suggests that this should increase the value of the industry to Côte d'Ivoire. During this study, however, challenges and obstacles to this goal were identified.

Agricultural and social issues represent the biggest challenges to the cocoa supply chain in Côte d'Ivoire. Threats include the aging of trees, susceptibility to disease, changing weather patterns, and lack of a strong program to research and promote agricultural practices and educate farmers in the techniques most likely to promote the long-term sustainability of the cocoa ecosystem. Charges of forced child labor impact both the Ivorian people and the industry itself as EU and US governments, multilateral agencies and consumers are finding such ethical issues unacceptable.

Also, there is insufficient infrastructure as well as an inadequate system to monitor and manage the quality of cocoa beans. While this study is focused on the cocoa industry, these findings are likely to be relevant in any developing economy that strives to increase its share of value chain benefits. It is also relevant to those considering entry into African business in that even a long-standing and successful African supply chain can be difficult and costly to manage.

Côte d'Ivoire: An Economic and Social Overview

Côte d'Ivoire is the world's largest grower and exporter of cocoa beans providing almost 40% of the world supply (ICCO Quarterly Bulletin, 2016). The value of cocoa exported in 2015 was U.S. \$5 billion (Trade Map, 2016). When combined with the output of Ghana, Côte d'Ivoire's neighbor to the east, the two countries produce over two thirds of the world supply, and cocoa is identified in Côte d'Ivoire's National Development Plan (NDP) of 2016-20 as one of five agricultural industries to help the nation attain status as an emerging economy by 2020 (Côte d'Ivoire NDP, 2016). It is estimated that there are between 600,000 and 900,000 small cocoa farms in Côte d'Ivoire and that over 6 million Ivoirians rely on cocoa for their livelihood making cocoa the most valuable component of the Ivoirian economy (Ingram et al., 2014).

In order to understand the cocoa industry in Côte d'Ivoire, it is necessary to understand the economic, business and social landscape. Table 1 provides a summary of information compiled

Indicator	Côte d'Ivoire	SSA IDA Average
Economic Management	3.7	3.3
Monetary and Exchange Rate Policy	4.0	3.4
Fiscal Policy	3.5	3.1
Debt Policy	3.5	3.3
Structural Policies	3.3	3.2
Trade	4.0	3.7
Financial Sector	3.0	2.9
Business Regulatory Environment	3.0	3.1
Policies for Social Inclusion and Equity	3.0	3.2
Gender Equality	3.0	3.2
Equity of Public Resource Use	3.0	3.3
Building Human Resources	3.5	3.5
Social Protection and Labor	2.5	2.9
Policies and Institutions for Environmental Sustainability	3.0	3.2
Public Sector Management and Institutions	3.1	3.0
Property Rights and Rule-Based Governance	3.0	2.8
Quality of Budgetary and Financial Management	3.0	3.1
Efficiency of Revenue Mobilization	3.5	3.4
Quality of Public Administration	3.0	2.8
Transparency, Accountability, and Corruption in the Public Sector	3.0	2.7

from the World Bank's Country Policy and Institutional Assessment (CPIA) that compares Côte d'Ivoire to the 37 other African countries identified by the International Development Association (IDA) as eligible for support (CPIA, 2016). As indicated in Table 1, Côte d'Ivoire's overall score is above the average for IDA countries, and shows relatively well on measures related to Economic Management, Structural Policies, and Public Sector Management and Institutions.

The interest on the part of the Ivoirian government in economic and public sector management was evident during the study, and concrete examples were provided in interviews with senior government officials and academics at Ivoirian institutions of higher learning. Meetings with senior officials of the Center for the Promotion of Investment in Côte d'Ivoire, the government organization responsible for attracting foreign investment, indicated an engaged and well-organized program to encourage investment in the Ivoirian economy. The program includes tax reductions and other financial incentives for companies considering establishing a presence, along with assistance in navigating the red tape that might impede requirements for doing business.

The Port of Abidjan favorably impacts the score on the trade indicator. The port is the largest in West Africa, and second only to Durban for all of Africa. Plans to upgrade the port are in place as are plans to improve roads, railroads, and the electrical grid, as specified in the NDP of 2016-2020 (Côte d'Ivoire NDP, 2016).

Côte d'Ivoire scores less favorably on Policies for Social Inclusion and Equity, especially in the area of forced child labor. As evidence, a study conducted through Tulane University showed that the percentage of children working in cocoa production in Côte d'Ivoire increased from 23.1% to 34.9% over the 5 years of the study (Tulane University Report, 2015). The U.S. Department of Labor, in an effort to resolve the issue, provided \$4.5M in 2015 to the international Cocoa Initiative, a nonprofit dedicated to ending child labor (ICI Annual Report, 2016).

During the course of the study, interviews with Ivoirians at various levels of the social strata indicate that child labor is a complex issue. While acknowledging the seriousness of forced labor of adults and children, a view often heard is that out of necessity, economic circumstance and lack of schools, children of small cocoa farmers participate in the family farming effort; therefore, there are two sides to child labor, one bad and one relatively benign. The perception among some Ivoirians is that the outside world interest does not take into account all issues. This study recognizes that Cote d'Ivoire was in a state of civil war until 2011, and has made considerable progress since then. Nonetheless, the issues of forced and child labor in the country seriously impact the cocoa supply chain in Cote d'Ivoire.

THE WORLDWIDE COCOA-CHOCOLATE SUPPLY CHAIN

The ten largest chocolate companies in 2015 had confectionary sales of U.S. \$83.7 billion (Chocolate Industry, 2016), and worldwide sales of chocolate are increasing. In addition to increasing demand in the United States and Europe, demand is developing elsewhere, especially in Asia and the Middle East. The increase in demand for chocolate points to the need for an upward trend in cocoa production.

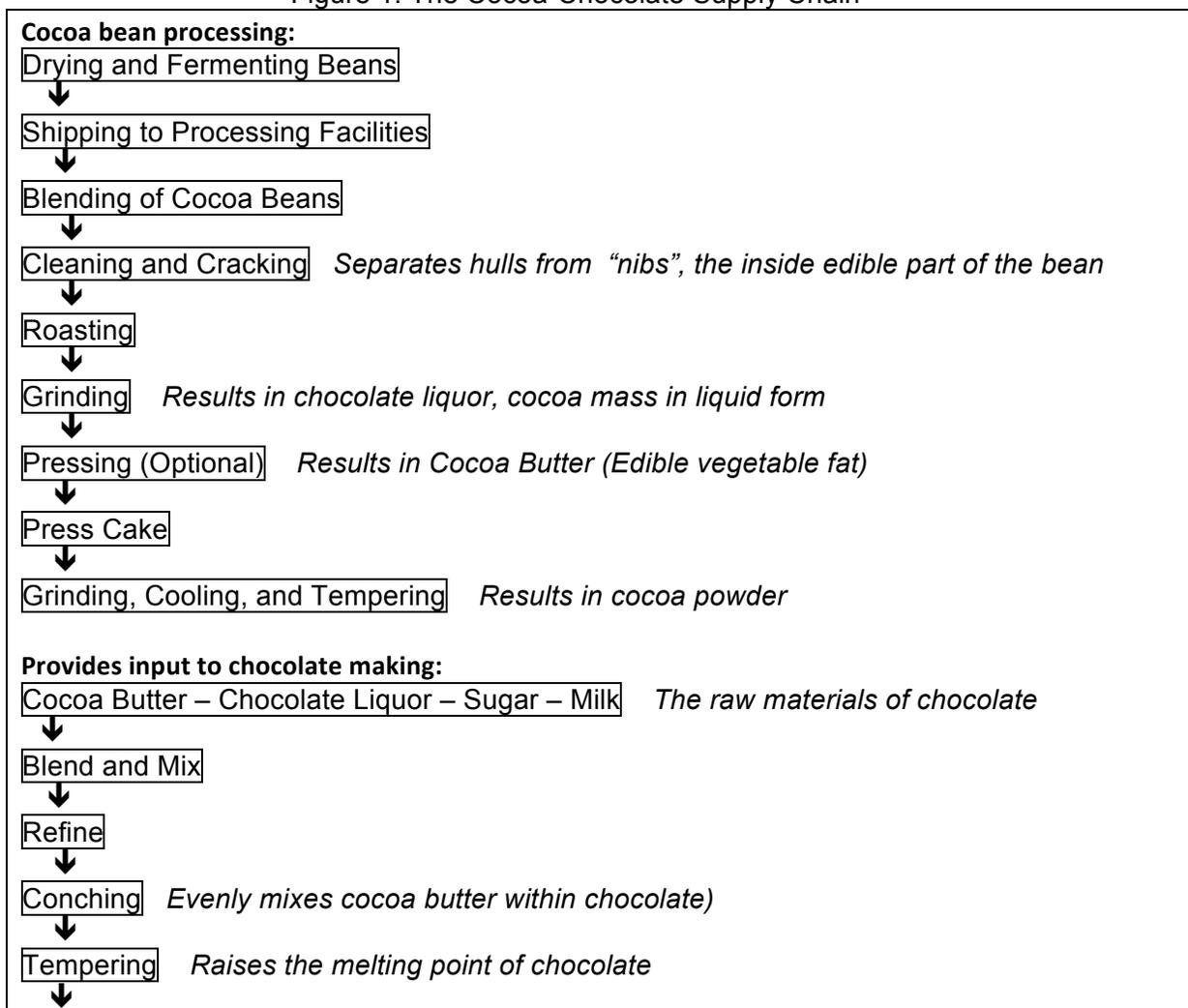
Unlike agriculture in the United States and Europe, which is based on large farms with heavy reliance on machinery, technology, fertilizers, herbicides and other chemicals, the cocoa grown in West and Central Africa is typically produced on small family farms that are less than 2 hectares (5 acres) (World Cocoa Foundation, 2016). Based on visits to a typical cocoa farm in Côte d'Ivoire and interviews with Ivoirian officials, the growing and harvesting process for cocoa relies almost entirely on human labor throughout the country.

Growing cocoa beans is the first step in the cocoa-chocolate supply chain, as illustrated in Figure 1. Once harvested, beans are fermented and dried, a process that requires a week to ten days. Fermentation is especially important as it gives the cocoa bean its chocolate flavor. The farmer then sells the crop to an agent or buying station after which the beans may be delivered for export, or they may be roasted and ground in-country prior to export. Regardless of where roasting and grinding takes place, beans are winnowed to separate the shell from the nibs (the inside of the bean) and roasted. The roasted nibs are then ground, resulting in chocolate liquor, which can further be refined and turned into unsweetened baking chocolate. Other steps in the

process yield cocoa butter and cocoa powder. For a comprehensive review of the cocoa bean growing process, see Fowler & Coutel (2017).

Note in Figure 1 that the supply chain is divided into two sections: Cocoa bean processing, shown in the upper half of the figure, and chocolate making in the lower half. The steps discussed in the previous paragraph refer to cocoa bean processing, which generates the inputs for chocolate making. There is a distinct geographical divide between cocoa bean processing and chocolate making as well. Growing and harvesting are limited to areas that have the appropriate combination of temperature, soil, rainfall and other variables, and are concentrated in tropical regions such as West Africa and Indonesia. The process of grinding may or may not take place in the cocoa-growing regions as well. Making chocolate, on the other hand is overwhelmingly concentrated in Europe and the United States. For many years it has been the case that growers of cocoa and consumers of chocolate are distinct groups; it is not unusual for cocoa farmers to have never tasted chocolate. More important, the majority of the value added in the supply chain is concentrated in making and selling chocolate. Those who grow and process cocoa beans do not reap the degree of financial rewards as those who manufacture and sell chocolate at the end of the value chain.

Figure 1: The Cocoa-Chocolate Supply Chain



The Cocoa-Chocolate Supply Chain in Côte d'Ivoire

In Côte d'Ivoire, the only post-growing and harvesting step in the supply/value chain that takes place at a significant level is the grinding process. Côte d'Ivoire is currently the world's leading cocoa grinder, having recently overtaken the Netherlands though the output of both countries remains roughly equal at approximately 500,000 tons estimated for the 2014/2015 season (Côte d'Ivoire's Grinding Sector, 2015). Even so, the output represents less than a third of the beans grown in country, and indicates room to increase "origin grindings", the amount of cocoa ground in country prior to export. The Ivoirian government has set a goal of processing half of the crop it produces (Côte d'Ivoire NDP, 2016), and yet, while currently processing approximately 30% of the beans grown in country, the grinding industry in Côte d'Ivoire is operating at less than capacity.

A serious factor that has contributed to the slump is a change in the tax structure. The "Droit Unique de Sortie" (DUS), has resulted in a 25% increase over the preceding two years in the export tax on ground beans (Côte d'Ivoire's Grinding Sector, 2015). Counter to the government's goal of increasing origin grindings, the effect of DUS is to penalize in-country grinding operations, and until the tax structure is changed the likelihood of increasing origin grindings is unlikely.

Absence of An Internationally Recognized Quality Standard

Another factor that impacts the cocoa supply chain in Côte d'Ivoire is the system for monitoring the quality of beans as they move through the system. While there are quality checks throughout the system, the process is not governed by an internationally recognized quality standard. Other cocoa-producing countries, including Ghana, adhere to ISO 2451:2014, the international standard that specifies "the requirements, classification, test methods, sampling, packaging, and marking for cocoa beans" (Cocoa Beans—Specification, 2014). The consequence for Côte d'Ivoire of not adhering to a rigorous internationally recognized standard is a lack of trust on the part of certain foreign buyers with regard to quality, and fewer beans exported.

Lack of Market for Lower-Quality Beans

This study indicated that there is currently no significant in-country market for lower quality beans. Cocoa beans, like most agricultural products, are graded. Quality is determined in part by the "count", that is the number of beans required to weigh 100 grams, and fat content. "Large" beans have a count totaling 100 to 105 beans per 100 grams and a fat content of 54%. "Small" beans total 121 beans per 100 grams, and a fat content of 48%, (Côte d'Ivoire's Grinding Sector, 2015). As another means of determining quality, the Federation of Cocoa Commerce Ltd (FCC) has established grades of "good" and "fair" as determined by a "cut test". This involves counting off a given number or weight of cocoa beans, cutting them lengthwise through the middle, and counting the number of beans which are moldy, slaty, insect-damaged, germinated or flat. Samples of good fermented cocoa beans must have less than 5% mold, 5% slate, and 1.5% foreign matter. Fair fermented cocoa beans must have less than 10% mold, 10% slate and 1.5% foreign matter (Trading and Shipping, 2015). Different buyers have different requirements in terms of count and grade, and the lack of a market for lesser quality beans means lost revenue for the value chain.

Limited Involvement in Later-Stage Supply Chain Activities

In spite of Côte d'Ivoire's leadership role in growing, harvesting and grinding beans, the remaining steps in the supply/value chain largely take place in other regions of the world, especially Europe and the United States. It is indicative of Côte d'Ivoire's limited involvement in later-stage supply chain activities that the first manufacturing facility in Côte d'Ivoire to manufacture chocolate products for direct consumption did not begin full operation until May 2015. As of the time of this study, this facility, operated by French chocolatier, Cémoi, is the only one of its kind in the country (France's Cémoi, 2015). The lack of a high level of participation in later-stage activities, especially chocolate manufacturing and retailing, means that Côte d'Ivoire is not reaping the financial benefits of the most profitable activities. The value distribution of the stages of the worldwide cocoa-chocolate supply chain by percent of value added is presented in Table 2, based on data gathered from Cocoa Barometer (2015). As can be seen in the table, the combined value added of activities that generally take place in Côte d'Ivoire (growing, transport/trade and grinding) is less than 21%, just slightly more than a fourth of the combined value added of manufacturing and retailing (79.4%).

Activity	Value Added
Farming	6.6%
Transport and Trade	6.3%
Processing (includes grinding)	7.6%
Manufacturing	35.2%
Wholesaling / Retailing	44.2%

OPPORTUNITIES TO INCORPORATE VALUE-ADDED ACTIVITIES INTO THE SUPPLY CHAIN

One means of improving the value of a supply chain in a developing economy is to bring higher value-added activities in country. de Boer et al. (2012), for example, emphasize "value chain analysis" as a means of providing developing economies a larger share of economic benefits. The goal is "forward integration" of value chain activities, that is, to "increase the level of value added in the producing country rather than just selling them as inputs." (de Boer et al., 2012, p. 39). They posit that analysis of the value chain yields insight as to where the chain might be further developed in order to benefit a developing industry. In the case of cocoa in Côte d'Ivoire, bringing more value-added activities in country affords an opportunity for the country to gain a larger share of the wealth of the worldwide cocoa-chocolate industry.

Improving value chains in general has received significant attention in the literature, especially as it pertains to developing nations, such as Côte d'Ivoire. Trienekens & van Dijk (2012) identify four strategies for upgrading: Increase the value added in the chain, improve market access, improve value chain governance structures and form partnerships. In terms of adding value to the existing chain, they stress the importance for developing economies to incorporate value-adding activities in country as opposed to merely being commodity suppliers.

The key question in value chain analysis is what activities to bring in. It is clear that grinding has been integrated into the Ivoirian supply chain as evidenced by the fact that Côte d'Ivoire leads the world in tons of beans ground. However, this study identified two complications surrounding the grinding industry in Côte d'Ivoire the first being the "DUS", noted previously,

which imposes a 25% export tax on ground beans. This policy has a detrimental impact on the grinding industry and runs contrary to the goal of increasing in-country grinding. More importantly, grinding is a low value-added operation. As can be seen in Table 2, grinding accounts for less than 8% of the value distribution in the cocoa–chocolate value chain. If the Ivoirian government achieves its goal of substantially increasing origin grindings, the economic benefits will be positive, but will not have the economic impact that would result from integrating the higher value-added activities of manufacturing or retailing, or both.

Challenges to Value Chain Development

Establishing a substantial chocolate manufacturing industry in country, which accounts for 35% of value added in the cocoa-chocolate industry, would yield higher benefits but faces systemic obstacles in Côte d'Ivoire. First and foremost is lack of in-country demand for chocolate. As noted by Trienekens & van Dijk (2012), increasing value added is dependent upon demand to justify the capital investment required of a manufacturing facility, and to generate a profitable return on operations. Ironically, in the nation that leads the world in cocoa production, the demand for chocolate in Côte d'Ivoire is well below that found in Europe, the United States or China. This reflects the state of the Ivoirian economy and a lack of disposable income for “luxury” items, such as chocolate, but also the lack of a well-developed market and different expectations in terms of packaging and product format. A question is whether a significant demand for chocolate can be developed in Côte d'Ivoire.

Aside from increasing demand in Côte d'Ivoire, another question is whether Ivoirian chocolate could be profitably exported to neighboring countries, or to other countries with a more developed taste for chocolate. Though the largest per capita consumption of chocolate is centered in Europe, demand in the Africa – Middle East region is growing. Saudi Arabia, Algeria, and Nigeria, itself another significant cocoa-growing country, are among the world's fastest growing chocolate markets (Nieburg, 2015).

Transportation is a second serious issue, both within the country and throughout the West African region. While the urban road structure is sound, rural roads have received less attention. In order to improve the internal circulation of cocoa, it will be necessary to upgrade roads that have been impassable during certain times of the year; internally 90% of the road fund is allocated for urban roads and it is estimated that only 25% of what is needed for road maintenance and rehabilitation is available. The rail system is growing; in July of 2016, Bolloré Railways received a concession for a rail link through West African countries, including Côte d'Ivoire for the management and running of a rail network between Abidjan and Kaya via Ouagadougou in Burkina Faso. This contract insures investment to renew and maintain infrastructure and maintain workshops and train stations. It will involve refurbishing 852 km of rail track and renovation of many stations, and will help to modernize the network and grow transportation capacity (Bolloré, 2016).

A third infrastructural challenge is the need for an electrical grid with sufficient capacity to meet the needs of manufacturing chocolate on a large scale. The tropical climate of Côte d'Ivoire necessitates the ability to keep product cool beyond the harvesting and drying stages, and lack of sufficient electrical generating capacity is therefore a major challenge. The government, in conjunction with Power Africa and independent power producers, plans to increase installed capacity by at least 150 MW each year (Power Africa, 2016).

Issues of infrastructure and demand are critical in determining whether or when Côte d'Ivoire will be able to integrate manufacturing and distribution into the Ivoirian value chain. This is a longer-term research issue for the authors, and focus has remained on the on-going need to supply cocoa beans and grinding services.

Initiatives to Improve Infrastructure

The government of Côte d'Ivoire has indicated a desire to become an emerging market in the midst of strong economic trends, and to expand its trade and partnering worldwide. The government has made large commitments and investments in infrastructure such as highways, bridges and an extension of its port. This investment by the government is a signal of possible private investment opportunities (Côte d'Ivoire NDP, 2016). Overall, the economic potential of Côte d'Ivoire has been viewed favorably in the international community. The World Bank, for example, has noted that, "Prospects (for the economy) for the next three years are bright, with a growth rate expected to converge toward 7.5 percent in 2019." (World Bank Overview 2017).

The most significant infrastructural asset in Côte d'Ivoire is the Port of Abidjan. As part of this project the port was visited and its director interviewed. With an annual capacity of 625 thousand TEU's (twenty-foot equivalent units), the Port has the largest capacity in West Africa, and is currently undergoing a major upgrade. The Port is a major resource in terms of infrastructure, though inland access to and from it remains problematic due to the need for a more expansive network of modern road and rail systems. Furthermore, there is in place a network of ports with other West African nations, including the ports of Dakar (Senegal), Lomé (Togo), and Tema (Ghana) that make a regional approach to shipping viable.

THREATS TO THE COCOA-CHOCOLATE SUPPLY CHAIN

As Côte d'Ivoire improves its infrastructure and considers expanding its role in the worldwide cocoa – chocolate industry, this study finds that the weakest link in the supply chain is an inefficient and outdated system of growing and harvesting. As noted earlier, growing and harvesting cocoa depend upon 600,000 to 900,000 small cocoa farms, most of which lack the financial means to invest in improvements to their operations. While the Ivoirian government has made concerted efforts to help, e.g., setting price supports, the research for this paper indicates that many farmers do not view the incentives in the system as sufficient. A lack of confidence in the economic future of cocoa has led farmers to consider alternative crops, a trend noted as early as 2013 (Rai, 2013). Rubber, for example, is less labor intensive to grow, generates crops for more months of the year, and generally is more long-lived than cocoa.

Another concern is that many trees are approaching the end of their useful life; cocoa trees have a lifespan, and as they age they yield fewer beans and become more vulnerable to disease. The Ivoirian government has recently announced a large-scale replenishment effort, but such an effort will require time to implement and careful thought as to where to plant and how to integrate the trees within existing farms.

Poverty and Agriculture

An issue inextricably linked to the current system of cocoa agriculture is the poverty in which many farmers live. Based on World Bank data, 11 million (46.3% of the population) lived below the national poverty line as of 2015 (World Bank Data, 2016). Poverty is also at the root of the vexing problem of child labor in Côte d'Ivoire. In a system dependent upon low-skilled manual labor, it is not surprising that such a problem would have developed. Finally, young people, not seeing a financial future in growing cocoa, are migrating to urban areas in search of more promising opportunities, exacerbating an already serious shortage of labor that is in some measure responsible for the prevalence of child labor.

ADDRESSING CHALLENGES IN THE IVOIRIAN COCOA – CHOCOLATE SUPPLY CHAIN

A key question is how the sustainability of the cocoa supply chain should be strengthened and

maintained. The answer to this question in large part depends on significantly improving the resources available to those who farm cocoa. The current state of Ivoirian cocoa agriculture closely resembles that of the United States or Europe in the late 19th and early 20th centuries when agriculture was almost completely dependent upon an abundance of low-skilled, low-paid manual labor. In the United States in 1890, 42% of the labor force was employed in farming. By 1960, however, that percentage had dwindled to 8%. (Lebergott, 1966), and today stands at less than 2%. (Industry-Employment Projections, 2015). And yet agricultural output is as high as it has ever been, and continues to grow, and the overall employment rate in general is among the highest in the industrialized world. Among the significant reasons for this dramatic change were advances in technology, agronomy, and the establishment of land-grant colleges and universities that have led to vast improvements in agricultural practices that continue to result in higher yields from less land. Similar investments in agricultural and business research and education along with partnerships with institutions of higher learning in other parts of the world would benefit agriculture in Côte d'Ivoire. Aside from improving the financial position of the small farmer, this new access to agricultural expertise, education in best agricultural practices, and development of trees and growing methods better suited to changing weather patterns would contribute to improved sustainability of the cocoa supply chain. In a study of cocoa production in West Africa, Wessel & Quist-Wessel (2015) posit that significant *structural* changes are needed if the goal of sustainable cocoa production is to be met, and question the economic viability of the current system of hundreds of thousands of small farms. The needed changes require a coordinated effort that go well beyond what the farmers themselves can do (Wessel and Quist-Wessel, 2015). True sustainability will require a joint effort among the Ivoirian government, non-governmental organizations, and the major cocoa and chocolate traders and manufacturers.

Major cocoa suppliers, traders and manufacturers, such as Barry Callebaut, ECOM and Mars, have been at the forefront of efforts to improve the productivity of cocoa farming and address socio-economic issues such as child labor. For example, Mars and their supply chain partner, ECOM, are in the process of establishing a network of Cocoa Development Centers (CDC) in Côte d'Ivoire, the goal of which is to train and assist farmers in growing methods to improve their yields and the profitability of their farms.

Changes in weather patterns, expected to result in increases in temperatures and decreases in rainfall, are expected to impact where and how cocoa can be grown throughout Western Africa (Scott, 2016). Maintaining or increasing the current level of production is likely to require a combination of changes in agricultural practices and breeding cocoa trees that are more tolerant of heat and drought. The impact of changes in weather patterns is not projected to be uniform with some regions being more affected than others. Schroth, et al. (2016) conclude that there is a wide variability in climate vulnerability among cocoa growing regions, eastern Côte d'Ivoire being one of the most vulnerable, and the southern region being among the least vulnerable. They cite the need for policies that promote more intensive agriculture in the areas expected to be least vulnerable to changing weather patterns, and as a means of dealing with deforestation to encourage the establishment of cocoa farms in areas that have already been deforested, climate considerations permitting.

Forced Child Labor

As noted previously, child labor in Côte d'Ivoire is a complicated issue, and time spent in the country clearly showed that it is a sensitive issue. Child labor is of great concern to the government of Cote d'Ivoire, as well as foreign governments, international organizations, chocolate manufacturers, and consumers. For more than a decade there have been efforts to obtain “certified” chocolate for the consumer which would provide guarantees that the end product was not made at the expense of forced child or forced adult labor. There is also interest in remediating the reality of child labor itself.

In 2001, the US government initiated the Harkin-Engel Protocol, the goal of which is to eradicate child and forced labor from the chocolate industry (Tulane, 2015). After years-long attempts on the part of the cocoa industry to come to terms with the issue, the United States Department of Labor awarded a contract to Tulane University to oversee public and private efforts to eliminate worst forms of child labor (WFCL) in both Côte d'Ivoire and Ghana. The Tulane survey project conclusion was that eradication is feasible assuming there is sustained interest in and attention devoted to the issue. The culmination of the Tulane survey/study resulted in four recommendations for the cocoa industry in Côte d'Ivoire and Ghana: Implementation of a Certification System to provide credible assurance on how the cocoa is being produced; Implementation of a Verification System by way of 4th party farm audits as independent verification of the absence of WFCL; Implementation of Child Labor Monitoring Systems, building on the current relationship with the International Labor Organization; and Remediation Activities Addressing the WFCL in the Cocoa Sector ensuring sensitization and remediation activities (Tulane, 2015). For a detailed discussion of the Harkin-Engel Protocol, see Bertrand and de Buhr (2015).

In many cases, lack of educational opportunities is a contributing factor to child labor in the cocoa industry. As of 2013, the country does not have any compulsory education law and additional gaps remain such as schools being too far away, not enough trained teachers and a requirement in some areas for families to pay for supplies, all of which inhibit some children's access to education (Findings on Child Labor, 2013).

Poverty and Associated Issues

As noted previously poverty incidence is also a factor. The World Bank reports that the Ivoirian economy was good in 2015 with growth at around 9% that is expected to continue at a similar rate. Growth is supported by investments and growth in building, public works and transport sectors, as well as finance. The current issue is the challenge of shared growth. World Bank data show that as of 2015, the poverty headcount ratio at national poverty lines (percent of population) was 46.3%, down from 48.9% in 2008. During the same period the number of poor rose from 9 million to 11 million (World Bank Data, 2016). The majority of the poor in Côte d'Ivoire work in the agricultural sector including cocoa farming. The country hopes for a sustained upturn in agriculture due to the 17% increase in the farm-gate price of cocoa in October of 2015. However, these prices are dependent on the fluctuations of the cocoa market. (Might of the Elephant, 2015).

Sanitation issues are also of concern. As of 2008, more than 8 million people, 43% of Côte d'Ivoire's population, lacked appropriate sanitation facilities and over 4 million had unsafe drinking water sources, especially in rural areas (Water and Sanitation - Côte d'Ivoire, 2008). Inappropriate sanitation and lack of safe drinking water result in illness which leads to lost productivity, and impact education, as children are often required to spend considerable amounts of time fetching water. Efforts to improve the availability of safe water have involved a variety of stakeholders, and have yielded improvements. Nestlé, for example, partnered with the International Federation of the Red Cross (IFRC) to provide 100,000 people in cocoa-growing communities with safe drinking water (Nestlé, 2013). Efforts such as this lessen the time required to carry water and allow children more time to attend school. While improvements have been made, access to sanitation and clean drinking water remains an ongoing concern.

CONCLUSION

This study identifies two issues in the cocoa supply chain of Côte d'Ivoire as it currently functions, each of which represents an opportunity for improvement. The first is the need for Côte d'Ivoire to establish or adopt an internationally recognized quality monitoring system.

Implementing such a system would increase the confidence of cocoa buyers and manufacturers, and have a positive impact on the reputation of Ivoirian beans. Second, there is currently no significant market for lower quality beans. Options, such as cosmetics exist for lower quality beans and exploring more options could potentially lead to additional revenue sources.

In a broader context, the government and people of Côte d'Ivoire, major cocoa and chocolate traders, and numerous NGO's all have a major stake in the cocoa-chocolate industry, and this study highlights two separate but related issues: The first is how to improve the economy by bringing in a larger share of the wealth from the worldwide cocoa-chocolate value chain through increasing origin grindings and attracting investment in the more lucrative business of making and selling chocolate. This is an aspirational goal. Challenges that impede the achievement of this goal to forwardly integrate the value chain include an underdeveloped market for chocolate in Côte d'Ivoire, a level of infrastructure that is in need of upgrading, and in the case of increasing origin grindings, a government policy that runs contrary to the goal, i.e., the "DUS" tax dis-incentive.

The second issue is more fundamental. It is unlikely that Côte d'Ivoire would consider an investment in chocolate manufacturing were it not for its leadership role in growing cocoa. The cocoa grown in Côte d'Ivoire and other West African nations is the foundation of the cocoa-chocolate supply chain and the most pressing issue it faces is this: The cocoa-chocolate supply chain in Côte d'Ivoire is at risk due to the inefficient and non-sustainable system of growing and harvesting. Growing is the weak link in the chain and the problems inherent in the system endanger the source of one of world's most valuable commodities and reliance on cheap manual labor has led to serious problems, including child labor. Cocoa has been grown in Côte d'Ivoire for almost two centuries, and the agricultural methods used today would be familiar to those who first farmed the product. Rather than lift farmers out of poverty, the current system contributes to the problem.

All major stakeholders, including the Ivoirian government, interested NGO's, and major cocoa and chocolate traders and manufacturers, are actively involved in addressing the challenges. The Ivoirian government gives a prominent place to improving the state of cocoa farming and helping to alleviate the poverty wherein most small farmers live, as evident in government initiatives and target goals for the National Development Plan 2016-20. Initiatives such as "CocoaAction" combine the efforts of government and cocoa and chocolate companies to improve the sustainability of cocoa agriculture, and to help alleviate the associated problems of poverty and child labor. Major cocoa traders and chocolate manufacturers, have long been involved in efforts to improve the sustainability of cocoa agriculture as their businesses depend upon a reliable and sustainable supply of cocoa. They, together with government agencies and NGO's, are critical to introducing more sustainable methods of agriculture. They have a presence at the farm level, educate on best agricultural practices, and monitor quality issues.

Finally, the cocoa supply chain would benefit greatly by having university interest and presence in farming practices, modeled on the land-grant universities in the United States which have led to vastly improved farming practices. Finding ways to increase yield and reduce manual labor would go far in increasing the income of farmers.

Much of what is discussed in this study is pertinent to any commodity-based African supply chain. Many of the issues found in the cocoa-chocolate supply chain would be relevant to any manufacturer interested in entering into a manufacturing partnership with an African country on an agricultural basis including tobacco, rubber, etc. These chains present challenges not typically encountered in Western supply chains: Issues including poverty, lack of infrastructure, and antiquated farming techniques require a high level of continued involvement from manufacturers which requires continual coordination and monetary inputs between the farmer, in-country governments as well as non-government organizations who provide a unique set of needed oversights and help.

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