



University of Tennessee, Knoxville

TRACE: Tennessee Research and Creative Exchange

Masters Theses

Graduate School

8-2008

Determinants of Liberian Farmgate Cocoa Prices

Alicia English

University of Tennessee - Knoxville

Follow this and additional works at: https://trace.tennessee.edu/utk_gradthes



Part of the [Agricultural Economics Commons](#)

Recommended Citation

English, Alicia, "Determinants of Liberian Farmgate Cocoa Prices. " Master's Thesis, University of Tennessee, 2008.

https://trace.tennessee.edu/utk_gradthes/3642

This Thesis is brought to you for free and open access by the Graduate School at TRACE: Tennessee Research and Creative Exchange. It has been accepted for inclusion in Masters Theses by an authorized administrator of TRACE: Tennessee Research and Creative Exchange. For more information, please contact trace@utk.edu.

To the Graduate Council:

I am submitting herewith a thesis written by Alicia English entitled "Determinants of Liberian Farmgate Cocoa Prices." I have examined the final electronic copy of this thesis for form and content and recommend that it be accepted in partial fulfillment of the requirements for the degree of Master of Science, with a major in Agricultural Economics.

Michael D. Wilcox - Roland K. Roberts, Major Professor

We have read this thesis and recommend its acceptance:

Dayton M. Lambert, Daniel de la Torre Ugarte

Accepted for the Council:

Carolyn R. Hodges

Vice Provost and Dean of the Graduate School

(Original signatures are on file with official student records.)

To the Graduate Council:

I am submitting herewith a thesis written by Alicia English entitled “Determinants of Liberian Farmgate Cocoa Prices.” I have examined the final electronic copy of this thesis for form and content and recommend that it be accepted in partial fulfillment of the requirements for the degree of Master of Science, with a major in Agricultural Economics.

Michael D. Wilcox, Co-Major Professor

Roland K. Roberts, Co-Major Professor

We have read this thesis
and recommend its acceptance:

Dayton M. Lambert

Daniel de la Torre Ugarte

Accepted for the Council:

Carolyn R. Hodges, Vice Provost and
Dean of the Graduate School

(Original signatures are on file with official student records.)

DETERMINANTS OF LIBERIAN FARMGATE COCOA PRICES

A Masters Thesis
Presented to the
Department of Agricultural Economics
University of Tennessee, Knoxville

Alicia English
August 2008

ABSTRACT

In an effort to increase growth, employment and diversify farmer portfolios and exports in Liberia, the government is currently focused on opportunities in smallholder tree crops. Smallholder cocoa has the potential to benefit a wide population of farmers by increasing income opportunities and adding to overall household food security. However, the government must contend with a chaotic buyer driven marketplace with limited access to financial and physical capital and relatively little incentive to enhance production capacity and ensure quality. This research describes the characteristics of Liberian cocoa producing and marketing households in order to give context to smallholder marketing decisions during the 2006/07 cocoa season. The research further identifies factors that affect the price formation of farmgate cocoa prices. Liberian cocoa farmers are receiving limited price signals due to the institutional, market-level and infrastructure-oriented transactions costs that constitute a sizeable gap between farmgate and world prices.

TABLE OF CONTENTS

CHAPTER 1. INTRODUCTION	1
1.1. Objectives	8
1.2. Organization	8
CHAPTER 2. COCOA PRODUCTION AND TRADE	10
2.1. Background	10
2.1.1. Agronomy	12
2.1.2. Quality	14
2.2. Global Demand	17
2.3. Global Supply	20
2.3.1. Cocoa Marketing	21
2.3.2. Liberalization	24
2.4. Liberian Cocoa Market	27
2.4.1. Marketing Chain	29
CHAPTER 3. METHODS AND PROCEDURES	34
3.1. Methods for the Liberian Baseline Survey	34
3.1.1. Selection of Counties, Buying Centers, and Villages	35
3.1.2. Selection of Survey Participants and Interviews	37
3.2. Household Description	38
3.3. Modeling Liberian Cocoa Price Determinants	39
3.3.1. Data	39
3.3.1. Regression Model	39
3.3.2. Variable Selection and Expected Signs	41
CHAPTER 4. SURVEY RESULTS AND DESCRIPTIVE STATISTICS ..	47
4.1. Household Demographics	47
4.2. Income Sources and Crop Diversification	49
4.3. Agricultural Inputs	51
4.4. Labor	52
4.5. Land Tenure	54
4.6. Market and Price Descriptors	55
4.6.1. Price	55
4.6.2. Discounts	57
4.6.3. Transportation	58
4.6.4. Credit	59
4.6.5. Farmer Organizations	59
4.6.6. Market Information	60
4.6.7. County Factors	60
CHAPTER 5. PRICE DETERMINATION RESULTS	62
5.1. Overall Model Results	62
5.2. World Price and Discount	63
5.3. Transportation	64
5.4. Market Information and Resources	66
5.5. Farmer Characteristics	67

5.6. Season and Location	68
CHAPTER 6. CONCLUSIONS AND POLICY IMPLICATIONS	70
6.1. The Market.....	71
6.2. The Cocoa Household.....	74
6.3. Farmer Organizations.....	76
6.4. Buyers and Intermediaries	76
6.5. Exporters	77
6.6. The Government	78
Appendix A. Supporting Tables and Figures.....	92
Appendix B. Baseline Survey	137
Appendix C. Village Survey	152
VITA	155

LIST OF TABLES

Table 1: Basic Economic and Social Indicators for Liberia, 2000-2007	93
Table 2: Estimates of Liberian Export Earnings by Product from 2000 - 2005	94
Table 3: Percentage of World Cocoa Production for Top Producers and Liberia, 1985,1990,1995,2000-2004	95
Table 4: Agronomic Conditions for Growing Cocoa	96
Table 5: Per Capita Chocolate Consumption (Kilogram/Person).....	97
Table 6: Number of Cocoa Producing Households by Liberian County and Percentage of Cocoa Holdings, 1976-1978,1981, and 2001.....	98
Table 7: Exporter profit margins, marketing cost per ton and farmgate cocoa prices, Liberia 2006/2007	99
Table 8: Cocoa Buying Centers in Bong, Lofa and Nimba Counties	100
Table 9: Number of Surveys Completed by Village in the Baseline Survey.....	101
Table 10: Farmgate Price Determination Regression Variables, Expected Signs, and Description with Mean, Standard Deviation, Minimum, and Maximum	102
Table 11: Price Transmission Regression Variables Continued.....	103
Table 12: Price Transmission Regression Variables Continued.....	104
Table 13: Distances from Villages to Buying Centers and Export Markets (In Kilometers)	105
Table 14: Management of Field Crops by Gender, Including Average and Maximum Number of Fields Per Household.....	106
Table 15: Number and Current Conditions of Tools Found in Households Surveyed....	107
Table 16: Cocoa Labor Provided the Household by Age Cohort and Occupation.....	108
Table 17: Quantity and Averages of Hired Labor for Cocoa by Task.....	109
Table 18: Farmgate and Port Prices for Cocoa Beans in Selected African Countries (\$US/kg).....	110
Table 19: Quality Discount Frequency and Discount Size (in Kilograms and \$USD) ...	111
Table 20: Cocoa Drying Methods for Surveyed Households	112
Table 21: Cost (\$USD) of a Taxi Ride to Monrovia from the Buying Centers.....	113
Table 22: Variable Means and Standard Deviations for Effective Farmgate Price Determination Model by County	114
Table 23: Estimates for the Effective Farmgate Price Determination Model.....	115

LIST OF FIGURES

Figure 1: General Cocoa Marketing Chain.....	116
Figure 2: 2006/07 Average Cocoa Prices for Selected West African Countries and the LIFFE Price.....	117
Figure 3: General Schematic of Current Liberian Smallholder Cocoa Marketing Chain	118
Figure 4: Frequency Distribution of Household Size for Households Producing and Marketing Cocoa in 2006/07 season.....	119
Figure 5: Frequency Distribution of Household Members by Family Status and Age Cohort (n=2047).....	120
Figure 6: Educational Experience Levels for Household Members by Age Cohort	121
Figure 7: Economic Activity of Surveyed Household Members Over Age 14	122
Figure 8: Sources of Household Income (n=332 Households).....	123
Figure 9: Tree Cropping Systems for Households Surveyed (n=657 farms).....	124
Figure 10: Secondary Tree Crops Planted with Cocoa (n=387).....	125
Figure 11: Importance of Agricultural Product, by Gender, Produced By Producing and Marketing Cocoa Household (n=332).....	126
Figure 12: Age of Cocoa Tree Stock for Households that Producing and Marketed Cocoa in 2006/07 season by County.....	127
Figure 13: Current Status of Cocoa Farms Producing and Marketing Cocoa Households (n=339).....	128
Figure 14: Future Plans for Abandoned Cocoa Farms for All Survey Respondents (n=102).....	129
Figure 15: Principal Type of Labor for Tree Crops in Producing and Marketing Cocoa Households (n=332).....	130
Figure 16: Cocoa Farming Labor Input of Household Members by Age Cohort and Gender for Cocoa Producing and Marketing Households (n=332)	131
Figure 17: Average Monthly Prices Received by Surveyed Households, Weighted by Quantity Sold, by County Compared to LIFFE Price.....	132
Figure 18: Percentage of Sales Transactions per Month by Quantity	133
Figure 19: Sources of Credit for Cocoa Farming Received by Households that Producing and Marketed Cocoa in 2006/07.....	134
Figure 20: Status of Roads in Liberia 2006	135
Figure 21: Sources of Market Information for Cocoa (n=19).....	136

CHAPTER 1. INTRODUCTION

Sub-Saharan Africa has been the location of numerous conflicts since the 1960's, including a devastating internal conflict in Liberia that began in 1989 and lasted more than a decade. Critical to the long-term success of development in Liberia are the interdependent needs for security, human rights and capacity building on an individual, institutional and societal level to encourage economic development and an enhanced quality of life. Approximately 75% of the pre-war population of Liberia lived in rural areas (UNDP 2006). Displacement during the conflict has led to situation where a majority of Liberians live in the urban areas, many with few economic opportunities. Therefore, improving livelihoods in the rural areas, where agriculture dominates, is paramount to attract displaced Liberians home. However, policy formation and implementation is hampered as the country faces a sizable gap in reliable post-war information detailing the current status, opportunities and capacity of its rural populations and their agricultural means.

Liberia faces numerous challenges as the country rebuilds. Ranked 44 out of 50 on the 2005 United Nations Conference on Trade and Development's (UNCTAD) list of least developed countries, Liberia is rebounding from the largest decline in gross domestic product (GDP) (91%) in the world since World War II (UNCTAD 2005; Radelet 2007). The task is immense as an estimated 85% of the population is unemployed, 80% is in poverty, and per capita GDP is \$500 in purchasing power parity terms (CIA, 2007).

Collier and Hoeffler (2002) estimate the significant economic factors that contribute to the risk of conflict are the initial income level, the rate of economic growth, and the structure of export markets. Hostilities ended in 2003, and Liberia has begun to address these economic risk factors. One example is Liberia's strategy to reinvigorate and diversify the agricultural sector (Liberian Ministry of Agriculture 2008), which constituted 77% of GDP in 2007 (Table 1)¹. The Government of Liberia aims to achieve this goal through financial and technical assistance to rehabilitate smallholder farms and increase production (Government of Liberia 2006). Concurrently, the Government of Liberia is also seeking ways to increase market efficiency through partial or full liberalization of agricultural markets originally dominated by parastatals. Tree crops, such as rubber, oil palm, cocoa and coffee, are of particular interest as they accounted for 60% of total exports by value in 2007 (Table 1).

Throughout the conflict, all export crops were adversely affected. Once staples of the export market, timber and rubber were often cut down to produce charcoal or, as in the case with rubber, permanently damaged by "slaughter tapping" to support the conflict (Liberian Ministry of Agriculture 2008). The United Nations issued sanctions on timber exports in 2003 to disable conflict funding from this source. With continuing sanctions on timber, rubber exports accounted for 88% of total Liberian exports in 2005 and the second largest export, cocoa, accounted for 5.1% (Table 2). Although rubber is Liberia's dominant export, it provides relatively few opportunities for smallholders. Rubber production for export has traditionally focused on large plantations leased to and operated

¹Tables and Figures appear in Appendix 1.

by multinational corporations like Bridgestone Firestone². Despite the dominant position of the large rubber concessions, smallholder rubber producers persist. At the time of this study (2006-2007), smallholder rubber producers had few marketing alternatives save for selling to the multinationals, located in buying centers, which essentially set their prices in line with Bridgestone Firestone. On the production side, many smallholder rubber farms grown with unimproved germplasm, have reached the end of their productive life (Liberian Ministry of Agriculture 2008). Expanding economic opportunities for smallholders with other tree crops, outside of employment associated with traditional concession arrangements or attempting to participate in a smallholder fringe market for the same monocultured commodity, for example cocoa, have the potential to diversify agricultural portfolios and increase food security.

Cocoa has the potential to affect many Liberian smallholder farmers. In fact, the Ministry of Agriculture estimates that there are approximately 18,500 workers on rubber plantations compared with the 40,000 households producing cocoa. In addition, unlike monocultured rubber plantations, traditional intercropping of cocoa with food and other tree crops provides opportunities to diversify income and alleviate food insecurity faced by rural populations (Gockowski et al 2007). Throughout the war, cocoa smallholders were among the rural populations that migrated toward Liberian urban centers, fled to neighboring countries, or were placed in UN sanctioned Internally Displaced Person (IDP) Camps. With few opportunities to harvest and market cocoa during the conflict,

²Throughout Liberia's various political regimes, the government has granted generous resource contracts with concession payments regimes slanted towards the multinational firms. Concession policies have been less than favorable for taxation, resource preservation and local welfare. The Transitional Government of Liberia has renegotiated 16 resource contracts, including Firestone Rubber, canceled 27 forestry concessions, and left unchanged 52 that were in place during and before the conflict (Smillie 2007).

farms were abandoned to fallow. Unlike the ‘slaughter tapped’ rubber, the current cocoa stock remains economically viable and farms could potentially recover since cocoa has an average productive lifespan that peaks around 30 to 35 years and subsequently produces for decades (Dand 1999). Programs are underway to replace damaged and unmanaged cocoa stands with disease resistant and other improved varieties. Unfortunately, farmers in Nimba, Lofa, and Bong counties remain in a domestic cocoa market with limited economic incentives (Pay-Bayee 2005). The success of cocoa as a means of generating income for rural smallholder farmers hinges on the implementation of market reforms and enhanced production capacity. An understanding of the household-specific, county and regional variables that contribute to cocoa marketing outcomes is required to differentiate Liberia from its neighbors and cocoa from other important tree crops as policymakers seek to raise Liberian farm household income.

The conflict in Liberia partially liberalized the cocoa market. Before the conflict, a government parastatal, the Liberian Produce and Marketing Corporation (LPMC), acted as the market avenue for farmers to export cocoa. With the organization’s near demise during the conflict, its memberships in international organizations have been suspended, and farmers and investors alike have no means of remuneration of debts owed (Pay-Bayee 2005). Because of its inability to collect information throughout the conflict, Liberia lacks reliable information with which to judge the effects of this de facto liberalization. Without improvement in infrastructural and institutional arrangements, coupled with high transportation and transaction costs, there is little incentive for investment throughout the marketing chain, especially in remote areas. The government is looking to pursue a joint public-private arrangement, where the government serves as a

regulator, coordinator and facilitator without encroaching on private investment incentives (Liberian Ministry of Agriculture 2008). However, the debate continues about whether to pursue this arrangement through a reorganization of the LMPC or to dismantle the organization completely (Wilcox and Pay-Bayee 2006).

Although there are potential risks, the potential benefits from expanding smallholder production of cocoa and increasing the market efficiency of Liberia's cocoa sector deserves attention. The global cocoa market is volatile as demand grows and supply remains unstable due to cocoa diseases, lack of infrastructure, and political instability in producing countries. In addition, the cocoa marketing chain is complex. Market margins may be driven by institutions and market forces that leave some farmers with low prices (Wilcox 2006). Since the end of civil war in 2003, Liberian cocoa production has stagnated. However, according to the rapid assessment survey done in Nimba County for the Sustainable Tree Crops Program, "income obtained from cocoa and coffee by smallholder farmers more than offsets income from other sources and accordingly serves as the best alternative to other related farming activities" (Kennedy 2005, p. i).

Numerous factors directly affect a farmer's decisions to produce and market cocoa. The ability to market cocoa in Liberia is impeded by infrastructural constraints, such as distance to the market, quality of roads, and access to transportation. Villages farther from buying centers or villages located in remote areas have limited access to cocoa markets or markets are non-existent. Farmers living in border towns often travel across the border to neighboring countries to sell cocoa in adjacent towns or more distant buying centers. Problems with the marketing chain and identification of marketing

margins are exacerbated by arbitrage opportunities in currency markets and the uncertainty of downstream prices at the domestic port (e.g., Monrovia) or in neighboring countries. Other problems include land tenure disputes, lack of access to credit, inputs, and information, as well as, lack of incentives to increase quality from current low levels.

The world cocoa markets, from cocoa bean exporting to retail chocolate sales are dominated by multinational corporations. However, Liberia faces numerous obstacles when attracting foreign investment to increase economic growth and export opportunities in the cocoa market. Public debt, internal conflict and corruption create risk for investors. Recently, the World Bank and the Government of Liberia have outlined a path to forgive or repay the \$400 million dollars the government owes in obligations (World Bank 2007a). Since the end of civil strife in 2003, Liberia has improved in controlling corruption by 15 percentage points³, but Liberia has a long way to go (World Bank 2007b). On a scale from 1 to 10, where 1 indicates a high degree of public sector corruption, Liberia had a score of 2.1⁴ in 2007, compared to the United Kingdom (8.4) and the United States (7.2) (Transparency International 2007). Even with gains against corruption, “once a country has experienced a civil war it is much more likely to see further conflict, so that even though peace is an improvement, risk levels do not return to their pre-conflict level. Thus even once peace has returned, people may still wish to move more of their assets abroad” (Collier et al. 2003, p. 21).

³ Between 2003 and 2006, the World Bank Control of Corruption Indicator increased from 5% to 20%.

⁴ The Transparency International Index is a combination of the World Bank Indicator and several other NGO and governmental rankings. Liberia ranks similarly to its West African neighbors, Côte d’Ivoire (2.1), Sierra Leone (2.1), and Guinea (1.9) (Transparency International, 2007)

Another constraint on smallholder cocoa farmers is the lack of formal banking institutions in Liberia. Farmers without credit or savings opportunities will find alternative methods that may alter production and household decisions. For example, farmers may be unable to reestablish cocoa farms without the initial capital to purchase improved varieties or inputs. Farmers at the border may be able to purchase inputs from abroad, but constrained by exchange rates. Further complicating the transparency of the cocoa marketing chain are the resulting effects from smuggling cocoa in order to access foreign currency. Liberia does not share currency with any of its West African neighbors and thus access to locally available and internationally convertible currency (e.g., US dollar or CFA Franc) or simply locally available currency (Guinean Franc) is limited to gains made from rubber sales (transacted in US dollars) and cross border commodity trades (transacted in Guinean Franc, US Dollars or CFA Franc). Foreign exchange is completed in road stalls, operating at unofficial parallel market rates that are inconsistent between currencies (e.g., USD to GF, GF to LD, USD to LD), with the preferable currency being US Dollars⁵. In addition, credit is typically offered by Su-Sus (a group of businesspeople with internal lending schemes) or commodity brokers who may alter the effective price farmers receive for cocoa through implied interest. The United Nations Development Program has implemented micro-credit and micro-grant operations in five counties, including the traditional cocoa producing centers of Nimba and Bong County, which may have lower interest rates than some of the traditional credit sources and facilitate smallholder growth (UNDP 2006).

⁵ Essential commodities and government services are priced in US Dollars, which continues to increase demand, in effect depreciating the Liberian Dollar (UNDP 2006).

As the government attempts to assess the immediate needs of a struggling rural economy, the cocoa markets remain chaotic and an essentially defunct cocoa marketing board (LPMC), which offers no services, still plays a marginal role. Within the vacuum of information created by the conflict, is a lack of information about the current capacity of the rural cocoa producing household. To move forward with the goals set by the Liberian government, a clear picture of current cocoa producing households, the cocoa marketing chain and the resulting market outcomes needs to be developed. Little information exists on farmgate price determinants, factors that affect marketing margins, and how the Liberian cocoa market is integrated with the world market. Such information could prove useful in determining the most effective policy avenues for increasing farmgate prices and farmer welfare. This research builds and expands on earlier research done by Wilcox, English and Davies (2007).

1.1. Objectives

The objectives of this research were to 1) describe the characteristics of Liberian cocoa producing households, and 2) determine the factors that affect Liberian farmgate cocoa prices.

1.2. Organization

Chapter 2 gives an overview of the world cocoa market, providing the background on the cocoa production-to-consumption process, marketing trends, and global demand and supply, with emphasis on the Liberian cocoa sector. Chapter 3 describes the methods and procedures used to develop and implement a baseline household survey. The survey describes cocoa producing households, identifies factors

affecting the Liberian farmgate price and outlines a farmgate price determination model. Chapter 4 describes the results of the baseline survey and characteristics that may affect marketing decisions. Chapter 5 discusses the price determination model results. Chapter 6 discusses the conclusions, implications and potential policy avenues that may be drawn from the analysis.

CHAPTER 2. COCOA PRODUCTION AND TRADE

2.1. Background

The major cocoa producing countries in West Africa, including Côte d'Ivoire, Ghana, Nigeria and Cameroon, typically occupy 60% to 70% world market share (Table 3). Price differentials and porous borders have long supported illicit cross-border trading of cocoa between Liberia and its neighbors. Recently, civil unrest (e.g., Côte d'Ivoire beginning in 2002) has altered cross border cocoa flows and likely inflated reported cocoa production, based on exports, in Guinea, Sierra Leone and potentially Liberia⁶. Despite its importance as a revenue source for smallholder farmers, current cocoa production in Liberia accounts for roughly 0.1% of global production (FAOSTAT 2007).

Cocoa prices have been in overall decline since the 1989 global price shocks, resultant from high oil prices. Since then, cocoa prices have increased since October 2005 (ICCO 2007). With higher prices, farmers have economic incentive to increase quantity of cocoa. Concurrently, if premiums for quality also persist throughout the marketing chain, then quality may also rise. If farmers feel the effects of world market price dynamics, they will have greater incentive to make short to medium run improvements. These improvements can be made in production and post-harvest quality through improved management practices, planting hybrid varieties, and implementation of proper harvesting and post-harvesting methods.

⁶ Liberia's neighbors, Cote d'Ivoire, Guinea and Sierra Leone, produce 34.1%, 0.25% and 0.24% of the global supply respectively (Table 3).

Though cultivation and on-farm processing techniques differ from country to country, there are important production standards that need to be followed if the resultant cocoa is to be graded as fair average quality or higher (Dand 1999). However, if price signals for higher quality are dampened by the market structure, farmers will not respond (Wilcox 2006). For example, Ghanaian cocoa is sought after for its high quality, maintained through strict government oversight, and typically receives a premium on the world market. Marketing innovations in Ghana have also been successful. The farmer-owned Kuapa Kokoo cooperative formed a partnership with the UK's Day Chocolate Company to sell Fair Trade chocolate made with cocoa beans purchased at Fair Trade prices (Tiffen 2002). However, only 1% of the cooperative's cocoa bean sales from farmers who meet certification requirements receive higher prices. The experience in Ghana is interesting because cocoa production and processing and the chocolate industries are highly compartmentalized after a significant restructuring in the 1990's (Fold 2001; Fold 2004). The marketing chain from cocoa to chocolate rapidly consolidates from millions of smallholder cocoa producers to few global processors to a broad mix of end users, which has an effect on prices paid by the consumer and those received by the producer (ICCO 2007a).

Cocoa production, quality and market outcomes are inexorably linked. As Liberia attempts to reinvigorate and expand its cocoa sector, attention needs to be given to these factors to better understand the challenges, constraints and opportunities the sector faces. This chapter provides an overview of the cocoa industry from production and marketing to processing. Examples from other cocoa producing countries are given to relate past

experiences, best practices and possible avenues for information and technology transfer to Liberian smallholder cocoa farmers.

2.1.1. *Agronomy*

A brief description of the agronomic conditions necessary to grow and harvest cocoa helps one understand the constraints faced by Liberian cocoa smallholder farmers. As a tropical and perennial tree crop, cocoa requires a high amount of humidity. Cocoa is sensitive to total rainfall and shade, especially in its early years (Table 4). The ICCO estimates that a typical smallholder cocoa farm in West Africa yields 650 kilograms per hectare per year (50,000 cocoa pods), impacting the cocoa producing household's income by \$2000 to \$3000 USD a year (ICCO 2007b)⁷. Cocoa yields in Liberia are not as high, with an estimate of 176 kilograms per hectare in 2006 (FAO 2008). Increasing yields and expanding production of Liberian cocoa faces many challenges. Pre-war attempts to use improved varieties from neighboring countries ended with mixed results, likely due to incompatibility of the seed stock with prevailing agro-ecological conditions in Liberia. Adoption of improved varieties by Liberian producers was limited (Weise and David 2005). In 2007, new varieties and husbandry practices to improve yields were starting to be introduced in Liberia through farmer field schools, but the impact has been limited by availability of plant stock, infrastructural constraints and lack of capital in the cocoa producing areas.

⁷ Assuming the farm has at least 3 hectares, average yields, non-hybrid trees, and reasonable tax rates and with growing subsistence crops and other sources of income will raise the household income above \$2 a day (ICCO 2007d)

Cocoa is a labor intensive crop that requires maintenance to limit the spread of disease and to ensure high yields and an opportunity to significantly contribute to household income. Yields have been significantly impaired in Liberia, due to disease and pest pressure, but also limited household resources and the effects of cocoa farm abandonment during the war years. Black Pod Disease⁸ and pod borers are serious threats to Liberian cocoa and the application of insecticide and fungicide, to curb these threats, is constrained by limited availability and prohibitively high cost (Weise and David 2005). In an effort to promote environmentally-friendly farm management, the International Cocoa Organization (ICCO) recommends, in its ‘Best Known Practices Guide’, that farmers keep cocoa and shade trees well pruned and weeded, in addition to isolating and quickly disposing of infected trees to lessen the spreading of diseases and insects (ICCO 2008). Other management strategies include the use of disease-resistant varieties, and the introduction of predatory insects (Wood and Lass 1985). Limiting chemical use through frequent harvesting, improved sanitation and appropriate disposal of pod husks will reduce pests and diseases and may also allow the farmer to enhance household incomes by adding value through organic and fair-trade marketing opportunities (ICCO 2007d).

Balancing Liberia’s dependency on forest resources for economic welfare with conservation of forest lands is important for the long-term stability of rural populations. For example, increasing biodiversity in cocoa agroforest may aid in disease and pest management. Introducing improved varieties of cocoa can make smallholdings more

⁸ Black Pod Disease is the most common in West African cocoa producing countries destroying an estimated 44 percent of the global crop annually (Geene, Heijbroek, and Lagerwerf 2000). Losses in Liberia are estimated to be 42% of yields (Gockowski and Wilcox 2008).

productive. Additionally, intercropping cocoa stands with food crops all may alleviate the need for further expansion into forest resources (Geene, Heijbroek, and Lagerwerf 2000; Weise and David 2005, CIFOR 2005). Cocoa is often intercropped with food crops (e.g. avocados, mangoes, plantains), timber or coffee crops for shade during the early years (ICCO 2007a). Prior research in other West Africa countries indicates that an economic system of shade-grown cocoa can diversify the farmer's agricultural portfolio through the cultivation of other trees and crops. This diversification provides farmers with potential non-cocoa streams of income and decreases reliance on a single crop (Gockowski et al 2007).

Liberian cocoa farmers are having difficulty reaching the average West African yields since many farms were abandoned to bush, improperly managed or poorly established⁹. These problems have resulted in cocoa trees being too dense, unmanageably tall, multi-stemmed and over shaded, often with inappropriate or no-value shade trees. In many cases, replanting entire stands has been recommended by the International Institute of Tropical Agriculture (Weise and David 2005). The severity of these problems makes farmers less likely to improve or reestablish cocoa stands without incentive-laden marketing options and without outside assistance and short-term alternative sources of income as the cocoa agroforest complex reaches maturity.

2.1.2. *Quality*

Quality measures have a significant impact on cocoa marketability and may affect the prices received by farmers as well as those received by agents downstream. Cocoa

⁹ For more in-depth and technical information on the lifecycle, plant selection, establishment, maintenance and health of cocoa, see Mossu (1992) and Wood and Lass (1985).

beans acquire their flavor and quality during the fermentation and drying processes. In Ghana, fears of destabilizing the established quality premiums have led to opposition against liberalizing their cocoa market (Fold 2004). In Nigeria, legislation was passed outlawing improper fermentation, mixing qualities of cocoa, and other malpractices in order to regain global competitiveness (Oredein 2007). Liberian cocoa carries an origin discount on the world market, often ranging \$200 to \$330 per metric ton, due to the inability of exporters to access high quality cocoa. While this market perception persists, there is little information about what post-harvest practices are commonly followed by Liberian cocoa farmers. Therefore, more information is needed to ascertain the quality control practices of Liberian farmers, how they affect farmgate prices, in addition to how world price variability is transmitted to farmers.

Fermentation practices vary by country, available resources, and expected returns by the farmers. The ICCO (2008) recommends a period of five to seven days is for adequate fermentation. Beans should reach a temperature of 50°C during fermentation and should be turned once a day to allow for even fermentation and aeration. There are four commonly used methods in West Africa, including box, basket, tray, and heap fermentation. Depending on the method, the temperature and aeration of the beans will vary and, hence, determine differences in quality.

Farmers in Ghana wait several days to open pods after being harvested from the trees, in effect speeding up the fermentation process. In West Cameroon, fermentation is done on matted-floor trays¹⁰ that provide adequate aeration and save labor hours (Wood and Lass 1985). This technology may have practical application in Liberia where

¹⁰The trays measure 0.9m x 0.6m x 13cm, and are stacked 12 to 14 trays high.

financial compensation is limited to hire labor from outside the household. Typically, cocoa fermentation in Liberia is completed in heaps or baskets for two days to a week. It is unlikely that temperature or aeration control is practiced, contributing to the poor quality of cocoa arriving at the port in Monrovia (Wilcox, English and Davies 2007). Amelioration of current fermentation practices is a potential starting point as the Liberian Ministry of Agriculture strives to improve international perceptions of Liberian cocoa. Improving farmers' knowledge and application of best fermentation practices is being relayed to the farmers through farmer field schools.

Drying methods also vary across countries, regions the resources and preferences of the cocoa producer. The ICCO (2008) recommends drying under direct natural sunlight immediately after the fermentation period has ended and suggests turning the beans several times a day. West African producers typically sun-dry beans on the ground using mats or concrete slabs for at least a week. However, this method allows for free range animals and substrate to contaminate the beans. In some countries, beans are spread on elevated trays, which are moved or rotated into the sunlight and covered under a retractable roof during heavy rains. Properly dried cocoa will have a moisture content of 6 to 7% and will crack when rolled in hand (Wood and Lass 1985). Well dried cocoa can be stored for long periods of time without rotting. However, with little emphasis on proper drying techniques and the ambient humidity in tropical climates, cocoa only lasts a few days to a couple of weeks before moisture content climbs to unacceptable levels and the beans mold (Dand 1999).

Proper drying is critical to prevent cocoa from molding during transportation. Cocoa exporters will take bean samples to determine moisture, detect mold or

germination, and estimate the proportions of broken, slaty or under- or over-fermented beans and foreign matter. Cocoa buyers in the villages and buying centers often employ more rudimentary methods and focus on moisture content and percentage of foreign material. Cocoa beans reabsorb moisture and smoky odors obtained through wood-oven drying, so great care is needed during drying and storage processes (Wood and Lass 1985). While some quality issues can be rectified through the grinding and roasting processes, moldy and smoky beans are always rejected (Dand 1999). According to the ICCO, one long-term goal of the global cocoa industry is to improve quality control through educating farmers in quality control practices (ICCO 2008). Educating farmers about quality control methods may enable them to command higher prices for better quality cocoa. Maintaining quality and the identity of the origin of the beans, could also serve to establish accountability through the marketing chain while increasing the overall quality of cocoa globally (ICCO 2008).

2.2. Global Demand

Consumption of cocoa¹¹ expanded by 571,000 metric tons (an increase of 21%) to 2,719,048 metric tons between 1996/97 and 2004/05 with most of the increase from the cocoa consuming countries of Europe (ICCO 2007c). The largest regional increases, on a percentage basis, were seen in the emerging markets of Asia (41%) and Africa (48%) (ICCO 2007c). Overall, consumer demand for chocolate products is price sensitive because of the considerable range for substitution of ingredients and varieties of chocolates available (ICCO 2006). Demand for cocoa can be measured by final

¹¹ Calculated as grindings of cocoa beans plus net imports of cocoa products and of chocolate and chocolate products in beans equivalent (ICCO 2007c).

consumption, in the form of chocolate, as kilograms per person. Another measure of demand, grindings, measures the processing capacity of a specific country (Dand 1999)

¹². Switzerland and Belgium consume the highest amounts of chocolate products measured as final consumption (Table 5).

Cocoa may find alternative avenues of demand growth in the Fair-Trade chocolate, origin-based marketing, and organic markets. Liberia has the opportunity to take advantage of these niche markets, given their lack of dependence on chemical inputs (Wilcox and Pay-Bayee 2006). However, these niche markets are highly segmented and the farmer may not benefit from the premiums found in these markets. According to Abbott and Wilcox (2005), Fair Trade agreements strive to raise farmer income through institutional arrangements that are often achieved by setting a price floor to circumvent the traditional marketing chain. Beyond the effects on farmgate prices, Fair Trade chocolate certification may offer greater transparency to labor conditions and conflict funding, which may have an impact on the incidence and duration of civil strife (Collier et al 2003; Global Witness 2007).

Although concern over food safety and environmental damage has grown in the last few years in cocoa consuming countries, demand for organic and environmentally-friendly cocoa products is estimated at less than 0.5% of total cocoa demand. However, consumer demand is growing. The retail market for organic chocolate products has seen increases in sales from US\$171 million in 2002 to US\$304 million in 2005 (ICCO 2007c). Integrating environmental conservation into the cocoa market may be difficult,

¹² This measurement accounts for sales made in the country and does not weight for counties that are sought for their chocolates or account for other products mixed with the cocoa (Dand 1999).

since smallholder farmers are more likely to make decisions based on economic motives versus environmental and social concerns (ICCO 2007a). However, if there is access to these niche markets, farmers may be able to capitalize on higher premiums. Organic, Fair-trade, single-origin, reduced sugar and dark and high cocoa-content chocolates command higher prices than other products, and in most cases require a premium for higher quality raw cocoa.

In lower priced chocolate products, manufacturers may look for alternatives to higher priced cocoa butter. Cocoa butter substitutes (CBSs) have been encroaching on the cocoa and chocolate markets. These low cost alternatives are derived from other smallholder tree crops, like oil palm and shea nut. The CBSs come in three forms; cocoa butter replacers, equivalents and improvers. The CBSs typically have a higher melting point and may facilitate expansion of the industry into warmer climates and increase general smallholder opportunities. However, the use of these substitutes is still debated. One study estimates a decrease in cocoa demand by 130,000 to 180,000 metric tons from the substitution of CBSs for cocoa butter. Legislation was enacted in the European Union to limit the use of alternatives to 5% if the final product is to be considered chocolate. Other countries are debating similar options (Geene, Heijbroek, and Lagerwerf 2000).

Shifts in demand from emerging markets and upward trends in consumption in traditional markets coupled with elastic demand will elicit decreases in international supply stocks, higher raw cocoa prices, and a commensurate supply response. This response may result in more smallholder farmers, traders and buyers entering the market, as well as increases in quantity supplied and possibly premiums for quality as countries

compete for market share. The benefit from this supply response to Liberia's smallholder cocoa farmers depends on the influences of the factors that determine farmgate prices and the avenues for growth encouraged by the market or the government.

2.3. Global Supply

This section details the cocoa marketing chain, working from the marketing of cocoa to the farmgate, to outline the global marketplace in which Liberia is competing to supply. Over 66% of global cocoa production in 2004, originated in West Africa (Table 3) (FAOSTAT 2007). Cocoa is grown throughout the tropical regions of the world (e.g., Africa, Asia and South America) by an estimated 2.5 million smallholder farmers on plots that range in size from 2 to 5 hectares (ICCO 2007a). Farmers typically receive at most 5% of the retail value of chocolate (Oxfam 2002). This wide farm to retail price margin is driven by several factors including the complex nature of the marketing chain. The cocoa marketing chain is a primary concern of producing countries given the significant consolidation that has occurred in retail, manufacturing and processing sectors (Oxfam 2002). In many countries multinational processors also serve as in-country exporters, transferring the cocoa beans with an internally set cost schedule. The result is a buyer-driven marketing chain as the multinationals continue to create backward linkages that bring them closer to the farmgate. Certainly, if consolidation does have an impact on competition, then the farm to retail price margin would likely widen further. This impacts smallholder incomes and on-farm decision making.

2.3.1. *Cocoa Marketing*

In general, as cocoa beans pass downstream through the marketing chain (Figure 1), ownership changes but form does not until the beans enter the domain of multinational processors. Cocoa beans are transferred from smallholder farmers or plantations to intermediate buyers. Depending on the marketing system operating in the country, the domestic trade may have multiple intermediate buyers. These buyers may be agents for other buyers or for the multinational exporters located at the port. As the cocoa transfers from the domestic to the international marketplace, the cocoa may or may not actually trade ownership, since exporters (e.g. ADM, Cargill) may also be processors. Alternatively, cocoa is transferred to trade houses, which operate as storage and processing facilities in the importing country. These trade houses may add-value to the cocoa before selling the cocoa or processed cocoa to the chocolate manufacturing sector.

Raw (whole bean) cocoa¹³ goes through a process commonly referred to as ‘grindings’, where beans are roasted, de-hulled (resulting in ‘nibs’), blended, and then heated to produce liquor or ‘cocoa mass’. Cocoa mass is converted to cocoa butter or powder, defined as semi-finished products (Mossu 1992). Processors transform cocoa inputs into finished products (e.g. chocolates, biscuits, soluble cocoa) or distribute semi-finished products to the cosmetics and food manufacturing (e.g., biscuit/confectionary) industries. These food manufacturing industries transform cocoa into chocolate by finishing, branding and selling the results directly to consumers. The chocolate manufacturing industry is relatively concentrated, with the top ten chocolate

¹³ The ICCO (2007) categorizes whole beans as ‘fine flavor’, generally produced by the Criollo or Trinitario varieties with notable exceptions and ‘bulk’, grown from Forastero trees, which accounted for almost all of the cocoa traded in the last five decades.

manufacturers accounting for over 40% of global chocolate sales, estimated at US\$68.1 billion in 2005 (ICCO 2007d).

Chocolate manufactures often rely on processing companies to prepare cocoa into materials that they can use. The processing industry is considered the link between the production of cocoa beans and the manufacturing of chocolate. Consolidation in processing has been driven by economies of scale in transport (since cocoa can be transported in bulk on container ships) and processing. Three large companies, Archer Daniels Midland (ADM), Barry Callebaut, and Cargill Incorporated, dominate the international cocoa processing sector (ICCO 2007d). They process over 40% of the cocoa beans produced in the world (ICCO 2007d). These three companies process, sell and deliver custom blends for use in chocolate and confectionary products, as well as market finished products directly to the consumer through subsidiary brands (ADM 2008; Cargill 2008; Barry Callebaut 2008).

The backward marketing linkage fostered by the cocoa processors to ensure supply has created a situation where the world's largest cocoa processors are also the world's largest cocoa exporters. Informal arrangements with the large multinationals in cocoa producing countries make distinguishing local exporters from the multinationals difficult. This consolidation has a dual effect on farmgate prices and producer welfare. Multinational exporters, for example in Côte d'Ivoire, provide linkages upstream through financing and quality process training for farmers and farmer organizations, as well as sourcing some of its processing capabilities in-country (Oxfam 2002; Dorin 2003). Decreased opportunities for competition may push local exporters from the market and oligopsony practices could exert downward pressure on farmgate prices and

margins of those middlemen not connected directly to the exporter or their intermediaries.

The domestic markets of cocoa producing countries are typically focused on the procurement and export of raw beans. However, origin grindings (processing prior to export) have increased globally 31% (2000) to 1,301,000 metric tons or 36.6% (2005) of all grindings (ICCO 2007; Geene, Heijbroek, and Lagerwerf 2000). Country of origin cocoa may benefit countries that acquire quality premiums for their cocoa on the global market (e.g. Ghana) or those that participate in single origin marketing (e.g. San Tome, Java). However, with complexity of semi-finished product demand and strict sanitary controls in the consuming countries, these ventures may only be feasible for large scale processors located in-country (ICCO 2007d; Dand 1999). Though domestic consumption of cocoa is limited in most cocoa producing countries, farmers may be able to benefit from marketing by-products of production and other value-adding opportunities. Opportunities include animal feed from the husks, soft drink flavoring, and alcohol distilled from the fermentation residue (ICCO 2007a).

Many market forces are exerted at the farmgate level from downstream agents. Price differences between farmgate and world prices are often attributed to high transport costs, low domestic quality, marketing board influence, risk aversion, and exogenous influences like labor organization, supply stocks, weather and poor transition of world price fluctuations (Kherallah et al 2002; Townsend 1999; Fold 2001). When monopsony or oligopsony practices exist among buyers, farmers are offered discounted prices and market information is of little use. However, as the number of buyers increases, price and other market information may place limits on agents' ability to exert market power

(Timmer, Falcon and Pearson 1983). Another factor that may affect farmgate prices is the lack of proper storage capacity. Farmers may be quick to enter the market to sell cocoa that has not been properly handled (e.g. fermented, dried, sorted) or stored (Geene, Heijbroek, and Lagerwerf 2000). Farmers may also experience price discrimination when selling at the farmgate, instead of selling at a regional buying center where prices can be higher, but explicitly incur transportation costs (Fafchamps and Hill 2004).

2.3.2. Liberalization

One of the objectives of the Washington Consensus was to encourage market liberalization. The intended result of liberalization included increased economic growth, improved market transparency/efficiency, and the transmission of market-based price signals. These objectives can be addressed through the removal of market distortions, decreasing inefficient state intervention, addressing production incentives, and developing competitive local markets in an effort to increase smallholder farmer incomes and consumer welfare (Townsend 1999; Kherallah et al. 2002). As part of the colonial legacy of the major African cocoa producing countries, governments frequently intervened in the cocoa marketing chain to stabilize prices and collect tax revenue (Gilbert, 1997; Townsend 1999; Gibbon and Pointe 2005). The attractiveness of commodity marketing boards¹⁴ has decreased with the downfall of centrally planned economies, the increased debt burden of developing countries, and the successes of market reforms in China and Chile (Akiyama et al. 2003). A historical perspective of

¹⁴ Market liberalization has also been encouraged through the progress of structural reforms mandated by the 1989 Washington Consensus and the 1994 Agreement on Agriculture (World Bank 1981; Gibbon and Pointe 2005).

various countries and the effects of market liberalization will aid in the discussion about the potential effects of liberalizing Liberia's marketing chain.

Nigeria was first to fully liberalize its cocoa market by abolishing its marketing board in 1986 through a rapid Monday-to-Monday change. The market floundered in a vacuum taking many years to readjust (Geene, Heijbroek, and Lagerwerf 2000). The intention of liberalizing the market was to allow anyone to export cocoa. However, market liberalization occurred without liberalizing the currency markets, creating arbitrage problems. The price of cocoa was bid up with an inflated Nira to access foreign exchange, and the cocoa market fell into disarray. Prior to liberalization, quality premiums accrued to Nigerian cocoa. With the rapid increase and subsequent collapse in the number of exporters brought on by inflated prices, Nigeria's quality incentives were lost (Gilbert 1997). Vestiges of the former marketing chain still persist in the form of private 'licensed buying agents' (LBA's) and brokers that serve to bring buyers and sellers together. Nigeria is trying to regain the high quality premiums it once enjoyed through new legislation that requires grading and quality protocols at local buying centers to promote a higher quality cocoa (Gilbert 1997; Oredein 2007).

In the early 1990's, liberalization in Cameroon was also meant to eliminate direct governmental market intervention, open the market to private exporting interests and decrease barriers to entry. Post-liberalization market organization in Cameroon is similar to Nigeria in the Anglophone Southwest Province but is slightly different in the Francophone Central and South Provinces as smallholders selling to village-level farmer groups ("groupe d'initiative commune" or GIC's), coxeurs (independent middlemen), or caissiers (contracted by the traders). From these intermediaries, cocoa is transferred to

larger traders, residing in or near larger regional buying centers. These regional buyers often have direct contracts with exporters and local processors and (Figure 1). The liberalization process increased the number of exporters in the short-term, but during the 2004/05 season, consolidation and cooperation with multinational firms allowed Cargill and ADM to drive the export market (Wilcox 2006). Post-liberalization, market access is still challenging for those producers and buyers who are not connected through political, farmer organization or exporter linkages (Wilcox 2006).

Prior to reforms the Caisse de Stabilisation (CAISTAB) was the government run parastatal in Côte d'Ivoire. CAISTAB stabilized prices through setting export prices, determining domestic transportation costs and farmgate prices, excising some quality control, and directly purchasing and selling cocoa without taking physical possession of the beans (Gilbert 1997). Starting reforms during the 1991/92 season, Côte d'Ivoire implemented an auction based system in which exporters bid for export rights. CAISTAB was formally abolished in 1999 and replaced by separately controlled entities with government oversight. These entities are the Regulatory and Control Fund (FRC) price support mechanism and the Coffee and Cocoa Producers' Fund (FDPCC) which gives farmers tools and training, Regulatory Authority for Coffee and Cocoa (ARCC), the cocoa marketing and export industry (Bourse du Café et du Cacao (BCC)) and an organization representing farmer cooperatives (GVC). Côte d'Ivoire is the world's largest cocoa producer, therefore, global price fluctuations have a large impact on smallholder cocoa farmers. The ARCC provides the market with a suggested price floor, in the form of a declared representative price, but this is not enforced and widely flouted by downstream agents.

Since liberalization and the decrease in government influence in Cameroon, Côte d'Ivoire, and Nigeria, farmgate prices tend to follow international price movements closer than during the pre-reform period (Gilbert and Varangis 2003). The two largest cocoa producers, Côte d'Ivoire and Ghana (Ghana's domestic market is not-liberalized), receive between 45-60% of the ICCO price¹⁵ due to government intervention through direct and indirect taxation. Nigeria and Cameroon, who liberalized in the late 1980s and early 1990s, have more competitive markets resulting in farmers receiving upwards of 80% of the LIFFE price (Figure 2).

2.4. Liberian Cocoa Market

Liberia is considered a small exporting country and war essentially created a de facto liberalized market in Liberia. Yet, in comparison to other West African cocoa producing countries whose markets have undergone liberalization, Liberia receives a smaller fraction of the ICCO price. Part of this difference is driven by the fact that Liberian cocoa commands a discounted price on the world market because of generally poor quality. Various aspects of the supply chain and their effects on farmgate prices are discussed in this section. Supply-chain constraints that affect Liberia's cocoa market are emphasized.

In Liberia, the external (Monrovia to international port) and internal (farm to port) price margins are sizable, especially in comparison with other West African countries (Figure 2). Domestically, for example, Nigeria has similar infrastructural constraints (e.g. poor road quality), but overall marketing margins are small as noted by the

¹⁵ The ICCO price is a composite price for cocoa on the London (LIFFE) and New York futures markets.

difference between the farmgate and port price. This is not likely the case in Liberia. Though the Monrovia (port) price was not known in the given timeframe, one can reasonably assume that the external margins (not counting origin discounts) are somewhat similar between Nigerian and Liberia as these are accounted for in general, by transactions costs that intervene between f.o.b. (Freight on Board) and c.i.f. (Cost, Insurance, Freight). Therefore, the large margin between the Liberian farmgate and the LIFFE price is likely of domestic origin. This may be exacerbated by scale. During the 2006/07 season Liberia exported 392 metric tons of cocoa to the European Union (EU27), which is 35% less than what Nigeria exported to the EU27 in the month of September of that season (EUROSTAT 2008). Thus with such limited throughput, Liberia is currently unable to generate significant interest from world market and exporters are forced to develop markets with limited capital and insufficient scale to capture scale economies.

Counterintuitive to most agricultural products, cocoa prices are typically lower at the beginning of the season (Figure 2). In most countries, prices increase at the farmgate result from competition for the supply of cocoa beans. Prices are typically lower at the beginning of the season, because cocoa is just starting to be harvested in relatively low quantities and heavy rains concurrently hinder the drying process resulting in low quality and limit the buyer's access to the farmgate. Prices tend to increase as buyers enter and quantities rise (lowering search costs) and continue toward the end of the season when supply of main crop beans decreases and the market shifts to mid-crop beans which are generally smaller and less desirable. Harvesting of the Liberian main crop usually commences in September and lasts until mid-February. The mid-crop is relatively

insignificant with little harvested between March and August when, accordingly, the market is almost non-existent.

Historically, the cocoa trade in Liberia has relied heavily on cross-border transactions, primarily with Côte d'Ivoire, due to the potential for higher prices in neighboring countries and political instability driving trade flows within the West African region. Given the instability in Côte d'Ivoire, stemming from the 2002 civil war and subsequent division of the country, Liberian cocoa has recently been used as a means of obtaining foreign exchange and foodstuffs from neighboring Guinea. With limited information on the 'street' exchange rates among the Guinean Franc (GF), Liberian Dollar (LD) and US Dollar (USD), estimating an accurate price for the cocoa traded in Guinea is severely hindered. Liberian cocoa is traded in Guinea in GF then converted into bags of rice, durables (e.g. household goods, farm tools, fuel) or USD. Upon return to Liberia, rice is sold in LD or consumed by the household.

2.4.1. Marketing Chain

Prior to the end of the war in 2003, there were estimates of 19,520 ¹⁶(Table 6) smallholder cocoa households throughout Liberia, with the largest populations in Bong and Nimba Counties, or 13% of all agricultural households (FAO/MOA 2001). In 2008, the Ministry of Agriculture estimated that 40,000 households, including those in Lofa County, produce cocoa (Liberian Ministry of Agriculture 2008). Many farmers lack incentive to participate in the cocoa marketing chain due to low prices and difficult constraints. Smallholder cocoa farmers in Liberia are hindered by a deficient

¹⁶ This number does not include estimates from Lofa County, as the data was unavailable due to the displacement of the population during wartime.

transportation structure, lack of knowledge concerning prices and quality standards, limited credit resources, and inadequate legal protection from corruption and fraud (Pay-Bayee 2005). In theory, quality grades and price information are announced in English and local languages via radio, newspaper and information sheets where available. However, with no ability to appeal grades and limited knowledge and methods of quality testing, farmers are at the whim of buyers (Pay-Bayee 2005). Impeding the marketing chain further is that Liberian cocoa shipped to the global market is discounted by 20% for poor quality¹⁷ (Gockowski 2007). In the 2005/06 season, farmers received on average, 17 US cents per kilogram, or 25% of the world cocoa price (Pay-Bayee 2005).

In 1990, the near demise of the LPMC and the suspension of Liberia's membership with the International Cocoa Organization caused the consolidation of Liberia's cocoa export markets into five foreign exporters, each with several agent/buyers and subagents (Pay-Bayee 2005). During its tenure, the LPMC accumulated large debts to the membership organizations and to farmers in the form of weigh bills. The extent of this debt and the civil war crippled the organization's ability to operate as it once had. At the time of this study, the LPMC had nominal authority to register exporters, establish grades, and provide access to export facilities.

Generally, the Liberian market follows Figure 3. Farmers sell (partially) dried and fermented beans to any available buyer who approaches them or they head-carry the load to a nearby buying center for sale. At the farmgate, buyers may be agents for

¹⁷ There has only been one instance of grade one cocoa. Grade one cocoa has 7.5% moisture, less than 12% defective beans, less than 25% slated beans as well as less than 10% in other defects. It occurred in pre-war Nimba County (Pay-Bayee 2005).

local/regional traders who finance village-level sales in nearby regional buying centers¹⁸. Alternatively, the buyer could be a small intermediate village-level trader with limited personally financed capital. These small-scale buyers may be in a position to take advantage of farmers' immediate cash constraints by offering same day cash-on-hand for prices that are less than the prevailing farmgate price offered by buyer's agents. Small-scale buyers may collect enough cocoa to make travel to Guinea worthwhile, or sell to larger-scale regional buyers. Farmers may take the cocoa to the nearest buying center to capture the intermediary's margin (after transport costs) and/or gain access to credit through informal arrangements directly with a larger-scale buyer. Low overall production and has corresponded with a limited number of buyers, traders and exporters downstream. This may encourage monopsony practices upstream at the farmgate as this market power, exacerbated by limited numbers of exporters resulting from market consolidation after liberalization, has been observed in other cocoa producing countries (Gilbert 1997; Wilcox and Abbott 2005). Low national output and barriers to entry (e.g., adequate working capital) limit options for exporter recruitment. Beyond exporting cocoa beans, the likelihood that Liberia can foster the development of a cocoa processing industry is low given the extremely limited domestic throughput and other factors that have plagued the successful pursuit of such ventures that have required state intervention in Côte d'Ivoire and Ghana.

¹⁸ Buying centers are defined by their size. A local center may be the closest city to the farm. Regional centers are typically larger with more defined marketplaces. Local centers filter cocoa into the larger regional centers. Regional buying-center buyers, on the other hand, benefit from economies of size by aggregating smallholder cocoa and transporting it on motorized vehicles to Monrovia, deep into Guinean territory, or possibly to the Guinean regional buying center (Nzérekoré) close to the Nimba border.

Buyers at the farmgate, not directly tied to an exporter (Liberian or Guinean), face substantial market uncertainty downstream. For example, quality, supply, transportation access and costs all affect the buyer's decision making. Buyers may discount cocoa at the farmgate to capture more of the marketing margin. Constrained by the lack of resources in general in Liberia, little mechanized transportation is available and it is relatively costly, even for buyers collecting cocoa. Lastly, buyers transporting (smuggling) cocoa to Guinea also pay a "border fee" and additional costs associated with cocoa smuggling to avoid confiscation by the Liberian government.

At the time of this study (2006/07), indications were that cocoa is not processed in Liberia or Guinea. Therefore, raw cocoa sold in the domestic market eventually reaches the port in Monrovia or has been smuggled to the port in Conakry, Guinea. Cocoa remaining in Liberia is transported by a regional trader to Monrovia for sale to one of the five exporters (as of 2005). Prior to export, the cocoa at the Monrovia port is verified for shipment (e.g. properly dried, graded, and fumigated) through Bureau Veritas (BIVAC). During the time of the study, the LPMC additionally inspected the cocoa and provided drying and storage when the exporter was unable to provide these services. Estimates of prices and collection, transportation and insurance costs were derived from interviews and secondary data (Table 7). As discussed previously, there is a sizeable wedge between the farmgate price and the pre-entry price at the port. The government, including the LPMC accounts for approximately 13% of the margin. However, export taxes are only 2.5 of f.o.b. and serves as a much needed source of government funding. Buyers tend to receive approximately 47% of the f.o.b. price. This buyer's profit margin

is substantial; however, inefficiency and market power are potential issues as it accrues to several levels of intermediaries throughout the marketing chain.

CHAPTER 3. METHODS AND PROCEDURES

3.1. Methods for the Liberian Baseline Survey

Data were obtained from a baseline survey conducted by the International Institute for Tropical Agriculture's Sustainable Tree Crop Program (STCP) and the University of Tennessee (UTK) during the 2006/07 cocoa season. The survey instrument consisted of twelve sections: Locational Details, Household Characteristics, Household Demographics, Farming System Characteristics, Perennial Tree Crop Investments and Production, Hired Labor Use for Tree Crop Production, Tree Crop Marketing (cocoa, rubber, oil palm and coffee), Rural Services, and Rural Credit (Appendix B). The baseline survey was augmented with a village-level survey to collect information in five categories: General Information (distance, population, and ethnic distribution), Infrastructure (electricity, road quality, and education), Cocoa Production (inputs available), Farmer Groups, and Possible Buyers (Appendix C).

Enumerators from STCP and the Ministry of Agriculture interviewed participants between October 2006 and March 2007. The enumerators completed 794 surveys in 40 villages. The villages were located around two buying centers in the counties of Bong, Lofa, and Nimba (Table 8 and Table 9). The sampling methodology was impacted by the lack of village-level population and cocoa production data. The survey targeted rural households with an emphasis on those that were producing cocoa. Cocoa producing households were further divided by whether or not they were marketing their cocoa.

3.1.1. *Selection of Counties, Buying Centers, and Villages*

The survey focused on the cocoa producing regions in Bong, Lofa and Nimba counties. According to estimates by the Ministry of Agriculture and the Food and Agricultural Organization, these counties represented 85% of cocoa households for the country in 2001 (Table 6). Additionally, Bong, Lofa and Nimba were chosen for the survey because STCP and their industry partners indicated that almost all the Liberian cocoa was grown there in the 2006/07 season with Nimba producing the most, and Bong producing the least amount of cocoa. These counties continue to be the epicenter of cocoa production in Liberia. Other counties (e.g. Grand Cape Mount) have completely abandoned cocoa smallholdings due to a lack of markets and price incentives.

The regional buying centers were selected from a list of historically functioning cocoa buying centers, both prior and during the conflict. In the past, LPMC warehouses were scattered across the countryside in larger towns and served as points of aggregation for rural markets prior to shipping from Monrovia. With the near demise of LPMC, these traditional buying centers continue to serve as a base of operations for private Liberian-based buyers. These centers serve as focal points around which Liberian cocoa markets operate. Unfortunately, the lack of cocoa production and marketing data does not allow particular buying centers to be easily stratified by throughput. Instead, a preliminary list was assembled of potential buying centers in each of the three counties (Table 8)¹⁹. Two buying centers were chosen per county with assistance from STCP, the Liberian Ministry of Agriculture and members of the Liberian cocoa industry. These centers were

¹⁹ Several other buying centers were encountered in the field that are closely related to those in . In general, these other centers represent the exact location of a particular buyer who stores cocoa purchases in a town (village) adjacent to a traditional buying center (e.g. Bahn is a few kilometers from Saclepea).

considered to be representative of major and minor cocoa buying focal points. When compiling the survey data, two additional locations were identified as being buying centers in Nimba County (Bahn and Sanequille). Additionally, cocoa smuggled out of the country was more than likely passing through the towns of Ganta and Voinjama before being transported to Guinea.

Administrative maps (1:150,000 scale) were used to develop a comprehensive list of villages within the anticipated buying center market area. The market area was assumed to have a radius of 30-40 kilometers based on infrastructure quality and proximity to other buying centers. When possible, cocoa buyers and farmers were asked to assist in the demarcation of market boundaries. Any settlement name listed on the maps was considered a village. Cartesian quadrants (originating from the buying center) were used to separate each buying center market into four regions. One village was selected at random from each quadrant to create a sample of four villages. A sample of six villages was desired per buying center (one village per day during a six-day workweek). The remaining two villages were selected randomly from the master list of villages surrounding the buying center, regardless of quadrant. The result was a sample of six villages randomly drawn from around each of the two buying centers in each of the three counties for a total of 40 villages (Table 9).

The villages (Table 9) were visited before the scheduled surveying date to discuss the research agenda and logistics with village leaders. This visit was done to enhance participation and to allay concern about ulterior motives. The pre-visit meeting also allowed the research team to see the layout of the village and discuss the current cocoa marketing structure. On several occasions, the selected villages were found to have been

destroyed or abandoned during the war or devoid of persons producing and marketing cocoa. In these instances, the nearest village with cocoa farmers was chosen to replace the original village under the assumption that market institutions and production practices were likely similar given its close proximity to the original village.

3.1.2. Selection of Survey Participants and Interviews

Enumerators met with village leaders and assembled potential participants at a previously identified meeting place. Most meetings occurred in the morning to limit the meeting's impact on daily activities and assure maximum participation. The meeting began with team members introducing themselves and explaining the research agenda in the appropriate language(s). A village-level survey was completed with input from meeting participants. Village leaders then developed lists of general audience members and cocoa farmers who were not in attendance. Every effort was made to include all cocoa farmers in the village. Each name on the list was assigned a number and survey participants were chosen randomly. Since the focus of the survey was households engaged in marketing cocoa during the 2006/07 season, the enumerators surveyed ten cocoa farming households and six non-cocoa farming households, also chosen at random. Participants were randomly assigned to enumerators. Enumerators conducted interviews individually or as a group depending on language constraints and the comfort level of participants. Villages were visited twice, once at the beginning of the cocoa season (October/November) and once at the end (January/February/March) to facilitate the seasonal collection of transaction-level marketing information.

3.2. Household Description

Data from the baseline survey for households that marketed cocoa in the 2006/07 season were used to address Objective 1. Of the 794 surveys collected, 337 indicated that the household had sold cocoa²⁰. This survey subset included farmers that responded with market transactions and had at least one cocoa stand. Observations for those participants who sold but did not produce cocoa as their primary or secondary tree crop (5) were omitted from the dataset to describe the characteristics of the Liberian cocoa producing and marketing household. Data on these households were collected to describe household characteristics, production methods and inputs that may affect farmers' decisions and ability to grow and market cocoa.

Anecdotal information on marketing channels, margins, and quality assessment was collected through in-person interviews with three buyers in Bong and Nimba buying centers. Buyers were hesitant at first to discuss business matters, but after assurances that the researchers were neither buying nor competing in the market, they answered questions on their business practices. Interviews were also conducted with border patrol stationed at the Lofa and Nimba/Guinea borders. These interviews were arranged through STCP contacts while the researchers were in country.

²⁰ Households sold at least once and at most 5 times throughout the season

3.3. Modeling Liberian Cocoa Price Determinants

3.3.1. *Data*

Data from the baseline survey for households that marketed cocoa in the main 2006/07 season (from September to February) were used to address Objective 2. Of the 794 surveys collected, 337 indicated that the household had sold cocoa resulting in 563 individual transactions. After omitting sales for the previous 2005/06 main (5 sales) and mid-crop seasons (4 sales), and transactions with incomplete information (22 sales), the number of remaining sale transactions was 532. These observations were used to determine the factors influencing the farmgate cocoa price in Liberia. In order to delineate the affects of the world price on the farmgate price, the farmgate prices and discounts were converted from Liberian Dollars (LD) to US Dollars (USD) per kilogram. Prices were converted using the street market exchange rate, since it is the rate at which the marketplace operates, during the survey period of 60 LD per USD.

3.3.1. *Regression Model*

Factors that may affect the Liberian farmgate price received by farmers for cocoa are numerous. Farmers make decisions based on expectations on price and profitability. The price transmission framework estimates the effects that market and institutional forces have on the marketing margins and the effective transmission of the world price to the farmgate (Wilcox 2006). The difference between the international and farmgate prices is attributed not only to transportation and transaction costs (Townsend 1999) but also to factors that affect transmission of price signals. Fafchamps and Gabre-Madhin (2001) and Nkamleu and Kielland (2005) suggest that financial resources, physical

capital (assets and storage), human capital (education, experience, and family labor), social capital (dependents and membership in organizations) and distance affect marketing margins and production decisions for market participants. Seasonal and locational variables affect the number of participants in the market and the prices received at the farmgate (Fafchamps et al. 2004). The margin between the effective farmgate price ($P_{fi} = P_i - PPKG_i$) and the international price (P_w) can be explained through variables that represent the transportation costs (c_f), market information (mir), farmer characteristics (fc), seasonality (s) and location (l) for each transaction i (Equation 1):

$$(1) P_{fi} = P_{wi} + c_{fi} + mir_i + fc_i + s_i + l_i.$$

The effective price is calculated by subtracting the magnitude (per kilogram) of the explicit discount (\$/kg), discounted by the buyer for quality, quantity or other reasons, from the farmgate price. These variables may impact marketing margins and thus the producer's decision to harvest and market high-value export crops (Balat, Brambilla and Porto 2007). Given the categories expressed in Equation 1, the effective price received by producers for sales transaction i was expressed as:

$$(2) P_{fi} = \beta_0 + \beta_1 * LIFFE_i + \beta_2 * QUALMAT_i + \beta_3 * TGDIST_i + \beta_4 * TMDIST_i + \\ \beta_5 * QINV_i + \beta_6 * TRANSPORT_i + \beta_7 * BTRANS_i + \beta_8 * BFARM_i + \beta_9 * MKTIN_i + \\ \beta_{10} * OMRKTIN_i + \beta_{11} * CELL_i + \beta_{12} * BCRED_i + \beta_{13} * NONBCRED_i + \\ \beta_{14} * FAMSIZE_i + \beta_{15} * EDUC_i + \beta_{16} * CEXP_i + \beta_{17} * CHOLD_i + \beta_{18} * WET_i + \\ \beta_{19} * BIGCTR_i + \beta_{20} * NIMBA_i + \beta_{21} * LOFA_i + \epsilon_i,$$

where definitions and expected signs for the variables are found in Table 10, Table 11, and Table 12; β_j ($j=0\dots 21$) are parameters to be estimated, and ε is a random error term adjusted to normal distribution.

The model was estimated with Ordinary Least Squares (OLS). To test for collinearity, variance inflation factors were calculated. An index above ten would indicate that multicollinearity has biased the standard error of an estimated coefficient thereby causing the t-test to be unreliable in rejecting the null hypothesis. The model was further tested for collinearity among the regressors through the analysis of the eigenvectors (SAS 2004). White's test was used to test for heteroskedasticity. Assuming an unknown form of heteroskedasticity the model was adjusted using the approximated jackknife procedure (Mackinnon and White 1985), which scales the squared residuals by $(1-h_i)^2$, where h_i is the i th column of the residual matrix. This step down-weights outliers with larger variances by further inflating ε_i^2 . Intuitively this method deemphasizes the outlier effect on standard errors.

3.3.2. Variable Selection and Expected Signs

Farmers may experience price volatility from price signals received upstream. However, institutional factors and marketing margins may impact the proportion of the world price they receive (Townsend 1999). Cocoa demand is driven by the transmission of price signals through the marketing chain and the intermediaries. After initially testing for the significance of β_1 , the model was tested for perfect price transmission. If price transmission is perfect then the null hypothesis is that $\beta_1 = 1$. If the coefficient for β_1 does not equal 1 or 0, then there is a case of partial price transmission where transaction

costs and other factors affect prices received at the farmgate. If farmers are receiving price signals from the world market, the world price (*LIFFE*) would likely have a positively correlated affect on the farmgate price. The *LIFFE* price is the futures price that cocoa receives on the London Commodity Exchange. The *LIFFE* price was calculated as a monthly average over each month of the cocoa season. If quality discounts (*QUALMAT*), measured as a dummy variable, were taken for moldy or wet beans, they should have a negative impact ($\beta_2 < 0$) on farmgate prices. Buyers may try to lower their risk of lower upstream prices by buying low quality cocoa and requiring farmers to forfeit a quantity of cocoa (discount) for wet or moldy beans (Fairtrade Foundation 2002; Wilcox 2006).

Barrett and Li (2002) suggest that when buyers or producers have trade flow information, or upstream price information at different locations, it results in market integration. Integration may decrease imperfect information constraints on farmgate price outcomes. Farmers and buyers indicated that, during the 2006/07 season, cocoa was mainly smuggled to Guinea for sale. However, border enforcement, and proximity may have encouraged some to sell in Monrovia. Thus two possible markets were available for Liberian cocoa producers. If trade flows and market information were indicating better prices in Guinea, an increase in distance from Guinea (*TGDIST*) should decrease the farmgate price ($\beta_3 < 0$) and as distance from Monrovia increases (*TMDIST*), the farmgate price should increase ($\beta_4 > 0$) given the price differential between the two destinations. Estimated as per kilometer costs, the distances from the village to the Guinean border (*TGDIST*) and to Monrovia (*TMDIST*) on marked and passable roads

delineated by ReliefWeb (2007) were used to measure the costs of transport to the two markets (Table 13).

Quantity not only impacts the total price paid to farmers directly, but buyers may choose to limit search and transactions costs by amassing quantities in a target area that may have a larger cocoa crop or better road access. Therefore, buyers may be willing to increase farmgate prices to benefit from economies of size. As quantities sold increase, the procurement cost to the buyer per kilogram of cocoa should decrease, resulting in a smaller price margin relative to buyers who purchase smaller quantities. *QINV* is the inverse of the total amount of cocoa sold in the transaction to estimate the effects of scale. The expected sign is negative ($\beta_5 < 0$) as the variable represents a cost, though the magnitude decays as quantities increase given the inverse function (Wilcox 2006).

Fafchamps and Hill (2004) concluded that the likelihood of a farmer selling off-farm increases with quantity and proximity to the regional markets. Farmers that indicated ownership of a bicycle, or mechanized transportation were grouped into the dummy variable *TRANSPORT*. Having access to transportation resources may decrease the opportunity costs of transporting cocoa to a local or regional buying center, therefore having a positive effect on price ($\beta_6 > 0$). Those farmers who choose to transport cocoa to the marketplace (*BTRANS*) may bear the transportation costs but positively ($\beta_7 > 0$) capture part of the margin consumed by intermediaries.

Farmer groups (*BFARM*) organized at the village-level may provide farmers with resources such as bargaining power, collective marketing, or credit opportunities (Myers 2004). Value gained from participating in a farmer organization may positively impact the prices received ($\beta_8 > 0$). This variable does not measure market information received

from the farmer groups, since only 1 respondent received this kind of information. However, the source and frequency of market information may positively affect a farmer's ability to receive price signals and their ability to negotiate trades (Townsend 1999; Kherallah et al. 2002). The source of the information, government, newspaper or radio sources (*MKTIN*) may give the farmer a sense of downstream prices which may allow the farmer to better negotiate price ($\beta_9 > 0$). However, downstream price information may be irrelevant to local market negotiations, and therefore information from produce buyers and neighbors (*OMRKTIN*) may give the farmer a better sense of local market prices ($\beta_{10} > 0$). Observations are compared to those who did not receive any market information (*NOINFO*). Another source that may be used to gather price information is use of cell phones. Farmers who own cell phones (*CELL*) may have the ability to obtain prices from buyers or sources of information not already captured ($\beta_{11} > 0$).

A farmer's access to capital through credit may impact quantity and quality through production, purchasing of inputs, labor, or marketing (Oxfam 2002; Townsend 1999). Depending upon the source of credit, the effects on farmgate price may be positive or negative. Credit is often extended by the buyers (*BCRED*) as a means to secure supplies. Interest may be collected through lower farmgate prices at the time of the sale. Given these reasons, *BCRED* is hypothesized to have a negative effect ($\beta_{12} < 0$). Other credit sources (*NONBCRED*) may not have the same affect on farmgate cocoa prices because repayment is not specifically tied to the sale of the cocoa, although money from the sale could be used to repay loans ($\beta_{13} > 0$). These transactions are referenced to farmers who did not barrow from any source (*NOCRED*).

Farmer characteristics may have an impact on the farmer's decisions to produce and market cocoa. The immediate needs of the family (school fees, food, etc), access to social and human capital, and the lack of diversification in the farmer's tree crop holdings may affect the farmer's willingness to sell (Nkamleu and Kielland 2005). Family size (*FAMSIZE*) may impact the household's contribution to labor resources but negatively impact the farmer's willingness to negotiate prices (β_{14} is ambiguous). Education (*EDUC*) and experience in farming cocoa (*CEXP*) may provide a comparative advantage for a farmer, given that they may have previously experienced seasonal price trends or have cultivation knowledge ($\beta_{15} > 0$, $\beta_{16} > 0$). Farmers unable to diversify crop holdings (*CHOLD*) may have fewer income alternatives and be more risk averse to haggling prices and possibly losing a sale ($\beta_{17} < 0$).

During the rainy season (*WET*), transportation costs may increase due to waterlogged routes as markets may become inaccessible due to the road conditions. Improperly harvested and dried cocoa leads to decreased quality, as well. The wet season occurs during the beginning of the harvesting season in August and continues until mid October. Cocoa harvested during the wet season can become available in the market during the dry season, which may increase supply and price margins. However, the hypothesized effect of the wet season is negative ($\beta_{18} < 0$) on prices because of low quantities of poorly dried cocoa, relatively few buyers, poor road conditions, and high moisture content due to lack of sun drying opportunities.

In previous studies (Wilcox, 2006; Wilcox and Abbott, 2006), buying centers were designated as "large" if cocoa was amassed for shipment directly to the port. Buyers in large centers presumably have relatively high capacity to procure and transport

large quantities of cocoa produced in the surrounding area. Alternatively, “small” buying centers often pass cocoa through a second buying center before shipment to Monrovia. These small centers are typically in more remote areas where farms produce less cocoa and buyers have correspondingly lower buying capacity. Proximity to the market may also affect the number of buyers visiting the farmgate and quality of the infrastructure (Fafchamps and Hill 2004). Buying center size (*BIGCTR*) may be associated with scale economies, availability of market information, quality of infrastructure and a particular market environment driven by the institutional history of the market. These prospects suggest larger buying center could influence the magnitude and variation of farmgate prices positively ($\beta_{19} > 0$).

County factors may also impact prices for a multitude of reasons, including some unmeasured local level phenomenon. During the conflict, fighting subsided earlier in Nimba County and communities appear to have recovered and are involved in agriculture (Pay-Bayee 2005). Market access may be an issue in evacuating cocoa from a given county given the local infrastructure and attractiveness to buyers. As long as cross-border smuggling continues, Nimba County may have comparative advantage in sharing a large border with both Côte d’Ivoire and Guinea. Other pre-war and non-descript factors may impact the current status of cocoa in these counties; for example, Lofa and Nimba were the top two counties for cocoa producing households in 2001 (Table 6). The county dummy variables (*LOFA* ($\beta_{20} < 0$) and *NIMBA* ($\beta_{21} > 0$)) were calculated to compare these counties with the overall average of the survey, instead of a direct comparison between counties.

CHAPTER 4. SURVEY RESULTS AND DESCRIPTIVE STATISTICS

The characteristics of smallholder farmers and their households who are engaged in the production and marketing of cocoa (n=332), are described in this chapter. These characteristics may impact household decisions to participate in certain agricultural and other economic activities. Information about household size, education, income sources, labor, land tenure and inputs may have exogenous effects on the farmers' decisions to produce and market cocoa. The information in Section 4.6 is based on the sample of households that marketed cocoa during the 2006/07 season (n=337).

4.1. Household Demographics

The human capital of the household may affect many aspects of cocoa production and marketing from available labor force to ability to manage crops and from farmer's experience marketing cocoa to cash flow pressures. Household size ranged from single adults living alone to extended families with up to 19 members. The majority of households had 4-6 members (Figure 4). Households consisted of the head of house, their spouse(s), offspring, and extended family, who may be related by blood or other familial ties. Age, gender and experience of the head of household may impact the farmer's ability to market or produce cocoa. Heads of household were on average 47 years old and 89% were male. The average age of female heads of household was 51 years. The median level of cocoa farming experience for heads of household was 19 years. Roughly 53% of the household sample consisted of offspring, aged 3 to 20 years. Forty-three percent of these individuals were direct offspring of the head of household (Figure 5). The age composition of the household could affect both production and

marketing decisions of the cocoa marketing household. A cocoa farmer may choose to use youth to meet farm-labor demands (see Section 4.4), a high proportion of youth may increase pressure on the farmer to negotiate higher prices or settle for lower prices in times of sickness or starvation or produce more to pay for school fees (Nkamleu and Kielland 2006).

Fafchamps and Hill (2004) note that farmers may travel to the larger towns not only to participate in the non-farmgate cocoa market but to gain access to medical or educational services for household members. Therefore, having dependents in school may affect not only the spending habits of the household but change the marginal costs of transporting the cocoa to the market. For example, the dependent may need school supplies or medical treatment available in the village or regional buying center. Fourteen of the 39 villages surveyed had no schools located in the village, 24 had access to primary school, 1 had a secondary school, 1 had a technical school, and only 1 of the villages had both a primary and secondary school. The vast majority of household members who were born before 1956 received no formal education. At the time of this survey (2006/07), 39% of individuals aged 3 to 20 years indicated that they were students. However, more than half of pre-school aged children and roughly 80% of 8-20 year olds had participated in some level of formal education (Figure 6). This age group is the one that was arguably most affected by the war as they were the primary source of soldiers, and schooling was intermittent throughout the conflict. Uneducated farmers lack the production and business management skills that may be necessary to realize the potential of their farm enterprise (Wilcox and Pay-Bayee 2006).

More educated farmers may be better suited to learn new techniques in farm management, drying and fermentation, which affect quality and thus price and possibly negotiating prices. Despite the current push for education, access to formal education beyond elementary school is limited for most rural households, even with regard to supplemental agricultural training. Only three farmers indicated that they had received any formal agricultural training. Of those, two had completed some training on cocoa production.²¹

4.2. Income Sources and Crop Diversification

Economic activities of household members are often determined by age and gender (Figure 7). Not surprisingly, the primary activity for surveyed household members above the age of 14 was related to agriculture (66%) or school attendance (24%). Thirty-eight percent of household income was derived from food crop sales and 39% was derived from tree crop sales (Figure 8). When looking at combinations of the important sources of income, 63% of respondents indicated that they received income from a combination of food and tree crops. Although the sample is focused on households who marketed cocoa in 2006/07, 17% did not indicate that tree crops were considered as an important source of income. Other less prominent sources of income included petty commerce (7.8%), non-agricultural enterprises (9%) and remittances (2.7%) from relatives in larger towns or living abroad.

One aspect of cocoa production that aids farmers with household income is the capacity to diversify tree crop holdings. During the 2006/07 season, many farmers

²¹ The baseline survey was not conducted in villages that STCP has implemented farmer field schools.

divided their land holdings among more than one perennial tree crop system (Figure 9). Additionally, farmers may have added food security through secondary crop production. Although approximately 54% farmed only cocoa, secondary food crops were often interspersed among the stand²². Cocoa grown with other crops is an economic production system which diversifies the agricultural portfolio and contributes to overall household food security. Species such as avocado, kola nut²³, and plantain were commonly found along side cocoa on Liberian cocoa farms (Figure 10). These crops can either be consumed by the household or sold at the market.

Production and sale of food and tree crops generated approximately 77% of household income (Figure 8). As with many West African nations, agricultural production is divided amongst female and male household participants, who in turn, may affect marketing and production decisions (Carr 2008). Respondents were asked to rate the top three agricultural crops produced and sold by gender (Figure 11). Eighty percent of male respondents reported that tree crops, specifically cocoa and rubber, were the most important product they produced. This was in contrast to the 10% of females reporting a tree crop as one of the three most important crops they produced. Female respondents identified a variety of food crops as being the most important agricultural products that they produced. A majority of households (73%) had one field that was rotated with rice, cassava and mixed food crops. Eleven households indicated they had no field in staple crops (Table 14). Anecdotally, some farmers indicated higher opportunity costs (e.g. using limited labor hours for food or for tree crops) in the trade off between growing and

²² In contrast, rubber and oil palm were mostly monocultured.

²³ Kola nut is not a food crop per se but is sold in the marketplace for its cultural significance and has medicinal and stimulant properties.

maintaining cocoa versus food crops. Opportunity costs for growing cocoa may impact the farmer's willingness to transition from staple food production to cocoa, thus making it more difficult for Liberia to benefit from increased supply and economies of scale. However, diversifying overall household production by balancing higher-value export cocoa with staple crop farming was important.

4.3. Agricultural Inputs

With the limited resources available to producers in developing countries, the Liberian producer may have to decide between employing labor (which is readily available) and capital (which is scarce) intensive strategies (Cleaver and Donovan 1995). Liberian farmers are often unable to utilize agricultural inputs due to a lack of markets, prohibitive prices, and limited available capital. The use of agricultural inputs in Liberia is rare, only one survey respondent had purchased any kind of chemical input (pesticide) for the household's cocoa farm.

Productivity of cocoa on Liberian farms is limited partly because of the age of the current tree stock. As the civil war spread and subsided through the counties, displacement of cocoa farmers affected their ability to plant new tree stock. Some villagers were able to hide in the bush close to their village and could access their farms throughout. Others remained for years in refugee camps in other nations or internal displacements away from home. Regardless of distance, this displacement caused many farmers to have varying access to their cocoa farms and those that did had few incentives to manage their farms because of uncertain futures and demand for food crops. As such the prevalence of recently planted cocoa tree stocks reported in Figure 12 coincides with

the relative safety of the counties. A majority of this tree stock is of the unimproved variety (Wilcox and Pay-Bayee 2006; Weise and David 2005). Roughly 19% of the tree stock was under six years of age and was immature for harvest and 19% of the stock was already past its productive peak of 35 years. The current status of the cocoa farms can be found in Figure 13. Very few (3.6%) of the producing and marketing farmers had abandoned cocoa farms (12 farmers)²⁴. In contrast, 19% of non-marketing or producing cocoa farmers had abandoned their farms to fallow. For the general survey participants, a majority indicated that they were planning on rehabilitating the current cocoa farm (Figure 14) (Wilcox, English and Davies 2007).

Machetes, hoes and axes were all found in relative abundance (Table 15). The majority of these tools were in fair to good condition. Particular to harvesting and drying cocoa, 55% households had on average 1 cocoa harvesting pole and 55% had on average 2 raffia drying mats. In direct relation with the poor quality cocoa being produced by Liberian cocoa farmers, only 13% households reported having at least 1 fermentation basket and 13% households had on average 1 tarpaulin available for drying. Finally, 23% of households had on average 2 jute bags, commonly used to transport prepared cocoa.

4.4. Labor

The household serves as a regular source of labor for Liberian farms. Almost 80% of labor used on the main tree crops was family labor (Figure 15). Kuus are communal/rotational labor farming groups which help prepare and harvest farms. Labor supply from the local Kuus was limited, and 6% of households (20), over all the counties,

²⁴ These 12 farmers may not be managing their farms but still collecting cocoa from the trees.

indicated that they employed Kuu labor on their cocoa farms. Monetary compensation is not common. Rather, participants of the Kuu are often fed by the owner of the farm that they are working on that day. One of the benefits of participating in the Kuu is having access to labor and being able to cultivate larger farms, however the Kuu's services are limited to those who are able to ply their labor services.

As in food crop production, cocoa production and harvesting tasks are often gender specific and age based (Carr 2008; Nkamleu and Kielland 2006). Most often, once the cocoa is harvested from the trees by men, the pods are either broken en masse to collect the cocoa beans near the point of harvest or pods are carried back to the domicile by both sexes (Figure 16). The cocoa beans are usually fermented and dried by women. In general, cocoa production and marketing is dominated by males. Fermentation, clearing, and brushing are also tasks typically assigned to male household members. Other household members, primarily youth and women, contribute to harvest and post-harvest activities including breaking the cocoa pods, bean preparation, transportation and drying.

Concerns have been raised with regard to child labor in West African cocoa producing countries. Child labor has been seen as preparatory work experience (Nkamleu and Kielland 2006). Of the producing and marketing cocoa household members, 340 individuals aged 3-20 (30.9%) contribute to the household's cocoa labor. Of the 340, 41.7% attended school in addition to working on their household's cocoa farm. The other 58.8% indicated that, in addition to contributing to cocoa labor, they were economically active in other areas and not attending school (Table 16).

Although Liberia has a high rate of unemployment, the farmer's access and ability to compensate labor outside the family may be limited. Sixty-three households (18%) had hired workers for seasonal work or on a per task basis. Some farmers hired labor for multiple tasks. The average wages, employees, and hours worked per task are repeated in Table 17. A majority (55%) of the hired labor was used to brush (clearing out the undergrowth) at the cocoa farms. A majority of these workers (870) were identified as being from the local community and 18 were identified as being Guinean.

4.5. Land Tenure

Land tenure remains a tenuous issue as farmers return to their ancestral villages to reinstate claims on property. Proof of ownership may be difficult given disputed property demarcations and rudimentary records. Issues also arise when the head of house or virtually the entire family was killed during the civil war. Traditional inheritance of land falls to members of the extended family, regardless of whether the inheritors are members of the village. Undefined land rights affect farmers' willingness to invest in mid- to long-term improvements or expansions of current land holdings. Of the 332 households, only 23 respondents indicated that they had an official title to land. When asked how those without a title were able to farm the land, 148 responded that this was their ancestral village, and 2 farmers had an arrangement with the village elder.

Over 80% of all tree crop holdings for the producing and marketing households were inherited. Households that indicated that they had the official title to their land (n=23), sold an average of 218 kg or 30% more than those who did not have the title to their land (168 kg), during the 2006/07 season. However, when comparing households

that were residing in their ancestral village (n=296 households) sold on average 172kg versus those that were not, the non-ancestral villagers (n=36 households) who sold on average 166kg.

4.6. Market and Price Descriptors

4.6.1. *Price*

Crucial to determining the factors that affect farmgate prices are the observed prices at the farmgate. A comparison between observed farmgate cocoa prices in Liberia with those found in other African countries provides some indication of the current market conditions compared to other West African cocoa markets (Table 18). The margin between the farmgate price and the ICCO price (Figure 17) is considerable. The effect of infrastructure on the wide margin between the farmgate and ICCO price may be driven by transactions costs. This wide margin may be further compounded by several factors, including low quality and quantity, few exporters and an underdeveloped marketing chain.

Limited cooperation from buyers downstream led to an inability to determine conclusively the domestic marketing margins throughout the Liberian cocoa marketing chain during the 2006/07 season. However, the few buyers who agreed to be interviewed indicated that an estimate of 75% or greater of the cocoa purchased in Liberia was transported and sold in Guinea. Buyers indicated that there was a difference of \$0.25-0.42 USD/kg (or more) between the Monrovia port price and prices received in Guinea, despite the risk factors involved when transporting the cocoa to Guinea. Anecdotal information from buyers indicated that they were required to pay “entrance” fees at both

borders. Buyers also indicated that an influx of capital in Monrovia, coupled with violence in Guinea and cocoa in the marketing chain shifted trade flows to Monrovia at the end of the 2006/07 season. Almost all the cocoa grown is sold during the main season, which falls between September and January. Buyers presumably will minimize search costs, accounting for seasonal and transportation difficulties, thus procuring cocoa after the rainy season ends. The size and frequency of sales increased during the months of October, November and December (Figure 18). Individual transactions were typically less than 100 kg and rarely over 200 kg.

Cell phones may have a wide application in market development in the long-run, though currently few farmers have access to cell phones. Due to this, the impact of cell phone use, in relation to price information, is more likely to have an effect through the Liberian buyers. Buyers may have greater access to cell phone service in the larger village in which they reside and may have more resources to devote to the ownership of a cell phone. Buyers may have business relationships with buyers located in Guinea, and use a phone as a means to ascertain prices in the Guinean markets, unlike the typical rural cocoa farmer. Buyers or farmers trading cocoa in Guinea face a language barrier since transactions are often held in the Liberian's rudimentary French or the Guinean buyer's rudimentary Liberian English. Knowledge of prices further downstream may have aided buyers in setting marketing margins and directing trade flows. For farmers, market information may aid in negotiation of prices or improvement of quality. Despite uncertainties, smuggling is often worth the risk. Farmer's reported in interviews that they would often receive the equivalent of \$0.08-0.25 USD/kg more for their cocoa after accounting for transportation and transactions costs compared to the farmgate price.

4.6.2. *Discounts*

Buyers trying to meet exporter quantity demands, will sometimes purchase wet cocoa beans (and reportedly sometimes even moldy) with quality discounts taken. These discounts are paid to buyers through a weight deduction from the final sale weight. For example, the buyer will estimate that there are wet beans in the lot and ask the farmer to give him an extra 2 kg per bag for “free” to compensate. The deduction effectively lowers the price received by farmers. Often a kilogram is also deducted from the total amount sold to account for the weight of the sack holding the cocoa. Liberian buyers negotiate prices based on perceived quality, as industry standard procedures are not used to ascertain quality. Farmers without knowledge of quality improvement practices are left to the discretion of the buyers (Pay-Bayee 2005). Despite this, a majority (68%) of the discounts was taken for the weight of the bag alone and was not taken for quality. The average discount for quality was 2.7 kg per bag (Table 19).

The buyer often measures quality by obtaining a sample of beans and cutting them in half or hand rolling them to ascertain bean moisture levels. Level of fermentation is estimated by examining bean color (Dand 1999). In Liberia, measuring quality and determining discounts is highly subjective and depends on the buyer’s knowledge of good quality and the honesty of the buyer’s assessment, since no instruments are used. Farmers, for their part, may be improperly fermenting and drying the beans as a means of saving time, a lack of knowledge about fermenting or drying practices or simply a lack of incentive to do otherwise. Fermentation of cocoa in Liberia occurs in hanging banana-leaf-covered baskets, in a pile wrapped in banana leaves, or a tarpaulin on the ground. Farmers reported fermenting beans from two days to a week.

Drying times ranged from three days to a week. Farmers typically used bamboo mats or tarps to dry cocoa (Table 20).

4.6.3. *Transportation*

Access to transportation is limited for many farmers. Of the 332 respondents, only 13 had bicycles, 5 a moped or motorcycle, and 1 a pickup truck. If farmers were able to transport cocoa to the Monrovia port, they would more than likely have to take some form of taxi service or rent space on a vehicle transporting goods. The averages for a taxi ride, from the buying centers to Monrovia can be found in Table 21. Farmers interviewed indicated that, those who could transport cocoa to a regional buying center or to the port were compensated with the equivalent of \$0.083 – 0.25 USD per kilogram (\$5-15LD) more than at the farmgate.

Transportation to and from many villages in remote areas can be especially tricky during the wet season. Of the surveyed villages, only 2 were located on paved roads. The remaining 38 were accessible on dirt roads that are often easily washed out during the heavy rains. Road quality is only part of the issue. Transportation laws are also a factor, and vary between counties. In the start of 2006, remote areas of Nimba and Lofa County had vehicle weight restrictions (Figure 20). Depending on the remoteness of the village, villagers may have limited access to regional buying centers. Villages that are farther from the regional centers have difficulty attracting buyers, investment, and possibly extension or aid activities. However, remote villages closer to the Guinea border, may still have advantage due to the proximity of the market. The distances in

kilometers from village to buying center and buying center to Monrovia and Guinea are found in Table 13.

4.6.4. *Credit*

At the time of the study (2006/07), there were few sources of credit or loans for cocoa farmers in Liberia. A majority of the credit obtained, solely for use on cocoa farms, was from the local cocoa buyer (85%) (Figure 19). Interviews with farmers suggest that offering credit becomes an opportunity for buyers to secure cocoa supply prior to harvest and to offer lower prices at the time of sale. This takes the form of buyers often taking advantage of the farmer's cash needs and offer credit to be repaid at harvest and not charging interest, but offering lower prices to the farmer at the time of sale. Seventy-eight (23%) of the cocoa farmers took out loans during the 2006/07 season. The average loan size was \$18.86 USD. Eighty-five percent of these loans were taken out from produce buyers, 18% of the loans had interest collected on top of the principle, ranging from 1.3% to 25% interest.²⁵ The average length of a loan was 3.3 months. Loans were used primarily for farm cleaning and maintenance.

4.6.5. *Farmer Organizations*

Farmer organizations may be a way to promote educational training, access to credit, and group bargaining. Only five of the market transactions captured in the survey were brokered by a farmer group, only 7 respondents belonged to a farmer organization and each paid an average of \$2.80 USD (\$168 LD) for yearly membership dues. These

²⁵ Calculated as simple interest (principle*interest rate*loan length).

members used the farmer organizations to collectively market (1), obtain inputs (1), gain technical advice (3), obtain market information (1) or for access to Kuu labor (1).

4.6.6. Market Information

Rural Liberia has limited access to communication tools that might be effectively used to transmit price information. Cell phone use is constrained by limited signal availability. In addition, cell phones are still costly. Only 14 (4%) of the farmers who marketed cocoa had access to a cell phone. Much of the price information was gathered from local sources such as buyers and friends. Buyers often benefit from information asymmetries and the information they do convey may not be objective. Friends and neighbors may also be poorly informed or simply received from buyers (Figure 21). Given the lack of market information, it is difficult to know whether well informed farmers were actually able to negotiate higher prices without further analysis. Evidence from other countries, such as Cameroon, suggests that the dissemination of accurate market information can have a positive effect on farmgate prices received by farmers (Wilcox 2006).

4.6.7. County Factors

Differences between counties may have a large impact on the cocoa household and the market environment in which they participate. Bong, Lofa and Nimba County were often considered major crop producing counties prior to the war, especially Bong, which had a high estimate of cocoa farmers in 2001 (Table 6) (Pay-Bayee 2005). Of the three counties surveyed, anecdotal and historical evidence suggests that fighting in Nimba subsided earlier during the conflict and deemed safe after 1991. In contrast,

farmers who had evacuated Bong and Lofa started returning home around 2003 (Pay-Bayee 2005). This may be an important factor in the development of the marketplace and the rehabilitation/reinvestment of cocoa farms. Enumerators tried to ascertain a more accurate assessment of when farmers returned to their villages. Of the 20 that responded, 17 people from Lofa indicated that they had returned from exile or from IDP camps in 2005 or 2006.

Several control variables in the price transmission model that are expected to have a positive effect on farmgate prices were most favorable in Nimba County (Table 22). The market in Nimba is potentially the most developed since 58% of the cocoa sold in the 2006/07 baseline originated in Nimba. Farmers also had greater access to resources, such as transportation (*TRANSPORT*), cell phones (*CELL*), and farmer organizations (*BFARM*). Cocoa farmers in Nimba also had larger families, presumably a larger labor pool, and more years of education.

CHAPTER 5. PRICE DETERMINATION RESULTS

5.1. Overall Model Results

None of the variance inflation factors were greater than 10, suggesting that the variances were not seriously inflated due to collinearity (Belsey, Kuh, and Welsch 1980). One eigenvalue returned a value of 119, which warranted further inspection. For that eigenvalue, *LIFFE* and the intercept had proportions of variation of 0.967 and 0.978, indicating that collinearity between these variables might have reduced the reliability of the t-test for *LIFFE*. However, the coefficient for *LIFFE* was significant at the 1% level, suggesting the its variance was not inflated enough for multicollinearity to be a concern (Belsey, Kuh, and Welsch 1980). The lack of evidence of serious multicollinearity suggests that inferences drawn for the coefficients of the price determination model are reliable.

White's test confirmed the presence of heteroskedasticity. The presence of heteroskedasticity biases the standard errors and therefore affects the t and F statistics. Without adjustment the covariance estimators are inconsistent and inferences may be incorrect (White 1980). The usage of the approximated jackknife procedure adjusted the standard errors, correcting for the unknown bias. The explanatory power of the adjusted model as measured by the adjusted R^2 equals 0.20 (Table 23). The overall significance of the model ($\beta_1 = \dots = \beta_{21} = 0$), as measured by the F-test was found to be significant ($F_{21,510} = 6.98, p < 0.001$).

5.2. World Price and Discount

The world price (*LIFFE*) and the dummy variable for quality discounts (*QUALMAT*) were significant at the 1% level. The significant positive coefficient for the world price (*LIFFE*) suggests that farmers are receiving price signals from the world market, holding all other factors constant. When testing the hypothesis that $H_0: \beta_1=1$, the F-value ($F_{2,529}=252.75$) was insignificant at the 10% level. However, testing $H_0: \beta_1=0$, the F-value ($F_{1,510}=7.34$) was significant at the 1% level. These results imply that the transmission of the world price is not perfect, nor is it zero, therefore the *LIFFE* price has an effect on the farmgate price. The coefficient for the *LIFFE* price was \$0.146 and significant at the 1% level, suggesting that a \$1 increase (decrease) in the *LIFFE* price translates into only a \$0.146 increase (decrease) in the farmgate price. The low transmission may be due to numerous factors, especially given the resource limitations in Liberia already explained. The price elasticity of the farmgate price with respect to the *LIFFE* price is 0.704, which means that a 1% increase (decrease) in the *LIFFE* price is accompanied by only a 0.7% increase in the farmgate price, resulting in a less varied farmgate price. The resulting price margins created by fluctuations in the *LIFFE* price translates into a larger percentage of the margin captured by the buyers when the *LIFFE* price increases and a larger percentage loss with decreases than the farmers experience at the farmgate. Buyers will be more likely to enter the market when the downstream prices are higher and higher prices are less likely to be transferred to the farmer. Farmers unable to receive benefits from increased prices may be unable to react by increasing production or quality. Exporters use the world price to set the market price (the price to the

intermediaries) and thus the farmgate price. However, the extent of the margin that intermediaries capture could not be measured with the data obtained.

Liberian cocoa receives a discount on the world market for poor quality perceptions. In turn, exporters located at the port in Monrovia adjust their marketing margins. This can add pressure to marketing margins, driving down prices through the marketing chain. Traders up-country may be unwilling to purchase cocoa that is below the quality that they can sell. Although some buyers purchase cocoa that is not completely dried or fermented in order to process it themselves. These risks that the buyers face ultimately fall on the farmer, contributing to low farmgate prices. Anecdotally, farmers perceive that quality is unimportant, perhaps due to information given to them by buyers who use cocoa as arbitrage (access to foreign exchange or importable goods) or who finish processing the cocoa themselves. However, farmers did receive discounts for wet or moldy beans (*QUALMAT*). Discounts taken for poorly dried cocoa decreased the effective farmgate price by \$0.02 per kilogram, significant at the 1% level. For example, if the farmer is receiving an average price of \$0.34 for 100kg, a \$0.02 reduction per kilogram results in a \$2 loss (5%). Approximately 25% of the sample was affected by quality discounts (Table 22).

5.3. Transportation

Transportation variables *TGDIST* and *TMDIST* were both significant at the 1% level. Although measured as distance, they are related to cost and thus detract from the effective farmgate price. Distance to Monrovia (*TMDIST*) had a positive coefficient which suggests other factors (e.g. trade flows) may be at play. The significance of these

variables implies that distance from the farmgate to the buyer's terminal market (the port in Monrovia or the Guinea Border in 2006/07) affects the buyer's willingness to pay a higher price. Many of the farm-to-market roads are difficult to navigate with large or heavy vehicles, meaning that more remote villages would have higher transportation costs for buyers, through lower quality roads or taking more trips in a smaller vehicle to procure cocoa. The elasticity of *TGDIST* with respect to the effective farmgate price is - 0.350, suggesting that buyers are choosing villages that are close to the Guinea border to procure cocoa.

An alternative explanation to the coefficients for these variables could be that buyers' understand transportation cost margins prior to being in the market and that decisions are based on trade flows or price fluctuations in alternative markets.

Anecdotally, buyers indicated that prices were higher in Guinea during the 2006/07 season. Buyers more than likely had this information and focused their collection efforts closer to Guinea, increasing competition among buyers and the demand for cocoa closer to Guinea. Therefore, as distance decreases to Guinea (*TGDIST*) the effective farmgate price increased by \$0.002. This result implies that prices of cocoa purchased from farms closer to the Guinean market were higher than prices paid farther from Guinea.

Conversely, a one kilometer increase in distance from Monrovia (*TMDIST*) increases the effective farmgate price by \$0.001. The variable *QINV* was insignificant, implying that the size of the individual transactions did not affect the effective farmgate price. Buyers may not have had previous knowledge in regards to quantities harvested in the villages or that they had to travel farther from the market to fill their quotas and procure cocoa.

Transportation costs are a considerable factor, given the distance traveled from village to market (Table 13). In the 2006/07 season, 14% of farmers sold their cocoa at the buying centers (*BTRANS*). This could be due to the fact that only 6.4% of farmers had access to transportation (*TRANSPORT*). As such, it was incumbent upon the buyers to provide transport. If farmers have no increased price incentives to leave the farmgate or ulterior motives to travel to the buying center, buyers will account for their travel as variable costs and farmers will receive lower effective farmgate prices.

5.4. Market Information and Resources

The variables in the market information and resources category found to be significant were *BFARM*, at the 10% level, *OMRKTIN* at the 10% level, and *BCRED* at the 5% level. The signs were as expected, except for *OMRKTIN*, which had a negative coefficient (Table 23). During the 2006/07 season, Liberian farmer organizations were rarely involved in cocoa transactions. Despite their limited membership, participation in farmer organizations appears to have a positive effect on effective farmgate prices received by members. Farmers participating in farmer organization (*BFARM*) received on average \$0.024 more than those not involved. Some reasons for this may be access to technical advice, market information, access to labor, or countervailing market power. On average, 16.4 % of the transactions were from farmers who were involved in farmer organizations, although the average was higher in Nimba (27.9%) than in Bong (0.9%) and Lofa (8.8%).

Market price information received from radio, newspaper, and government extension (*MKTIN*) was no different than not receiving any price information. Only

3.6% of the sample received market information from these sources. A higher percentage (84.6%) of the sample received market information from possibly non-reliable or non-objective sources. Farmers who received market information from friends, neighbors or produce buyers (*OMKTIN*) received lower effective farmgate price by \$0.017. This may represent a bias in the information, with buyers convincing farmers of lower prevailing prices or neighbors protecting their own marketing abilities or perpetuating the buyer's misinformation. Access to cell phones (*CELL*) for the farmer was unrelated to farmgate cocoa prices.

With little to no formal banking structure in Liberia, farmers rely on buyers or local money lenders for loans specifically related to cocoa farms. A majority of these loans are supplied by produce buyers (Figure 19). Farmers receiving loans from cocoa buyers (*BCRED*) received \$0.024 less than those who received no loan at all (*NOURED*), while prices received by farmers who received loans from other sources (*NONBCRED*) were no different from those received by farmers who did not obtain a loan. Buyers supply credit to procure cocoa before the harvest season begins. Farmers may receive lower effective farmgate prices as a means of paying interest.

5.5. Farmer Characteristics

Social and human capital may be important in making household decisions on economic activities. In the regression model, none of the farmer specific characteristics was significant. Attempts to capture the effects of more detailed aspects of the household composition through family size (*FAMSIZE*), education of the head of household (*EDUC*), head of household's years as a cocoa farmer (*CEXP*), and the household's

dependency on cocoa farms over all other tree crops (*CHOLD*) were not significant factors in explaining farmgate prices. This suggests that the education of the farmer may not equate to higher quality cocoa or price negotiating ability, and experience navigating the cocoa market may not affect the farmer's ability to negotiate better prices.

5.6. Season and Location

Seasonality (*WET*) and county location (*BIGCTR*, *NIMBA* and *LOFA*) were significant at the 1% level. The rainy season was negatively correlated with effective farmgate prices. During the rainy season, farmgate price was negatively impacted by \$0.034. Heavy rains degrade farm-to-market roads, making some villages inaccessible by vehicles. Villages that are accessible may require more time navigating roads, digging out vehicles, or waiting for debris to be cleared from the roads to procure cocoa. The rainy season occurs concurrently at the start of the cocoa harvesting season when the cocoa is being harvested, fermented and dried. The rainy season affects the ability to harvest, ferment and dry cocoa, especially given that few farmers have the resources to ferment and dry cocoa off of the ground. Inability to properly prepare cocoa for the marketplace can disrupt the supply to the marketing chain.

Farmers located near regional buying centers (*BIGCTR*) received \$0.041 less than farmers located near local buying centers. All else equal, farmers located closer to the regional buying centers have access to larger buyers with more resources or increased avenues for price competition. Another plausible alternative is that farmers located near regional buying centers may produce perishable food crops for urban populations, increasing the opportunity costs of growing cocoa. Another concern, given the legality of

cross-border smuggling, buyers may be inclined to avoid larger population centers that may have a higher presence of government enforcement officers.

Cross county differences impact effective farmgate prices. The dummy variables for Bong, Lofa and Nimba Counties were calculated to compare effective farmgate prices in the counties with the overall average. Farmers located in Nimba County (*NIMBA*) received \$0.028 more than the average effective farmgate price. Farmers in Lofa County (*LOFA*) received \$0.033 less than the average. There may be intrinsic qualities to these counties that affect their effective farmgate prices. Farmers in Nimba County may have better access to markets due to its proximity to Guinea and Côte d'Ivoire .

CHAPTER 6. CONCLUSIONS AND POLICY IMPLICATIONS

Through the production and export of cocoa, Liberia has the opportunity to work towards at least three of the Millennium Development Goals set forth by the United Nations (UN 2008). Cocoa has the potential to increase rural income and decrease food insecurity which may aid in alleviating extreme poverty and hunger (Goal 1). Through the improvement of cocoa varieties and emphasis on agroforestry management, cocoa can enhance environmental sustainability (Goal 7). With improvements in the marketing chain, Liberia may be able through the use of farmer groups and improvements in quality and infrastructure to develop global partnerships in the cocoa industry (Goal 8). Liberian cocoa represents an important source of income for rural populations. Focusing on this export crop may result in increases in welfare and incomes for thousands of cocoa producing households. Improving the transmission of the world price to the farmgate by integrating market efficiency and cocoa quality enhancement practices into the marketing chain will help farmers receive improved price signals from the world market and improve decision making.

The objectives of this research were to describe the characteristics of Liberian cocoa producing households and determine the factors that affect Liberian farmgate cocoa prices. It is important to note that this analysis is only a snapshot of the cocoa market during the 2006/07 season and that there were limitations with respect to data collection. During the 2007/08 season, preliminary indications suggest an increased presence of farmer groups in cocoa market transactions. More exporters entered the Liberian market and thus created greater competition, which shifted trade flows to

Monrovia from Guinea. Coupled with higher world prices for raw cocoa, farmers experienced over twice the farmgate prices in the 2007/08 season than in the 2006/07 season (Gockowski and Wilcox 2008). This research may provide a starting point for further surveys and as a reference for comparison as the market dynamics change and further studies are undertaken.

6.1. The Market

The Liberian cocoa market is chaotic and continually changing. The marketing chain is buyer-driven with possible market power issues. Decreasing barriers to entry and increasing production will allow the market to determine price and quantity more efficiently. Throughout the marketing chain various barriers limit the entry of new market participants. At the farmgate, low cocoa prices discourage production. Low production leads to entry barriers further down the marketing chain. With current production in Liberia, it is possible for a single firm to dominate the export market. Competing for the limited throughput at the current prices and quantity available may not persuade firms to enter at any stage in the marketing chain. Increases in production can be encouraged through better farm management training, and access to hybrid varieties or chemical inputs. Increasing public access to price information along the marketing chain could also reduce market power issues at the farmgate. Through reductions in marketing margins and encouraging legislation in favor of a transparent business climate will encourage competition in the market place, and thus encourage higher prices (Gockowski and Wilcox 2008).

Opening the market to new participants may limit buyers from exerting market power through lower prices or restricting credit access. Remoteness and access to rural populations will continue to be an issue in market development. Infrastructural limitations, such as distance to markets, road quality, and access to transportation constrain the cocoa market in Liberia inhibit entry into the market and result in low farmgate prices. Villages farther from buying centers or villages located in remote areas have limited or no access to cocoa markets. Remoteness of villages may dissuade buyers especially during the rainy season. Improving transportation to the villages will improve other aspects of the Liberian livelihood, as well as decreasing transportation costs associated with the procurement of cocoa.

One of the main objectives of many of the government parastatals was to ensure quality throughout the marketing chain. Liberalization of the cocoa market in Liberia was not legislated or planned but rather the fallout from a devastating civil war. Therefore, the lack of market structure in Liberia further hinders quality control throughout the marketing chain. Liberian cocoa has never had a reputation for high quality. This is mainly due to the LPMC creating a market for only fair average quality cocoa that does not meet international standards for the cocoa-based sector of the confectionary industry. Improvements in quality standards and practices, coupled with enforcement, will benefit Liberian cocoa on the world market. At the time of the survey, there were no external market mechanisms in place, public or private, to ensure quality standards were practiced. Improving quality may increase competition in the market place and improve farmgate cocoa prices, while possibly opening access to more global and niche markets.

Balancing Liberia's dependency on forest resources for economic welfare and conservation of biodiversity is important for the long-term stability of rural populations, as they rely heavily on the forest for food and income. Food security and food prices remain issues in Liberia, improving access to both food crops and incomes will continue to benefit the rural cocoa farmers and the population as a whole. Improving varieties of cocoa and intercropping stands with food crops may alleviate the need to expand further into forest lands, while meeting the demand for food and tree crops. Concurrently an improvement of cocoa yields through improved germplasm would increase the farmer's ability to participate in the marketplace through economies of size.

Further research could look at market integration and efficiency. When markets are missing, the transfer of benefits to the farmgate and throughout the marketing chain is hindered. Ascertaining a more accurate estimate of farm-level yields, coupled with information from the census underway, would give a more complete assessment of Liberia's productive capabilities. Looking more in depth into arbitrage opportunities that affect farmer and buyer perceptions, decisions to participate in illegal border trade and the effectiveness of regional trade oversight by the Economic Community of West African States (ECOWAS) or the government would be beneficial. Continuing research on marketing margins downstream from the farmgate may be beneficial for further analysis of the Liberian cocoa market. As the situation changes in Liberia, factors affecting marketing margins will change. Exogenous factors in the global marketplace will continue to affect outcomes upstream for farmers through the prices farmers receive. Looking at the effects of policies in the short, medium, and long terms would be beneficial in further policy formation.

6.2. The Cocoa Household

There are many problems that arise with re-emerging agricultural export crops, such as cocoa, in developing nations. In Liberia, these issues include balancing the trade-offs between household food security and the production of a marketable food surplus or export crops, disseminating price information, and introducing and maintaining quality standards starting at the farmgate. All of which are further compounded by the various health and social issues associated with the devastation of prolonged civil conflict affecting rural populations.

Liberian cocoa receives a heavy discount on the world market. Since global processors reject moldy or off flavored cocoa, concerns over quality possibly relegate Liberian cocoa to usage in secondary (cosmetic) markets. Improving quality processes through improved access to agricultural inputs and education is paramount. Physical unavailability of agricultural inputs in most areas, in addition to prohibitive prices, limits the use of insecticides and pesticides. While not using agricultural chemicals may allow Liberian cocoa farmers to enter organic markets more easily, it hinders their ability to manage cocoa stands. To increase yields, substantial investments into agricultural inputs will need to be made.

Market power is limited for the farmer as they have little opportunity to negotiate prices. Buyers often benefit from asymmetric price information and can leverage loans as a means to set prices. Better market information throughout the marketing chain may lead to more transparency and thus allow farmers to negotiate. Credit opportunities are limited to farmers wanting to increase the quality and quantity of cocoa. Improving

access to credit or regulating the current credit market to give farmers more credit options besides produce buyers who effectively decrease farmgate prices is desirable.

Farmers suffer from a lack of extension activities. To improve quality and yields produced at the farm-level, farmers will need training in new techniques of cocoa farming and access to improved varieties of cocoa. STCP-Liberia is working to fill the gap in cocoa related training through creation of Farmer Field Schools (FFS) in Bong and Nimba counties with a planned future expansion into Lofa County. In 2007, 24 new FFS were established, in addition to the 15 FFS created in Nimba County in 2006. These schools are estimated to reach up to 700 direct beneficiaries and 2,100 farmer-to-farmer (indirect beneficiaries) throughout Bong and Nimba counties (STCP 2007).

Overarching issues like land tenure, education and labor affect overall household stability and growth. Land tenure will affect the farmer's decisions on land usage. If farmers are unable to expand or define their current land holdings, alternative decisions may be made to improve food security over gaining income from cocoa. Children who are not currently receiving education and are economically active (working agriculturally or otherwise) may be in a precarious position. These children may not be learning basic reading, writing and math skills required to thrive in an increasingly global and competitive world. Additionally, without basic education, rural populations do not have access to the skills they need to operate in a global business environment. Improving incomes through cocoa production may allow farmers to be less dependent on household-provided labor and more able to fund schooling opportunities for dependants.

6.3. Farmer Organizations

Farmer organizations have proven useful in countervailing market power of private firms (Wilcox 2006). Farmer groups can provide resources such as collective marketing, market information, education activities, and labor or credit opportunities. Farmer organizations serve as points of contact and intermediaries between farmers in the field and other groups (e.g., the government, NGOs, industry). Furthermore, farmers can benefit from the collective experience and knowledge of other farmers in their area.

Whether through encouragement of farmer organizations, non-governmental programs or dismantling, restructuring, or resolving issues with LMPC, farmers would benefit from increased access to training, resources and marketing groups. Policy options, such as the continuation and expansion of farmer field schools, formation of farmer groups, and the development of supporting private and public institutions, will play a critical role in the formation of formal domestic markets in Liberia which, in turn, may have a positive impact on Liberian farmgate cocoa prices.

6.4. Buyers and Intermediaries

As the market evolves with the ebb and flow of buyers and intermediaries in the marketing chain and consolidation in the processing sector, concerns over market power remain. The LPMC essentially held monopsonistic power over farmers. It is important that as the private market defines its presence, that the monopsonistic power is not merely transferred from public to private entities. The lack of objective and accurate market information transferred from buyers to producers will have implications with regards to

market power. Additionally, the lack of objectivity and measurement tools when assessing quality will continue to send biased price signals from buyers to producers.

6.5. Exporters

During the 2006/07 season, only one shipment of cocoa occurred through Monrovia. Anecdotally, buyers were receiving higher prices in Guinea until civil unrest in Conakry halted trade in February. With cocoa remaining upcountry in the marketing chain, trade to Monrovia became attractive with the entry of a new exporter with access to public capital. At the start of the 2007/08 season, the two Monrovia exporters were still competing with Guinean buyers. Entry in October by an additional firm in Monrovia led to increased participation in the export market and upward price competition appears to have played a role in farmgate prices more than doubling (Gockowski and Wilcox 2008).

At the time of this study, the LMPC was stifling growth in the market internally by maintaining barriers to entry in the export market. The over taxing of exporters without providing them adequate services, along with its international debt which effectively prohibits their participation in international markets, furthers the call for the LPMC's complete dismantling. However, dismantling the LMPC may be politically problematic as employment opportunities are still scarce in Liberia. However, with debts also owed to farmers and their current limited capacity to function, putting a new face on the same organization will not likely inspire confidence that change has occurred.

Using examples from cocoa producing countries, the government might consider abolishing the parastatal in favor of government cooperation with entities (e.g.

intermediaries, farmer organizations) in different aspects of the market. The government might also consider partnering with industry and farmers to create short-term financial incentives for increased production of good quality cocoa.

6.6. The Government

The Government of Liberia can play an important role in the future of the Liberian cocoa market. Through policy formation and enforcement, the Government can improve the legal, business, and banking aspects of the cocoa marketing chain. Policies can direct the use of government funds to improve infrastructure, specifically in the building and maintenance of roads. Market participants need a legal framework for arbitration, enforcement of contracts, and protection from corrupt practices. The government could also encourage sources of financial capital through improvements in the banking system. Microcredit loans would provide market participants with more choices to access credit or keep savings. Government intervention in these aspects of the marketing chain may increase transparency and encourage business development.

The government is also in the position of providing and securing peace through rule of law. If security, especially in rural areas, remains tenuous, attracting foreign investment, increasing producer incentive and stabilizing internal country supply chains will be difficult. Farmers and buyers with few marketing opportunities or price incentives in Monrovia will continue to trade cocoa on the path of least resistance (smuggling) and the highest opportunity (higher prices or means to gain other goods). With limited rural infrastructure, regional instability directing market flows and the lack

of local outlets may dissuade producers from producing and marketing high-value export crops.

The marketing chain may benefit from oversight on quality control and extension activities. Further research into the costs and benefits of creating a government entity to provide public services to the cocoa market would be useful in policy formation. Many of the institutional and infrastructural constraints in Liberia may be too great for private enterprise or NGOs to manage.

REFERENCES

- Akiyama, T., J. Baffes, D.F. Larson, and P. Varangis. 2003. "Commodity market reform in Africa: some recent experience." *Economic Systems* 27:83-115.
- ADM. 2008. "Candy and Confectionary." Internet site:
<http://www.admworld.com/naen/food/candy.asp> (Accessed May 19, 2008).
- Balat, J., I. Brambilla and G. Porto. 2007. Realizing the gains from trade: Export crops, Marketing Costs and Poverty. NBER Working Paper 13395. National Bureau of Economic Research, Cambridge, Massachusetts.
- Barrett, C. B., and J. R Li. 2002. "Distinguishing between Equilibrium and Integration in Spatial Price Analysis." *American Journal of Agricultural Economics*. 84: 292-307.
- Barry Callebaut. 2008. "Barry Callebut." Internet Site: <http://www.barry-callebaut.com/> (Accessed on May 19, 2008).
- Belsley, D.A., E. Kuh, and R.E. Welsch. 1980. *Regression Diagnostics*. New York: John Wiley & Sons, Inc.
- Cargill. 2008. "Cocoa and Chocolate: Food: Products and Services." Internet Site:
http://www.cargill.com/products/food/ps_cocoa.htm (Accessed May 19, 2008).
- Carr, E.R. 2008. "Men's Crops and Women's Crops: The Importance of Gender to the Understanding of Agricultural and Development Outcomes in Ghana's Central Region." *World Development* Vol. 36, No. 5, pp. 900–915
- Center for International Forestry Research (CIFOR). 2005. "Towards a shared vision and action frame for community forestry in Liberia." Workshop proceedings of the

First International Workshop on Community Forestry in Liberia, Monrovia, 12-15 December.

Central Intelligence Agency (CIA). 2007. "The World Factbook – Liberia." Internet site: <https://www.cia.gov/cia/publications/factbook/geos/li.html> (Accessed on February 16, 2007).

Cleaver, K. M., and W.G. Donovan. 1995. *Agriculture, poverty, and policy reform in Sub-Saharan Africa*. Washington, D.C.: World Bank.

Collier, P., V.L. Elliott, H. Hegre, A. Hoeffler, M. Reynal-Querol and N Sambanis. 2003. *Breaking the conflict trap civil war and development policy*. A World Bank policy research report. Washington, DC: World Bank.

Collier, P., and A. Hoeffler. 2002. "On the Incidence of Civil War in Africa." *Journal of Conflict Resolution*. 46 (1): 13-28.

Dand, R. 1999. *International cocoa trade*. Boca Raton, FL: CRC Press.

Dorin, B. 2003. "From Ivoirian Cocoa Bean to French Dark Chocolate Tablet." CIRAD, AMIS-36 CP-1602.

EUROSTAT. 2008. External Trade Data. Internet Site: http://epp.eurostat.ec.europa.eu/portal/page?_pageid=1996,45323734&_dad=portal&_schema=PORTAL&screen=welcomeref&open=/&product=EU_external_trade&depth=4 (Accessed May 11, 2008).

Fafchamps, M. and R.V. Hill. 2004. "Selling at the Farm-Gate or Traveling to Market." *American Journal of Agricultural Economics* 87(3):717-734.

- Fafchamps, M., Hill, R.V., Kaudha, A. and Nsibirwa, R.W. 2004. "The Transmission of International Commodity Prices to Domestic Producers." *Development and Comp Systems* 0409038, EconWPA.
- Fafchamps, M., and E.Z. Gabre-Madhin. 2001. *Agricultural markets in Benin and Malawi: the operation and performance of traders*. Washington, D.C.: World Bank, Development Research Group, Rural Development.
- Fairtrade Foundation. 2002. *Spilling the beans on the coffee trade*. London: Fairtrade Foundation. Internet site: <http://www.fairtrade.org.uk/downloads/pdf/spilling.pdf>
- Food and Agriculture Organization of the United Nations (FAO). 2007. FAOSTAT. Internet site: <http://faostat.fao.org> (Accessed on July 9, 2007).
- _____. 2008. FAOSTAT – ProdSTAT. Internet site: <http://faostat.fao.org> (Accessed on May 11, 2008).
- Food and Agriculture Organization of the United Nations and Liberian Ministry of Agriculture (FAO/MOA). 2001. *Baseline Survey*. Food and Agriculture Organization and Liberian Ministry of Agriculture. Monrovia, Liberia.
- Fold, N. 2001. "Restructuring of the European chocolate industry and its impact on cocoa production in West Africa." *Journal of Economic Geography* 1:405-420.
- _____. 2004. "Spilling the beans on a tough nut." In A. Hughes, ed. *Geographies of Commodity Chains*. Routledge, pp. 63-80.
- Geene, A., A. Heijbroek, and A. Lagerwerf. 2000. *The dynamics of the cocoa and chocolate industry*. Rabobank International, Netherlands.
- Gibbon, P., and S. Ponte. 2005. *Trading down Africa, value chains, and the global economy*. Philadelphia: Temple University Press.

- Gilbert, C. L. 1997. "Cocoa market liberalization: effects on quality, futures trading and prices." *The Cocoa Association of London*.
- _____. 2006. "Value Chain Analysis and Market Power in Commodity Processing with Application to the Cocoa and Coffee Sectors." Discussion Paper No. 5 Università degli Studi, Italy
- Gilbert, C. L., and P. N. Varangis. 2003. *Globalization and International Commodity Trade with Specific Reference to the West African Cocoa Producers*. Cambridge, Mass: National Bureau of Economic Research.
- Global Witness. 2007. *Hot Chocolate: How Cocoa Fueled the Conflict in Côte d'Ivoire*. Internet Site:
http://www.globalwitness.org/media_library_detail.php/552/en/hot_chocolate_how_cocoa_fuelled_the_conflict_in_cote_d_ivoire (Accessed on May 11, 2008).
- Gockowski, J.J. 2007. "Achieving Agricultural Transformation in Liberia – Mobilizing Resources in the Smallholder Rural Economy." Powerpoint Presentation for roundtable Transforming Agriculture in Liberia: The Potential Role of Cocoa and Linkages to Knowledge-Generating Institution, Monrovia, Liberia, 22 June 2007.
- Gockowski, J.J., M. Tchatat, J.P. Dondjang, G. Hietet and T. Fouda. 2007. *The Value of Biodiversity in the Beti Cocoa Agroforests of Southern Cameroon*. Unpublished, International Institute of Tropical Agriculture.
- Gockowski, J.J. and M.D. Wilcox. 2008. *Liberia Agricultural Policy Brief - Reforming Cocoa and Coffee Markets in Liberia*. Unpublished.
- Government of Liberia. 2006. "150 Day Action Plan: A working document for a new Liberia." Internet site:

<http://allafrica.com/peaceafrica/resources/view/00010785.pdf> (Accessed on February 28, 2008).

International Cocoa Organization Cocoa Board (ICCO). 2008. "Overview of "Best Known Practices" In Cocoa Production." Presented at the Consultative Board on the World Cocoa Economy 15th meeting. Internet site:

<http://www.icco.org/documents/documents3.aspx> (Accessed on February 28, 2008).

International Cocoa Organization Cocoa Board (ICCO). 2007. *ICCO Quarterly Bulletin of Cocoa Statistics*. Vol. XXXIII, No.3.

International Cocoa Organization (ICCO). 2007a. "Growing Cocoa." Internet site:

<http://www.icco.org/about/growing.aspx> (Accessed on December 20, 2007).

International Cocoa Organization Cocoa Board (ICCO). 2007b. "Sustainable Cocoa Economy: A Comprehensive and Participatory Approach." Presented at the Consultative Board on the World Cocoa Economy 12th meeting. Internet site:

<http://www.icco.org/documents/documents3.aspx> (Accessed on December 20, 2007).

International Cocoa Organization Marketing Committee (ICCO). 2007c. "Cocoa Resources in Consuming Countries." No. MC-10-6. Presented at the Market Committee 10th meeting. Internet site:

<http://www.icco.org/documents/documents.aspx> (Accessed on January 15, 2008).

- International Cocoa Organization Executive Committee (ICCO). 2007d. "Supply Chain Management for Total Quality Cocoa in Africa." No. EX/133/7. Internet site: <http://www.icco.org/documents/documents.aspx> (Accessed on May 11, 2008).
- International Cocoa Organization. 2006. *International Cocoa Organization Annual Report 2004/2005*. Internet site: http://www.icco.org/pdf/An_report/AREGLISHV4.pdf (Accessed on March 13, 2008).
- International Monetary Fund (IMF). 2006. *Liberia: Statistical Appendix*. Internet site: <http://www.imf.org/external/pubs/ft/scr/2006/cr06167.pdf> (Accessed on July 3, 2007).
- Kennedy, J. 2005. "Rapid Assessment of Cocoa and Coffee Production Base in Liberia." Unpublished, Monrovia, Liberia.
- Kherallah, M., C. Delgado, E. Gabre-Madhin, N. Minot, and M. Johnson. 2002. *Reforming Agricultural Markets in Africa*, Maryland: The John Hopkins University Press.
- Liberian Ministry of Agriculture (MOA). 2008. *Food and Agriculture Policy and Strategy Draft*. Ministry of Agriculture, Government of Liberia, Monrovia, Liberia.
- Liberian Ministry of Agriculture (MOA). 1988. *Production Estimates of Major Crops*. Statistics and Planning Division, Department of Planning and Development, Ministry of Agriculture, Government of Liberia, Monrovia, Liberia.

- MacKinnon, J. G. and H. L. White (1985). "Some heteroskedasticity consistent covariance matrix estimators with improved finite sample properties". *Journal of Econometrics* 21, 53-70.
- Myers, A. 2004. *Old Concepts Revisited: Are cooperatives the way forward for smallholder farmers to engage in international trade?* Doctoral dissertation, University of London. Internet Site:
<http://www.coopdevelopmentcenter.coop/Analysis/AlishaMyersdissertation.pdf>
 (Accessed on April 21, 2008).
- Mossu, G.A.R. 1992. *Cocoa. Tropical agriculturalist*. London: Macmillan published in co-operation with the Technical Centre for Agricultural and Rural Co-operation.
- Nkamleu, G. B., and A. Kielland. 2006. "Modeling farmers' decisions on child labor and schooling in the cocoa sector: a multinomial logit analysis in Côte d'Ivoire ." *Agricultural Economics*, 35(3): 319-333.
- Oredein, O. 2007. "Nigeria's Ondo State Passes Law Prohibiting Cocoa Tampering." Dow Jones Newswire. 14 July 2007.
- Oxfam. 2002. "The Cocoa Market – A Background Study." Oxfam: Oxfam, Make Fair Trade Fair. Internet site:
<http://www.maketrade-fair.com/en/index.php?file=15052002135027.htm>
- Pay-Bayee, M.M. 2005. "A Rapid Assessment of the Cocoa/Coffee Supply Chain." USAID Draft Report, October.
- Radelet, S. 2007. "Reviving economic growth in Liberia." Center for Global Development Working Paper Number 133.

- ReliefWEB. 2007. "Status of Roads in Liberia." Internet Site:
<http://www.reliefweb.int/rw/rwb.nsf/db900sid/JOPA-6PDDSZ?OpenDocument>
(Accessed on May 16, 2008).
- Reuters News. 2007. "Cocoa Prices". Internet Site: <http://global.factiva.com>
- SAS Institute. 2004. *SAS 9.1.3 Help and Documentation*. Cary, NC: SAS Institute Inc.
- Smillie, I. and A. Brownell, ed. 2007. "Land Grabbing and Land Reform Diamonds, Rubber and Forests in the New Liberia." The Diamonds and Human Security Project, Occasional Paper #17.
- Sustainable Tree Crops Program (STCP) and International Institute of Tropical Agriculture. 2002. *Child Labor in the Cocoa Sector of West Africa: A synthesis of findings in Cameroon, Côte d'Ivoire, Ghana, and Nigeria*.
- Tiffen, P. 2002. "A Chocolate-coated Case for Alternative International Business Models." *Development in Practice*, 12(3&4):383-397.
- Timmer, C.P., W.P. Falcon, and S.R. Pearson. 1983. *Food Policy Analysis*. Maryland: The John Hopkins University Press.
- Townsend, R. F. 1999. "Agricultural Incentives in Sub-Saharan Africa: Policy Challenges." World Bank technical paper No. 444. Washington, DC.
- Transparency International. 2007. "Transparency International Corruption Perceptions Index." Internet site:
http://www.transparency.org/policy_research/surveys_indices/cpi/2007/regional_highlights_factsheets (Accessed on November 12, 2007).
- United Nations (UN). 2008. "Millennium Development Goals." Internet Site:
<http://www.un.org/millenniumgoals/> (Accessed May 17, 2008).

- United Nations Conference on Trade And Development (UNCTAD). 2005. *Statistical Profiles of the Least Developed Countries 2005*. Geneva, Switzerland.
- United Nations Development Program (UNDP). 2006. *National Human Development Report 2006 – Mobilizing Capacity for Reconstruction and Development*.
Monrovia, Liberia.
- Weise, S. and S. David. 2005. “Tree Crops to Ensure Income Generation and Sustainable Livelihoods in Liberia: Unlocking the Potential of the Cocoa Subsector.” IITA Project Note.
- White, H. 1980. “A Heteroskedasticity-Consistent Covariance Matrix Estimator and a Direct Test for Heteroskedasticity.” *Econometrica*, Vol. 48, No. 4 (May, 1980), pp. 817-838.
- Wilcox, M.D. 2006. “Farmgate prices and market power in liberalized West African cocoa markets.” PhD dissertation, Purdue University.
- Wilcox, M.D. and P.C. Abbott. 2004. “Market Power and Structural Adjustment: The Case of West African Cocoa Market Liberalization.” Selected paper presented at 2004 AAEEA Annual Meeting.
- Wilcox, M.D. and M. M Pay-Bayee. 2006. “Outcomes from the Liberian Cocoa Sector Roundtable held on May 26, 2006 In Monrovia, Liberia.” Technical Report submitted to International Institute of Tropical.
- Wilcox, M.D., A. English and J. Davies. 2007. *Tree Crop Sub Sector Report. Comprehensive Assessment of the Agriculture Sector in Liberia*, Volume II.
World Bank, Washington D.C., USA.

- Wood, G. A. R., and R. A. Lass. 1985. *Cocoa*. Tropical agriculture series. London: Longman
- World Bank. 2007a. "Liberia Begins Path Toward Debt Relief." Internet site: <http://go.worldbank.org/8J33T05RU0> (Accessed on December 12, 2007).
- World Bank. 2007b. *Governance Matters 2007 - Country Data Report for LIBERIA, 1996-2006*. Internet site: <http://info.worldbank.org/governance/wgi2007/pdf/c125.pdf> (Accessed on November 12, 2007).
- World Bank. 2007c. *World Development Indicators*. World Bank, Washington D.C., USA.
- World Trade Organization (WTO). 2008. "Development – Aid For Trade Fact Sheet." Internet Site: http://www.wto.org/english/tratop_e/devel_e/a4t_e/a4t_factsheet_e.htm (Accessed on June 27, 2008).

APPENDIX

Appendix A. Supporting Tables and Figures

Table 1: Basic Economic and Social Indicators for Liberia, 2000-2007

Indicator	Year	Value
Population, (millions)	2006	3.4
Population growth (annual %)	2006	2.9
Infant mortality (per 1,000 live births)	2007	149.73
Life expectancy at birth, total (years)	2005	44.7
Rural population growth rate (% p.a.)	2005	0.3
Rural as % total population (%)	2005	41.9
School enrollment, primary (% net)	2005	57.4
Adult literacy (% Over 15yrs)	2007	57.5
Unemployment rate (%)	2003	85
GDP (current US\$) (billions)	2006	0.6
GNI per capita, Atlas method (current US\$)	2006	140
GDP growth rate (% p.p.p in real terms)	2006	7.8
GDP per capita (current US\$) (PPP)	2007	500
Agriculture GDP share (%)	2007	76.9
Tree crops as % export value (%)	2007	60
Total aid (current US\$) (millions)	2006	268.7
Total external debt (current US\$) (billions)	2005	2.7

Source: World Bank (2007c); CIA (2007); FAOSTAT (2008).

Table 2: Estimates of Liberian Export Earnings by Product from 2000 - 2005

Product	2000	2001	2002	2003	2004	2005
Rubber	47.5%	42.2%	35.6%	40.3%	90.0%	88.0%
Other	0.9%	3.4%	3.8%	8.7%	6.7%	7.0%
Cocoa	0.5%	0.4%	0.2%	0.8%	3.4%	5.1%
Timber	50.7%	54.1%	60.3%	50.1%	0.0%	0.0%
Coffee	0.4%	0.0%	0.1%	0.1%	0.0%	0.0%
Total exports (\$US millions)	120.3	127.9	166.5	108.9	103.8	112.2

Source: IMF (2006)

Table 3: Percentage of World Cocoa Production for Top Producers and Liberia, 1985,1990,1995,2000-2004

Country ^{ab}	1985	1990	1995	2000	2001	2002	2003	2004
Côte d'Ivoire	27.56	31.89	37.45	41.37	41.18	38.74	37.94	34.1
Ghana	9.65	11.59	13.5	12.94	12.06	10.43	13.95	18.88
Indonesia	1.68	5.62	9.31	12.48	13.26	17.49	16.08	15.4
Nigeria	7.94	9.64	6.79	10.02	10.53	10.41	10.13	9.37
Brazil	21.39	10.12	9.92	5.83	5.75	5.35	4.77	5.02
Cameroon	5.87	4.54	4.48	3.63	3.78	3.83	4.35	4.27
Ecuador	6.49	3.82	2.86	2.96	2.35	2.69	2.46	3.17
Colombia	2.11	2.22	1.89	1.32	1.35	1.48	1.47	1.3
Mexico	2.53	1.74	1.65	0.83	1.45	1.41	1.36	1.24
Dominican Republic	1.71	1.7	2.16	1.1	1.39	1.52	1.31	1.21
Papua New Guinea	1.75	1.51	0.97	1.39	1.2	1.3	1.19	1.09
Malaysia	4.92	9.76	4.4	2.08	1.79	1.46	1.02	0.86
Guinea	0.2	0.07	0.15	0.1	0.06	0.08	0.28	0.25
Sierra Leone	---	0.95	0.33	0.32	0.34	0.34	0.34	0.24
Madagascar	0.11	0.14	0.13	0.13	0.14	0.14	0.12	0.12
Liberia	0.25	0.08	0.02	0.09	0.03	0.05	0.07	0.06
Total	94.18	94.45	95.69	96.27	96.31	96.38	96.51	96.33

Source: FAOSTAT (2007).

^a Percent of total annual world production sorted by share in 2004.

^b Countries highlighted in yellow are located on the African continent.

Table 4: Agronomic Conditions for Growing Cocoa

Category	Description
Distribution	Countries within 10 degrees North and 10 degrees South of the Equator; often lower storey of evergreen rainforest
Temperature	21-30C
Rainfall	Rainfall is of primary concern with regard to yield. Rainfall should be fairly evenly distributed with annual average of between 1,500mm and 2,000mm. Persistent lack of rainfall (less than 100mm) detrimental.
Humidity	Relative humidity is generally high, often as much as 100% during the day, falling to 70-80% during the night.
Light And Shade	Shading is indispensable in a cocoa tree's early years, often cropped with plantains or wide leaf plants. The cocoa tree will make optimum use of any light available and has been traditionally grown under shade.
Soil Conditions Physical properties	Coarse particles leave free space for roots and a reasonable quantity of nutrients to a depth of 1.5m. Soil must have both water retention properties and good drainage. Cocoa will withstand waterlogging for short periods, but is sensitive to a lack of water.
Soil Conditions Chemical properties	Cocoa can grow in soils with a pH in the range of 5.0-7.5. Cocoa is tolerant of acid soils (8.0) provided the nutrient content is high enough. High content of organic matter (3.5%) is needed in the top 15 centimeters of soil. The optimum total nitrogen/total phosphorus ratio should be around 1.5.
Cocoa tree varieties Criollos	Dominated the market until the middle of the eighteenth century but today only a few, if any, pure Criollo trees remain.
Cocoa tree varieties Forastero	Largest group containing cultivated, semi-wild and wild populations of which the Amelonado populations are the most extensively planted. Large areas of Brazil and West Africa are planted with Amelonado.
Cocoa tree varieties Trinitario	Across between Criollo and Forastero. Trinitario planting started in Trinidad and spread to Venezuela and then was planted in Ecuador, Cameroon, Samoa, Sri Lanka, Java and Papua New Guinea.
Breeding Seeds	Will germinate and produce good plants when taken from pods not more than 15 days underripe.
Breeding Cuttings	Taken with between two and five leaves and one or two buds. The leaves are cut in half and the cutting placed in a pot under polythene until roots begin to grow.
Breeding Budding	A bud is cut from a tree and placed under a flap of bark on another tree. The budding patch is then bound with raffia, waxed tape or clear plastic to prevent moisture loss. When the bud is established the old tree above it is cut off.
Breeding Marcotting	A strip of bark is removed from a branch and the area covered in sawdust and a polythene sheet. The area will produce roots and the branch can then be chopped off and planted.

Source: Dand (1999) and ICCO (2007),

Table 5: Per Capita Chocolate Consumption (Kilogram/Person)

Country	1996/97	1997/98	1998/99	1999/2000	2000/01	2001/02	2002/03	2003/04	2004/05
Switzerland	3.732	3.353	4.53	4.258	3.658	3.567	4.496	4.963	5.108
Belgium/Luxembourg	5.671	5.169	5.165	4.966	5.475	5.228	5.57	5.639	4.986
France	3.236	3.036	3.173	3.627	3.459	3.615	3.654	3.818	4.073
Norway	2.929	2.826	2.631	2.695	3.082	2.917	3.1	3.686	3.754
Austria	2.976	2.777	4.066	4.225	3.809	3.481	3.426	4.067	3.654
United Kingdom	3.116	3.257	3.657	3.553	3.38	3.483	3.613	3.672	3.648
Germany	3.023	3.526	3.467	3.334	3.596	3.426	3.395	3.718	3.36
US	2.386	2.42	2.406	2.677	2.466	2.299	2.355	2.624	2.63
Australia	2.17	2.299	2.385	2.179	2.113	2.27	2.213	2.3	2.568
Israel	1.764	1.913	1.656	1.754	1.415	1.694	1.866	1.95	2.558
Greece	0.869	1.529	2.119	1.699	1.564	1.859	1.932	1.996	2.211
Netherlands	2.05	2.164	1.834	2.263	2.43	1.92	1.972	2.027	2.143
Sweden	2.103	2.193	1.896	1.787	1.955	2.051	1.962	2.221	2.134
Spain	1.533	1.757	1.697	2.017	1.756	1.689	1.854	2.115	2.098
Czech	1.965	1.797	1.769	1.401	2.268	2.334	2.31	1.935	2.05
Europe	1.686	1.693	1.722	1.814	1.869	1.875	1.9	2.007	2.027
Canada	2.116	2.589	2.083	2.359	2.23	2.02	1.952	2.242	1.959
Italy	1.487	1.589	1.685	1.551	1.754	1.737	1.764	1.731	1.891
Poland	1.447	1.275	1.382	1.507	1.464	1.375	1.583	1.457	1.656
Russian Federation	1.117	0.791	0.648	0.961	1.184	1.24	1.154	1.233	1.277

Source: ICCO (2007c)

Table 6: Number of Cocoa Producing Households by Liberian County and Percentage of Cocoa Holdings, 1976-1978,1981, and 2001

	1976	1977	1978	1981	2001
Bomi					320
Bong	5,300	6,500	7,300	5,575	5,930
Cape Mount	600	700	800	300	220
Grand Bassa	3,100	3,100	3,300	1,765	790
Grand Gedeh	3,900	4,500	4,800	2,400	1,700
Grand Kru					240
Lofa	8,600	9,300	10,400	8,800	-
Margibi					250
Maryland	2,200	2,400	2,600	4,250	550
Montserrado	1,500	1,700	1,800	1,360	40
Nimba	6,800	7,200	8,100	5,000	9,140
Rivercess					80
Sinoe	700	800	900	950	260
Total	32,700	36,200	40,000	52,000	19,520
Cocoa holdings as a % all Agricultural Households	21%	23%	25%	27%	13%

Source: MOA(1988), FAO/MOA (2001).

Table 7: Exporter profit margins, marketing cost per ton and farmgate cocoa prices, Liberia 2006/2007

Position	Price/Fee	Sep	Oct	Nov	Dec	Jan	Avg.
-----USD \$ per ton-----							
World Market	ICCO price	1,567	1,530	1,581	1,703	1,702	1,617
	Liberian origin discount	189	189	189	189	189	189
	cif	1,379	1,341	1,392	1,514	1,513	1,428
Ocean	freight and insurance	111	111	111	111	111	111
Port	fob	1268	1230	1281	1403	1402	1,317
	freight shrinkage (1%)	14	13	14	15	15	14
	export conditioning costs	54	54	54	54	54	54
	government taxes (2.5% CIF value)	32	31	32	35	35	33
	BIVAC quality certificate (1.4%)	18	17	18	20	20	18
	LPMC royalty, fees, export declaration	62	62	62	62	62	62
Intermediaries	collection and transportation costs	155	155	155	155	155	155
	profit margin and risk premium	611	570	588	677	632	616
Farmgate	farm gate cocoa price	323	327	359	385	430	365
	% of the F.O.B for the Farmer	26%	27%	28%	27%	31%	28%
	% of the F.O.B for the Buyer	48%	46%	46%	48%	45%	47%
	% of the F.O.B for the Government	13%	13%	13%	12%	12%	13%

Source: Gockowski and Wilcox (2007)

Table 8: Cocoa Buying Centers in Bong, Lofa and Nimba Counties

Bong	Lofa	Nimba
Belefanai <i>Gbarnga</i> ²⁶ Gbatala Kokoya Palala <i>Zoweinta</i>	Bolahun Kolahun Salayea <i>Voinjama</i> <i>Zorzor</i>	[Bahn] ²⁷ Butuo [Ganta] Gbeilay (Beo) <i>Karnplay</i> Loguatuo Mehnla <i>Saclepea</i> Tappita Zikepa

²⁶ Buying centers in bold and italics were chosen for the baseline survey.

²⁷ Villages in brackets were not included in the buying centers per se, but indicated to be aggregation points in calculating *TGDIST* for cocoa before being smuggled into Guinea.

Table 9: Number of Surveys Completed by Village in the Baseline Survey

Number of Surveys	Date	Village	Clan	District	County	Buying Center
25	11/4/06 & 3/6/07	Weinsue	Jorpolu	Jorquelleh	Bong	Gbarnga
8	10/28/2006	Cooper-Ta	Jorquelleh	Jorquelleh	Bong	Gbarnga
23	10/28/06 & 2/26/07	Melekia	Jorquelleh	Jorquelleh	Bong	Gbarnga
16	10/31/06	Galai	Suakoko	Suakoko	Bong	Gbarnga
16	3/7/07 & 3/8/07	Gwenima	Suakoko	Suakoko	Bong	Gbarnga
16	10/3/2007	Jimmy Korkollie	Suakoko	Suakoko	Bong	Gbarnga
21	10/24/06 & 2/25/07	Nai	Suakoko	Suakoko	Bong	Gbarnga
16	9/3/2007	Benneh	Yeanawon	Suakoko	Bong	Gbarnga
16	11/3/06	Kpoe	Zota	Zota	Bong	Gbarnga
22	11/2/2006	Boepa	Bonwein	Kokoyah	Bong	Zoweinta
24	11/1/06 & 2/3/07	Gbalorkpalar	Soe	Panta-Kpai	Bong	Zoweinta
24	11/1/06 & 3/1/07	Malonkai	Soe	Panta-Kpai	Bong	Zoweinta
24	11/2/06 & 3/4/07	Mileenta	Wolota	Kpai	Bong	Zoweinta
23	10/16/06 & 1/31/07	Betibah	Bondi	Voinjama	Lofa	Voinjama
16	10/16/06	Kennedy Farm	Bondi	Voinjama	Lofa	Voinjama
16	10/17/06	Kpakumai	Bondi	Voinjama	Lofa	Voinjama
24	10/15/06 & 2/1/07	Bolongoidu	Quadu-Bondi	Voinjama	Lofa	Voinjama
16	10/18/06	Nassadu	Quadu-Bondi	Voinjama	Lofa	Voinjama
24	10/17/06 & 01/02/07	Bazzagizzia	Upper Walker	Voinjama	Lofa	Voinjama
16	2/21/07	Mehmeh	Gbalein	Salayea	Lofa	Zorzor
23	10/25/06 & 2/18/07	Yeila	Gizemai	Zorzor	Lofa	Zorzor
16	2/22/07	Kokolu-Zazay	Palama	Salayea	Lofa	Zorzor
23	10/25/06 & 2/20/07	Gbanway	Vavala	Salayea	Lofa	Zorzor
25	10/2/06 & 2/19/07	Sucromu	Vavala	Salayea	Lofa	Zorzor
16	2/23/07	Nikebozu	Zeyema	Zorzor	Lofa	Zorzor
20	10/24/06 & 2/17/07	Kpassagisia	Zeyema	Zorzor	Lofa	Zorzor
25	10/23/06 & 2/16/07	Wakesu	Zeyema	Zorzor	Lofa	Zorzor
24	10/23/06 & 2/15/07	Zelemai	Zeyema	Zorzor	Lofa	Zorzor
21	10/3/06 & 1/22/07	Mlintontuo	Boe-Quellah	Tappita	Nimba	Bahn
20	10/3/06 & 1/20/07	Fiaplay	Gbor	Zoe Geh	Nimba	Bahn
16	9/06/06 & 9/29/06	Bayleglay	Zoe	Zoe Geh	Nimba	Bahn
16	10/1/2006	Miaplay Yeazlay	Zoe	Zoe Geh	Nimba	Bahn
18	10/7/06 & 1/26/07	Zahn-Boie	Zahn	Saclepea-Mah	Nimba	Saclepea
18	9/27/06 & 1/15/07	Duoplay	Sango-zoa	Gbelaygeh	Nimba	Karnplay
18	9/6/06 & 1/18/07	Slangonplay	Sollay	Gbelaygeh	Nimba	Karnplay
20	9/6/06 & 1/17/07	Gbeh-Bonnah	Sroh	Gbelaygeh	Nimba	Karnplay
25	9/6/06 & 1/15/07	Zualay	Zor	Gbelaygeh	Nimba	Sanequille
23	10/04/06 & 1/24/07	Ganwee	Mehnsonoh	Yarwin-Mehnsonoh	Nimba	Saclepea
21	10/6/06 & 1/7/07	Loyee	Wee	Saclepea-Mah	Nimba	Saclepea
20	10/5/06 & 1/23/07	Beinglan	Mehnsonoh	Yarwin-Mehnsonoh	Nimba	Zoweinta

Table 10: Farmgate Price Determination Regression Variables, Expected Signs, and Description with Mean, Standard Deviation, Minimum, and Maximum

Category	Variable	Coefficient	Expected Sign	Units	Description	Mean	Std	Min	Max
World Prices and Discount	<i>LIFFE</i>	β_1	+	\$/Kilogram	London futures price by month of sale	1.66	0.08	1.58	1.77
	<i>QUALMAT</i>	β_2	-		=1 if the transaction had a discount associated with wet or moldy beans, else =0	0.25	0.44	0	1
Transportation	<i>TGDIST</i>	β_3	-	Kilometer	Total distance from the village to Guinea border	67.52	21.90	25.9	122.65
	<i>TMDIST</i>	β_4	-	Kilometer	Total distance from the village to Monrovia	117.38	28.43	55.9	186.09
	<i>QINV</i>	β_5	-	kg	Inverse of the total amount of cocoa sold	0.02	0.04	0	0.5
	<i>TRANSPORT</i>	β_6	+		=1 if farmer owns either a Bicycle, Moped/Motorcycle, Pickup truck or Automobile; else =0	0.06	0.24	0	1
	<i>BTRANS</i>	β_7	+/-		=1 if the farmer transported the cocoa to the buying center; else =0	0.14	0.34	0	1

Table 11: Price Transmission Regression Variables Continued

Market Information And Resources	<i>BFARM</i>	β_8	+	=1 if Farmer participates in farmer organization, else =0	0.16	0.37	0	1
	<i>MKTIN</i>	β_9	+	=1 if market information was gathered from newspaper, radio or government at the Always, Often and Sometimes level, else = 0	0.04	0.19	0	1
	<i>OMRKTIN</i>	β_{10}	+	=1 if market information gathered from neighbors or produce buyers at the Always, Often and Sometimes level, else = 0	0.85	0.36	0	1
	<i>NOINFO</i>			Control representing if the farmer obtained no information on cocoa				
	<i>CELL</i>	β_{11}	+	=1 if the farmer has access to cell phone, else =0	0.05	0.23	0	1
	<i>BCRED</i>	β_{12}	-	=1 if the farmer obtained a loan from the buyer, else = 0	0.24	0.43	0	1
	<i>NONBCRED</i>	β_{13}	+	=1 if the farmer had obtained a loan but had not obtained it from a buyer, else = 0	0.03	0.18	0	1
	<i>NOCRED</i>			Control representing if the farmer had not obtained a loan				

Table 12: Price Transmission Regression Variables Continued

Farm Characteristics	<i>FAMSIZE</i>	β_{14}	-/+	Number of household members	6.67	3.34	1	19
	<i>EDUC</i>	β_{15}	+	Number of years the main cocoa farmer in the household (Head of House or Spouse) attended school	4.44	5.05	0	25
	<i>CEXP</i>	β_{16}	+	Number of years of cocoa farming experience of the head of household.	19.86	11.85	0	56
	<i>CHOLD</i>	β_{17}	-	Importance of cocoa to household calculated as ratio of acres of cocoa to other tree crop acreage.	0.7	0.3	0	1
Season	<i>WET</i>	β_{18}	-	1= if sale occurred in the months of September or October, else = 0	0.29	0.45	0	1
	<i>DRY</i>			Control representing if the sale did not occur in September or October.				
Location	<i>BIGCTR</i>	β_{19}	+	1= if village is located near a regional buying center (villages of Gbarnga, Voinjama, Saclepea), else = 0	0.31	0.46	0	1
	<i>LILCTR</i>			1= if village is located near a local buying center (villages of Zoweinta, Zorzor, Karnplay), else = 0				
	<i>NIMBA</i>	β_{20}	+	=1 if household is in Nimba County =0 if household is in Lofa County =-1 if household is in Bong County	0.28	0.78	-1	1
	<i>LOFA</i>	β_{21}	-	=1 if household is in Lofa County =0 if household is in Nimba County =-1 if household is in Bong County	0.11	0.71	-1	1
	<i>BONG</i>			=0 if household is in Lofa County =0 if household is in Nimba County =1 if household is in Bong County				

Table 13: Distances from Villages to Buying Centers and Export Markets (In Kilometers)

# of Transactions	Village	Buying Centers								Export Market		County	Descriptive Distances	
										Monrovia	Guinea			
									Bahn	120	56			
								Ganta	0	66	2			
								Cbaruga	17	49	19			
								Karuplay	68	133	70			
									39	104	41			
									15	96	16			
									0	74	44			
									0	100	70			
									0	104	40			
n=8	Benneh								16	65	35			
n=11	Boepa								0	108	78			
n=0	Cooper-Ta								14	62	32			
n=2	Galni								19	67	37			
n=13	Gbalorkpalar								0	124	94			
n=11	Gwenima								12	61	31			
n=4	Jimmy Korkollie								9	58	28			
n=0	Kpoe								37	86	56			
n=8	Malonkui								0	118	88			
n=5	Melelae								8	56	26			
n=16	Mileenta								0	115	85			
n=18	Nai								24	73	43			
n=12	Weinsue								7	56	26			
n=17	Bazzagizzia									110	29			
n=12	Betibah									127	47			
n=19	Bolongoidu									111	31			
n=9	Gbauway									74	27			
n=1	Kennedy Farm									117	37			
n=12	Kokoitu-Zazay									95	65			
n=3	Kpakumai									123	43			
n=24	Kpassagisia									106	48			
n=11	Mehmeh									104	74			
n=0	Nassadu									106	25			
n=11	Nikebozu									140	60			
n=9	Sucromu									80	22			
n=15	Wakesu									100	43			
n=15	Yeila									88	31			
n=9	Zelemai									91	33			
n=22	Bavleglay	0	0			0	0		15	135	72			
n=19	Beinglan	0	21			0	0		0	121	91			
n=34	Duoplay	0	0			0	10		0	143	79			
n=20	Fiaplay	0	0			0	0		11	130	67			
n=12	Gauwee	0	0			37	0		0	141	77			
n=32	Gbeh-Bonnah	0	0			0	17		0	150	86			
n=25	Loyee	0	0			10	0		0	114	51			
n=22	Miaplay Yeazlay	0	0			0	0		6	128	62			
n=15	Mintontuo	0	0			0	0		21	140	77			
n=24	Slangouplay	0	0			0	15		0	148	85			
n=18	Zahn-Boie	0	0			47	0		0	152	88			
n=14	Zualay	29	0			0	24		0	157	94			

Table 14: Management of Field Crops by Gender, Including Average and Maximum Number of Fields Per Household

Field Crop	Number of Households	Women	Men	Both	No Response	Average Number of Fields per House	Max Fields per Household
Rice/Cassava/Mixed Food Crop Fallow Rotation	245	22%	3%	75%	0%	1.09	4
Swamp rice	103	14%	2%	80%	4%	1.10	3
Cassava field	100	14%	14%	57%	14%	1.06	2
Plantain field	86	14%	3%	78%	5%	1.02	2
Pepper field	83	13%	88%	2%	0%	1.00	1
Bitter Ball field	56	11%	4%	84%	0%	1.00	1
Upland rice field	36	11%	5%	76%	9%	1.00	1
Okra field	24	8%	92%	0%	0%	1.00	1
Sweet Potato Field	7	7%	21%	71%	1%	1.00	1
Maize field	2	0%	100%	0%	0%	1.00	1
Eggplant field	1	0%	100%	0%	0%	1.00	1

Table 15: Number and Current Conditions of Tools Found in Households Surveyed

Item	Number of Households	Number of Tools	Condition of Tools				Average Qty Per House
			Good (%)	Fair (%)	Poor (%)	Unknown (%)	
Cutlasses/machetes	332	905	49%	40%	11%	1%	2.73
Axes	269	432	51%	36%	13%	1%	1.61
Hoes	286	871	45%	39%	16%	2%	3.05
Pruning shears	14	24	42%	50%	8%	0%	1.71
Oil press	0	0	0%	0%	0%	0%	0.00
Chainsaw	0	0	0%	0%	0%	0%	0.00
Knapsack sprayer	3	3	67%	0%	33%	0%	1.00
Irrigation pump	1	1	100%	0%	0%	0%	1.00
Cocoa harvesting poles	183	244	63%	30%	5%	4%	1.33
Jute bags	79	183	69%	30%	1%	5%	2.32
Tarpaulin	43	46	54%	41%	4%	4%	1.07
Raffia drying mats	185	279	60%	33%	6%	3%	1.51
Fermentation baskets	43	59	68%	31%	2%	0%	1.37
Dibble planting stick	3	3	33%	33%	33%	0%	1.00
Other	56	61	52%	28%	20%	2%	1.09

Table 16: Cocoa Labor Provided the Household by Age Cohort and Occupation

	3-7	8-14	15-20	21-30	31-40	41-50	51-60	61 +
Number of Laborers	407	402	290	309	239	177	111	112
Total Tasks	38	218	406	668	530	504	291	167
Total Cocoa Laborers	15	135	190	236	190	155	92	54
Average # Tasks per Person	2.53	1.61	2.14	2.83	2.79	3.25	3.16	3.09
% of Cohort Participating in Cocoa Labor	3.69%	33.58%	65.52%	76.38%	79.50%	87.57%	82.88%	48.21%
<i>Principle Economic Activity for Household Cocoa Labor</i>								
Self Employed Ag	0	4	53	160	177	145	88	45
Hire Labor Ag	0	7	0	1	0	0	0	0
Salaried Non Ag	0	0	1	0	0	4	2	1
Retired	0	0	0	0	0	0	1	1
Student	13	0	128	57	3	1	0	0
Petty Commerce	0	121	1	0	2	0	0	1
Homemaker	0	0	3	14	5	2	0	0
Other	0	3	0	0	0	0	0	2
None	2	0	4	4	3	2	1	4

Table 17: Quantity and Averages of Hired Labor for Cocoa by Task

Task	Number of Households That Hired Labor	Total Number of Workers Hired²⁸	Average Wage (\$USD/hr)	Average Number of Employees	Average Number of Hours per Employee
Pruning	9	59	0.42	9.56	14.00
Brushing	59	577	0.73	12.95	13.41
Harvesting	11	203	0.80	18.45	10.13
Drying/Fermenting	0	0	0.00	0.00	0.00
Seasonal	13	214	69.51	20.15	

²⁸ Households may have employed the same individual for more than one task

Table 18: Farmgate and Port Prices for Cocoa Beans in Selected African Countries (\$US/kg)

Price	Location	Main Cocoa Crop 06/07			
		Oct	Nov	Dec	Jan
World Price	<i>ICCO</i>	1.53	1.58	1.70	1.70
Port Price	<i>Nigeria - Port</i>	1.30	1.33	1.46	1.57
	<i>Côte d'Ivoire - Port</i>	0.72	0.78	0.87	0.92
Farmgate Price	<i>Liberia - Farm</i>	0.32	0.35	0.37	0.39
	<i>Cameroon - Farm</i>	1.17	1.16	1.26	1.35
	<i>Nigeria - Farm</i>	1.21	1.25	1.38	1.49
	<i>Ghana - Farm</i>	0.96	0.96	0.96	0.96
	<i>Côte d'Ivoire - Farm</i>	0.58	0.68	0.76	0.82
% of the ICCO Price received at the Farmgate	<i>Liberia - Farm</i>	21%	22%	22%	23%
	<i>Cameroon - Farm</i>	77%	73%	74%	79%
	<i>Nigeria - Farm</i>	79%	79%	81%	87%
	<i>Ghana - Farm</i>	63%	61%	56%	56%
	<i>Côte d'Ivoire - Farm</i>	38%	43%	45%	48%

Source: Reuters News (2007)

Table 19: Quality Discount Frequency and Discount Size (in Kilograms and \$USD)

Item	Nimba (n=286)	Lofa (n=169)	Bong (n=108)
% of Sales with Any Type of Discount	70.3%	85.8%	83.3%
% Sales with Quality Discount (Wet or Moldy)	18.9%	10.1%	5.6%
Average Size of Discount (kg)	3.0	2.9	2.3
Average discount per transaction (\$USD)	1.13	0.92	0.77

Table 20: Cocoa Drying Methods for Surveyed Households

Method	Percent of Households (n=336)
Concrete Slab	1.19%
Road	0.30%
Bamboo mats	69.94%
Tarp	8.33%
Attic with fire	0.89%
Raised platform with mat	0.30%

Table 21: Cost (\$USD) of a Taxi Ride to Monrovia from the Buying Centers

Buying Center	N	Mean²⁹	Min	Max	Std
Bahn	72	11.42	0.12	16.67	3.33
Gbarnga	157	6.29	4.17	10.00	1.54
Karnplay	81	13.60	1.67	29.17	4.33
Saclepea	62	12.06	0.15	25.00	3.91
Voinjama	118	19.35	11.67	25.00	3.45
Zorzor	183	12.19	8.33	25.00	2.45
Zoweinta	113	11.49	6.67	25.00	4.24

²⁹ Using the Law of Averages as justification, these figures were calculated using responses from the entire survey population

Table 22: Variable Means and Standard Deviations for Effective Farmgate Price Determination Model by County

		Bong n=108		Lofa n=171		Nimba n=206		Sample n=532	
	Units	Mean	Std Err	Mean	Std Err	Mean	Std Err	Mean	Std Error
<i>PRICED</i>	\$USD	0.33	0	0.31	0	0.37	0.01	0.34	0.09
<i>LIFFE</i>	\$/Kilogram	1.67	0.01	1.67	0.01	1.66	0.01	1.67	0.08
<i>QUALMAT</i>	Dummy Variable (0,1)	0.30	0.04	0.29	0.04	0.22	0.03	0.25	0.44
<i>TGDIST</i>	Kilometer	57.17	2.60	57.82	1.37	78.41	0.98	67.52	21.90
<i>TMDIST</i>	Kilometer	87.17	2.60	103.09	0.95	139.28	1.01	117.38	28.44
<i>QINV</i>	Kilogram	0.02	0	0.02	0	0.03	0	0.02	0.04
<i>TRANSPORT</i>	Dummy Variable (0,1)	0.03	0.02	0.04	0.02	0.10	0.02	0.06	0.25
<i>BTRANS</i>	Dummy Variable (0,1)	0.25	0.04	0.07	0.02	0.13	0.02	0.14	0.34
<i>BFARM</i>	Dummy Variable (0,1)	0.01	0.01	0.09	0.02	0.28	0.03	0.16	0.37
<i>MKTIN</i>	Dummy Variable (0,1)	0	0	0	0	0.07	0.02	0.04	0.19
<i>OMKTIN</i>	Dummy Variable (0,1)	0.94	0.02	0.91	0.02	0.76	0.03	0.85	0.36
<i>CELL</i>	Dummy Variable (0,1)	0.03	0.02	0	0	0.10	0.02	0.06	0.23
<i>BCRED</i>	Dummy Variable (0,1)	0.06	0.02	0.23	0.03	0.33	0.03	0.24	0.43
<i>NONBCRED</i>	Dummy Variable (0,1)	0.05	0.02	0.02	0.01	0.03	0.01	0.03	0.18
<i>FAMSIZE</i>	People	5.23	0.17	5.42	0.14	8.09	0.25	6.66	3.29
<i>EDUC</i>	Years	4.14	0.42	2.80	0.32	5.65	0.34	4.44	5.05
<i>CEXP</i>	Years	20.40	1.20	18.57	0.87	20.36	0.74	19.86	11.85
<i>CHOLD</i>	Percentage	0.72	0.03	0.77	0.02	0.64	0.02	0.70	0.30
<i>WET</i>	Dummy Variable (0,1)	0.13	0.03	0.21	0.03	0.40	0.03	0.29	0.45
<i>BIGCTR</i>	Dummy Variable (0,1)	0.56	0.05	0.30	0.04	0.21	0.03	0.31	0.47

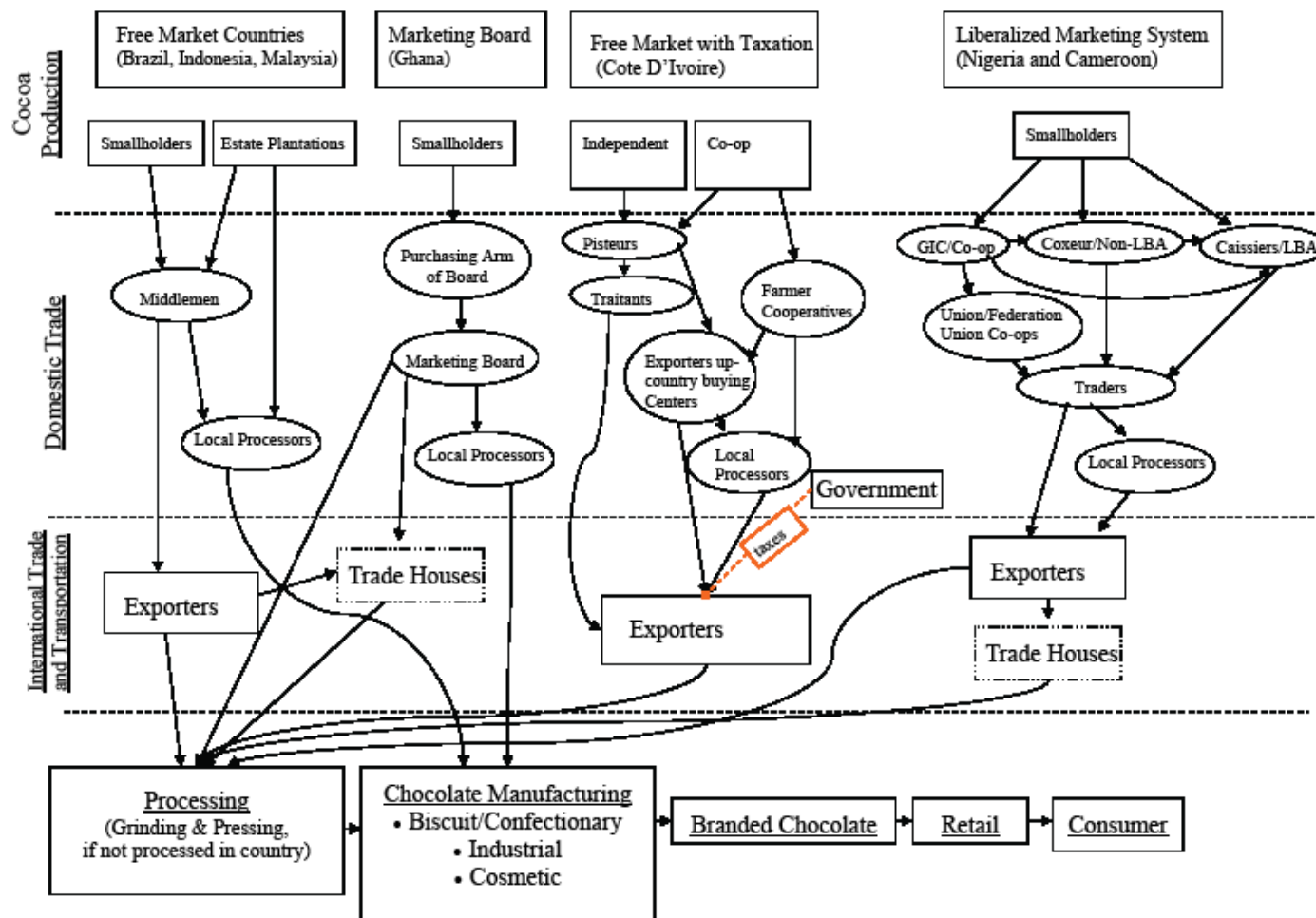
Table 23: Estimates for the Effective Farmgate Price Determination Model

Variable ⁱ	Parameter Estimates ⁱⁱ	T-Stat	Elasticities ⁱⁱⁱ
<i>INTERCEPT</i>	0.161		
<i>LIFFE</i>	0.146***	2.840	0.704
<i>QUALMAT</i>	-0.023***	-2.841	
<i>TGDIST</i>	-0.002***	-4.389	-0.350
<i>TMDIST</i>	0.001***	2.867	0.322
<i>QINV</i>	0.189	1.043	0.012
<i>TRANSPORT</i>	-0.025	-1.418	
<i>BTRANS</i>	0.016	1.608	
<i>BFARM</i>	0.024*	1.714	
<i>MKTIN</i>	0.036	0.885	
<i>OMRKTIN</i>	-0.017*	-1.693	
<i>CELL</i>	-0.021	-1.262	
<i>BCRED</i>	-0.021**	-2.151	
<i>NONBCRED</i>	0.007	0.250	
<i>FAMILYSIZE</i>	-0.001	-0.386	-0.010
<i>EDUC</i>	0.000	-0.374	-0.004
<i>CEXP</i>	0.000	-1.119	-0.019
<i>CHOLD</i>	-0.005	-0.325	-0.009
<i>WET</i>	-0.034***	-3.752	
<i>BIGCTR</i>	-0.041***	-3.321	
<i>NIMBA</i>	0.028***	3.047	
<i>LOFA</i>	-0.033***	-7.071	
<i>N</i>	532		
<i>DF</i>	511		
<i>Adjusted R²</i>	0.1997		

ⁱ Variables are defined in tables Table 10, Table 11, and Table 12.

ⁱⁱ Critical t-value for ***1%, **5%, *10% is 2.585, 1.964, and 1.647 respectively.

ⁱⁱⁱ Elasticities were not calculated for the discrete variables.



Source: Gilbert (1997), Geene, Heijbroek, and Lagerwerf. (2000) and Wilcox (2006)

Figure 1: General Cocoa Marketing Chain

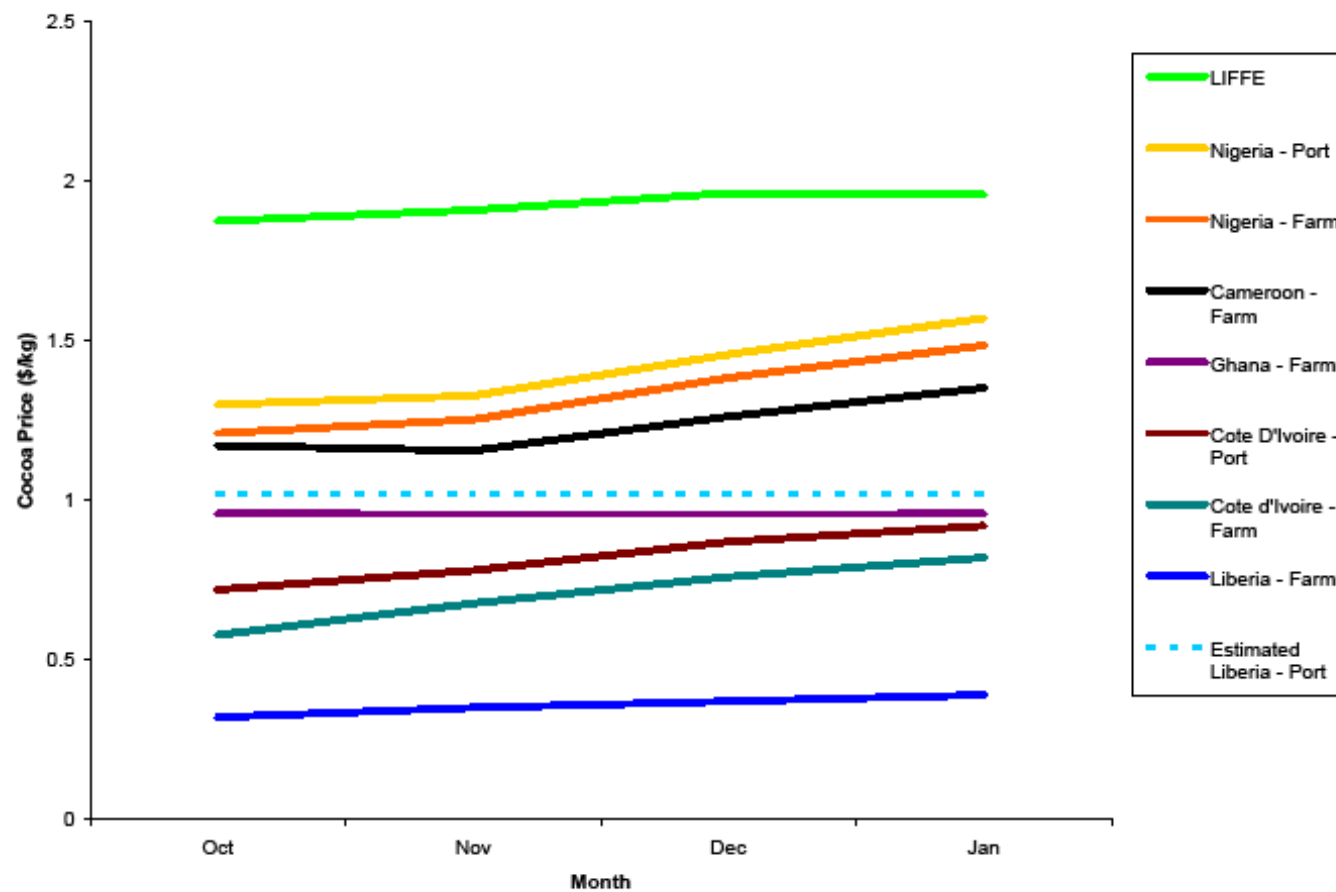
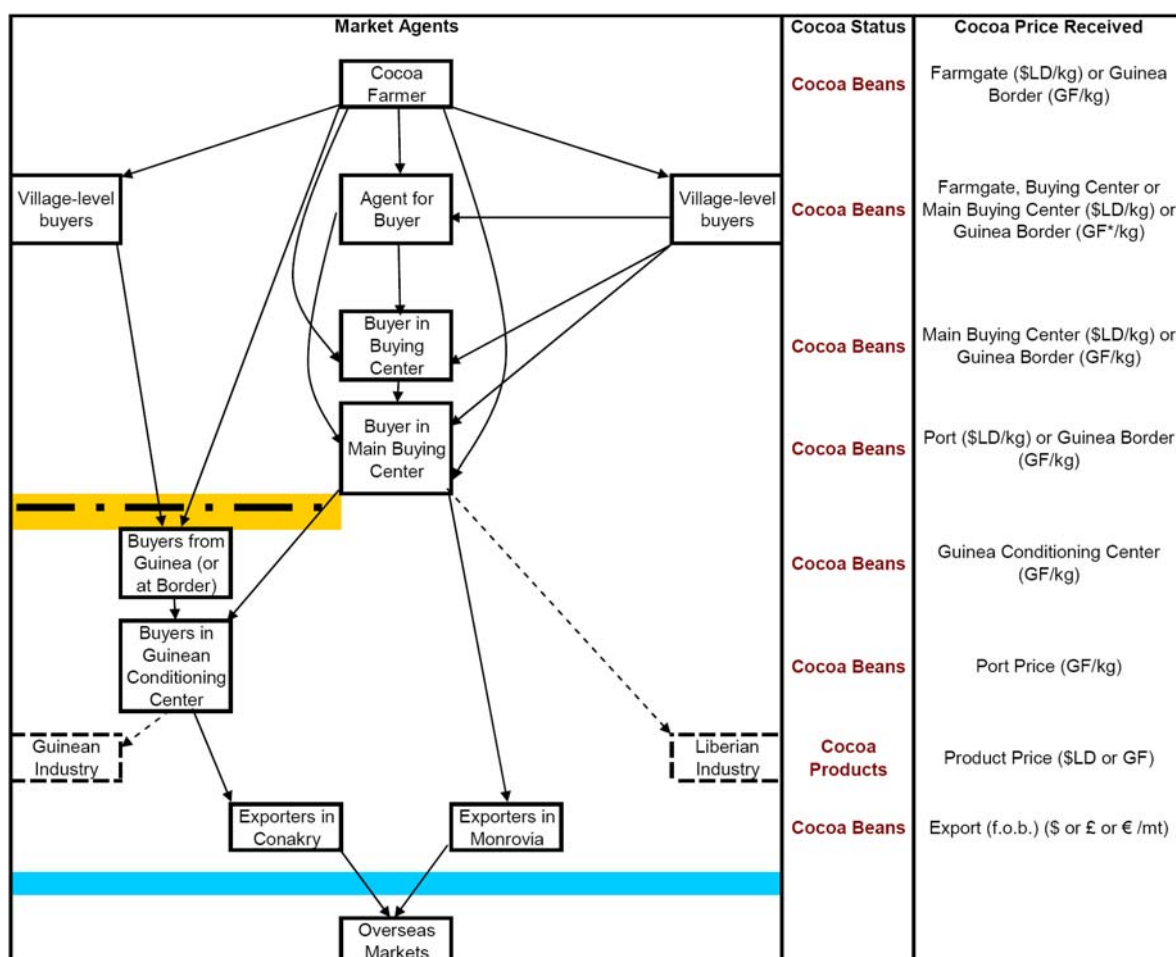


Figure 2: 2006/07 Average Cocoa Prices for Selected West African Countries and the LIFFE Price
Source: Reuters News (2007)



Source: Wilcox, English and Davies (2007)

Figure 3: General Schematic of Current Liberian Smallholder Cocoa Marketing Chain

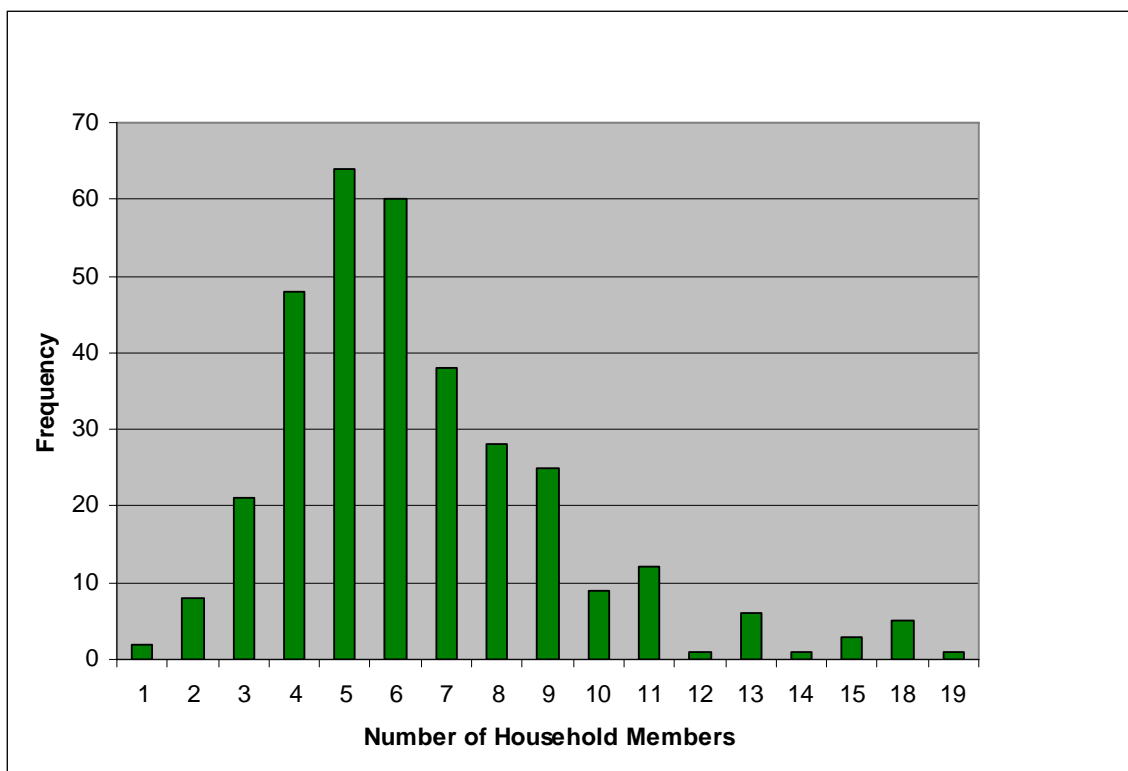


Figure 4: Frequency Distribution of Household Size for Households Producing and Marketing Cocoa in 2006/07 season

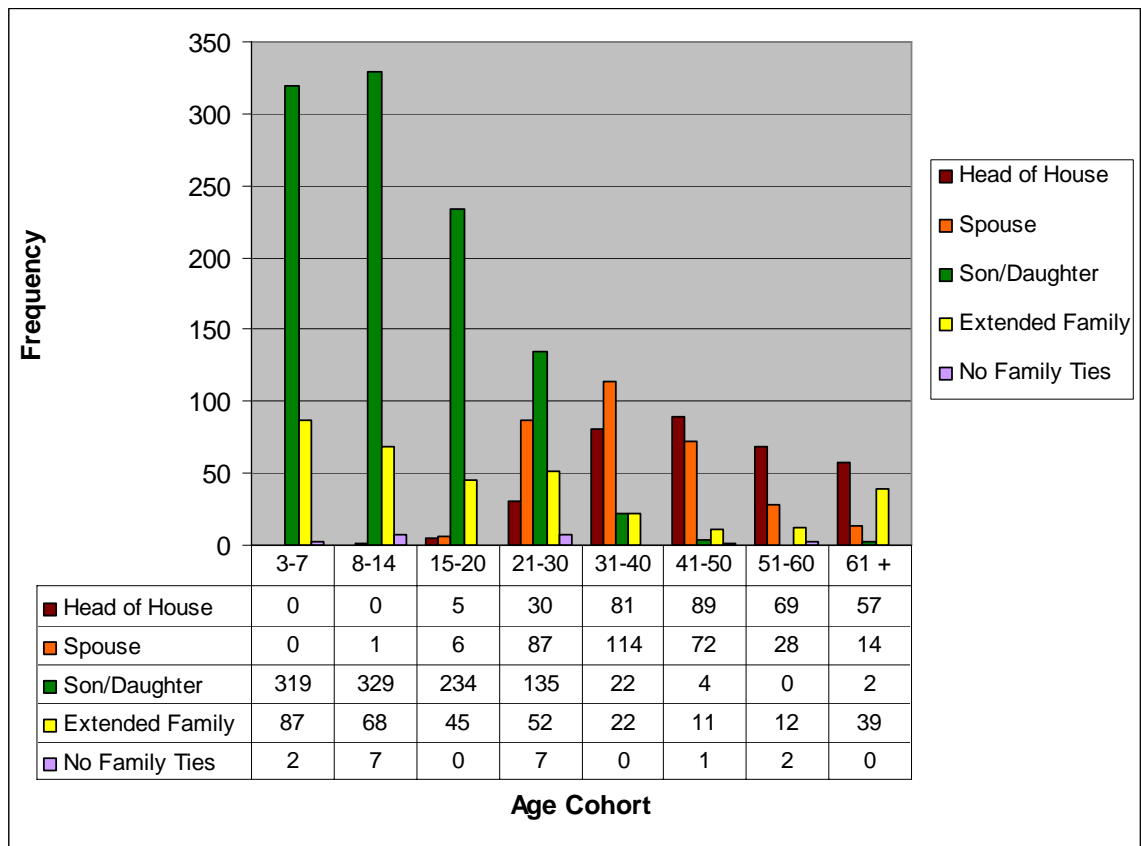


Figure 5: Frequency Distribution of Household Members by Family Status and Age Cohort (n=2047)

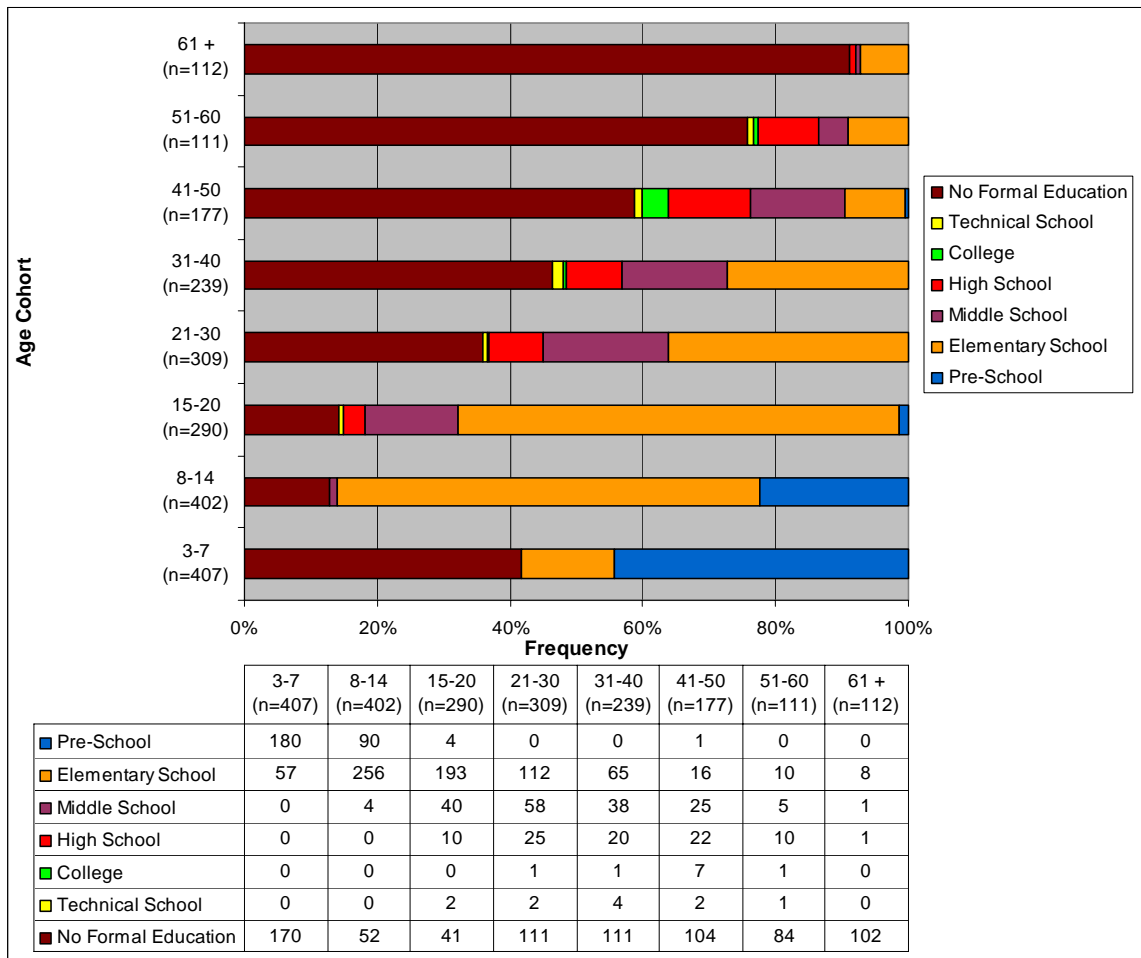


Figure 6: Educational Experience Levels for Household Members by Age Cohort

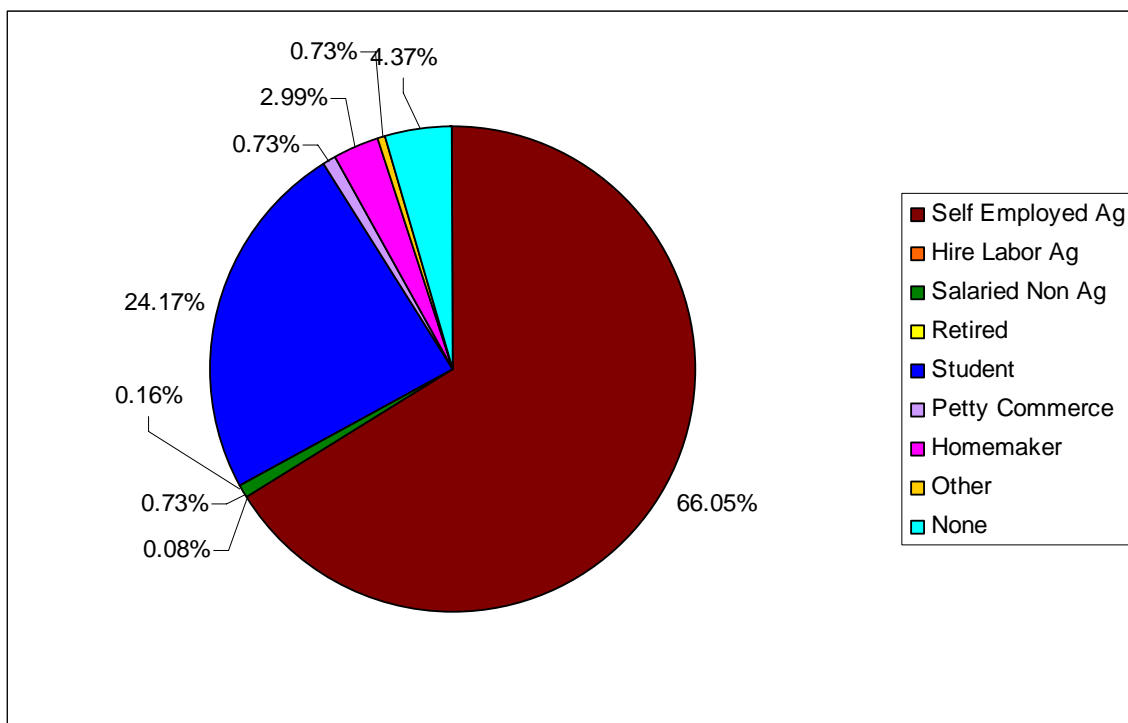


Figure 7: Economic Activity of Surveyed Household Members Over Age 14

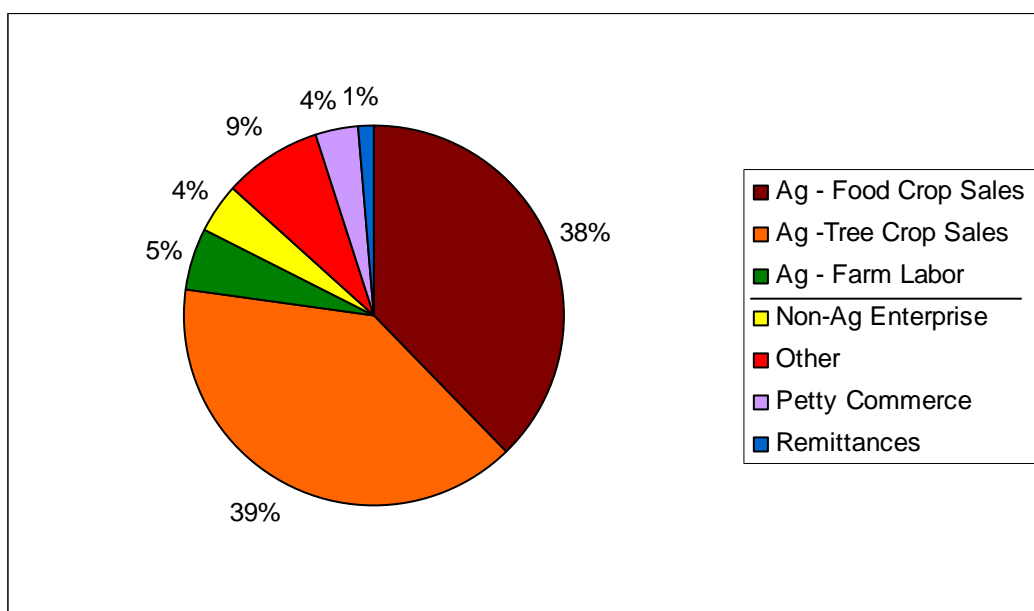


Figure 8: Sources of Household Income (n=332 Households)

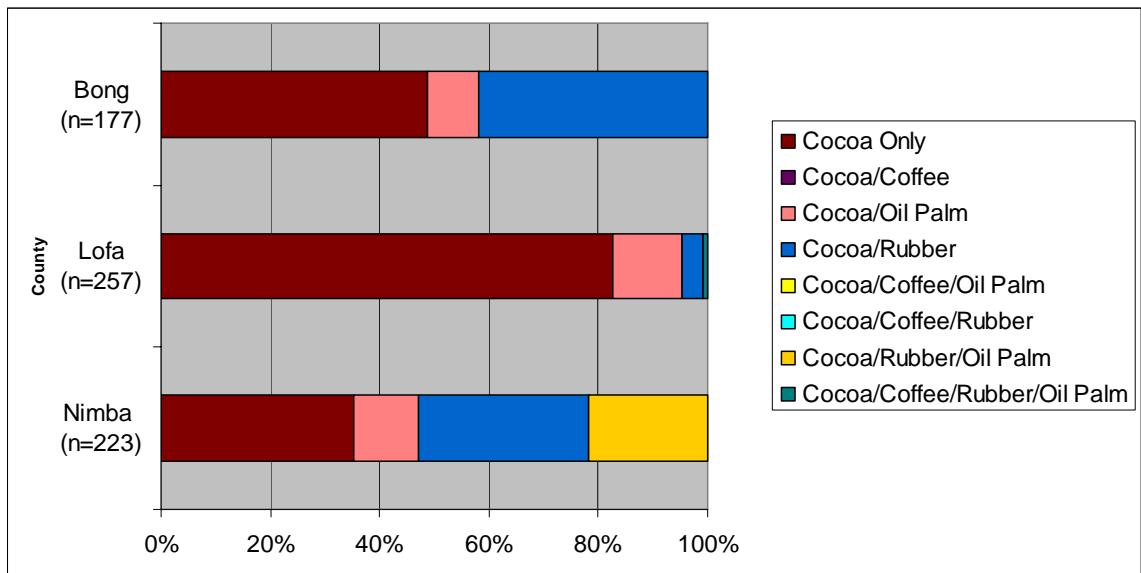


Figure 9: Tree Cropping Systems for Households Surveyed (n=657 farms)

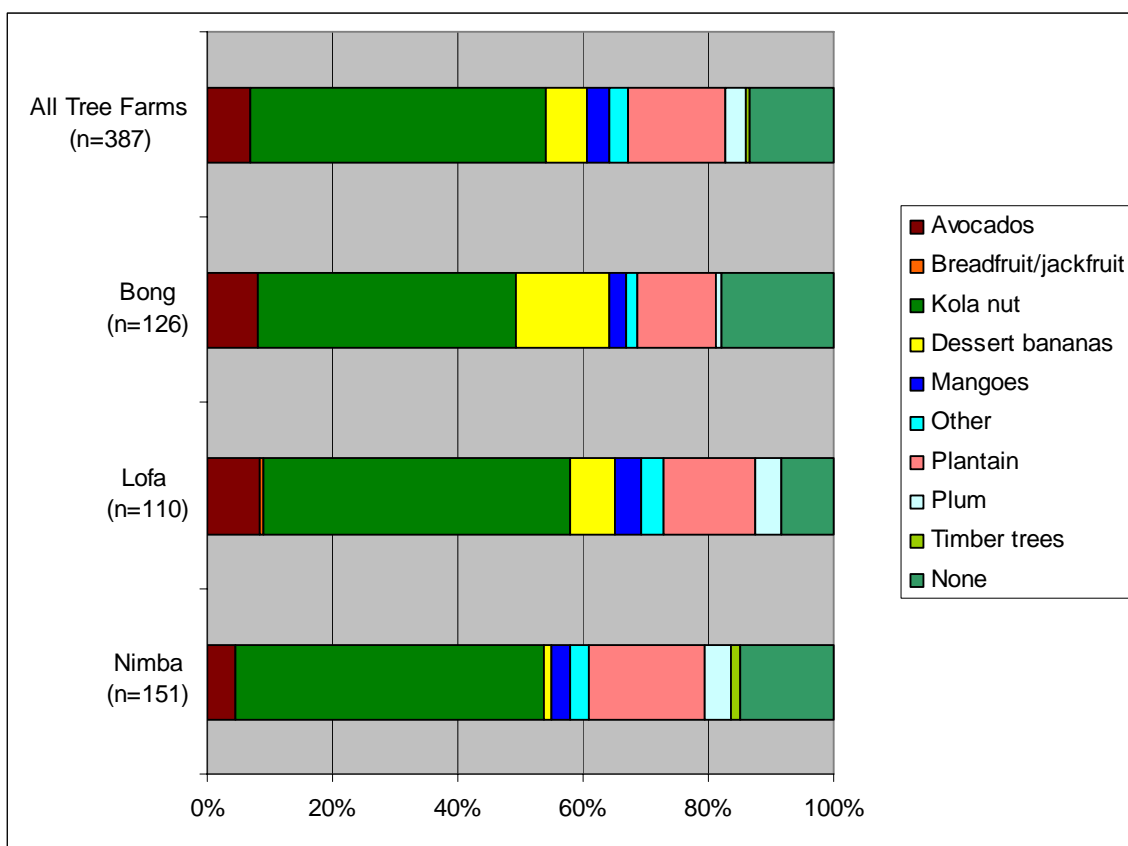


Figure 10: Secondary Tree Crops Planted with Cocoa (n=387)

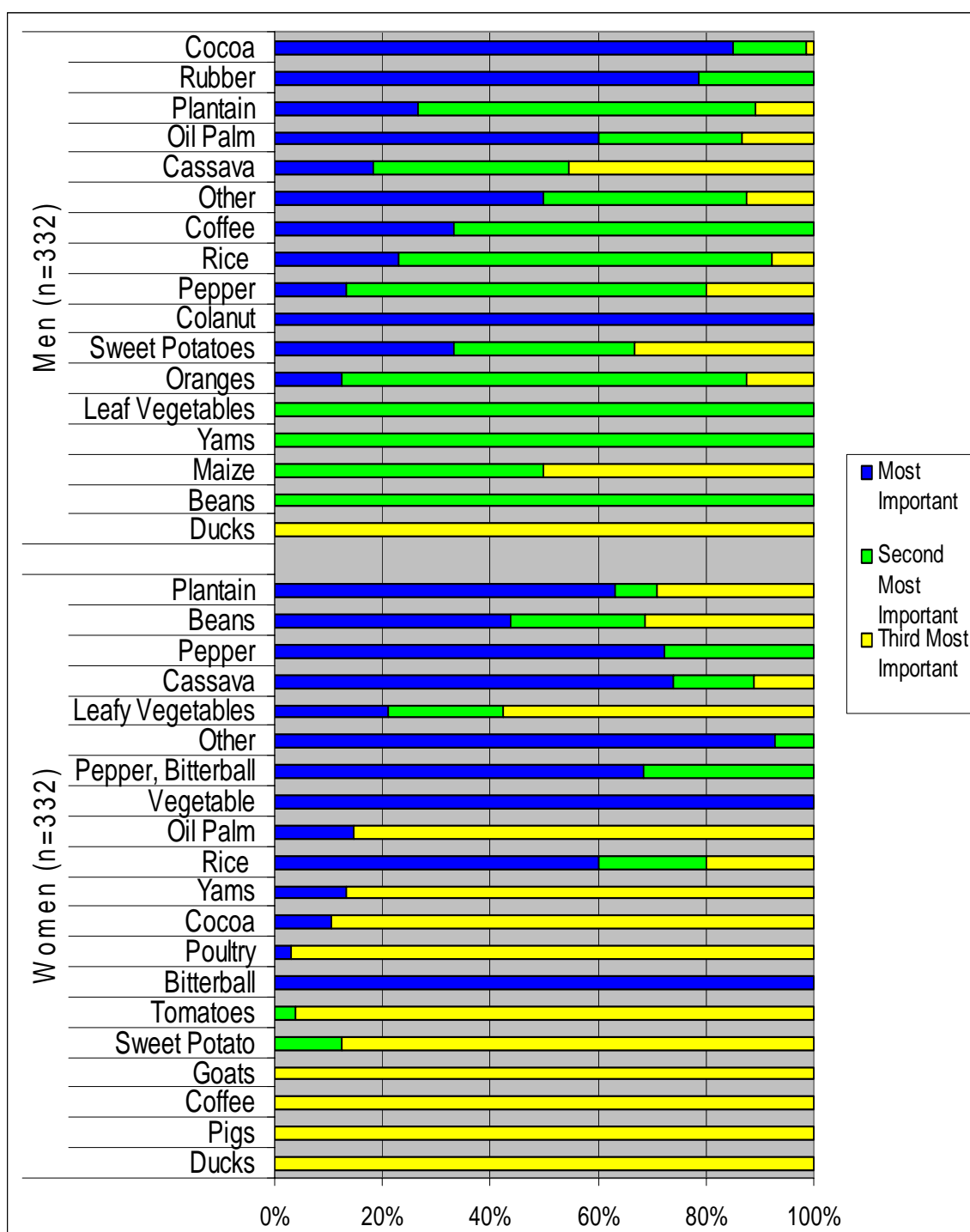


Figure 11: Importance of Agricultural Product, by Gender, Produced By Producing and Marketing Cocoa Household (n=332)

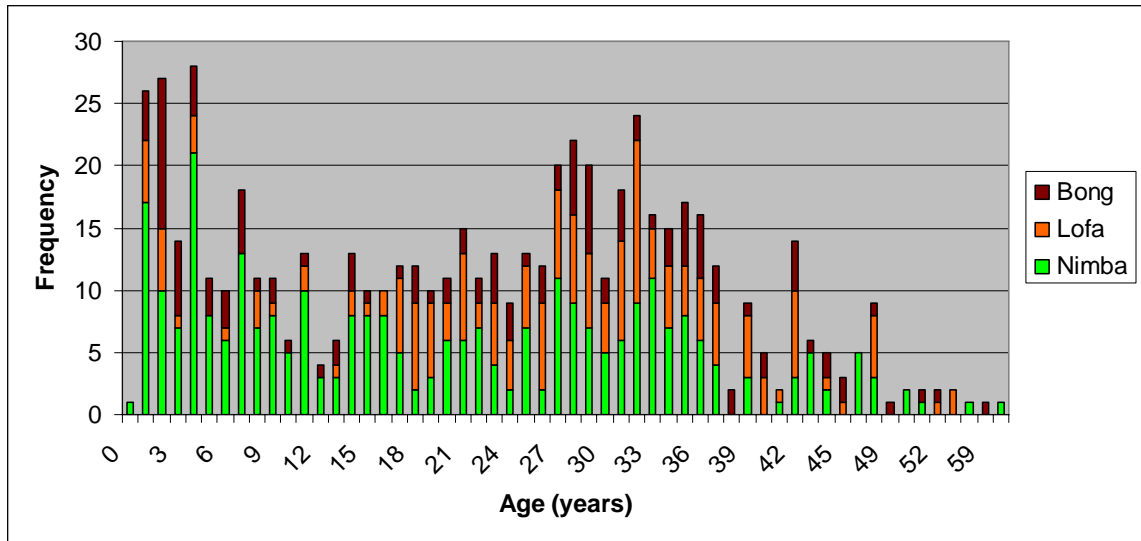


Figure 12: Age of Cocoa Tree Stock for Households that Producing and Marketed Cocoa in 2006/07 season by County

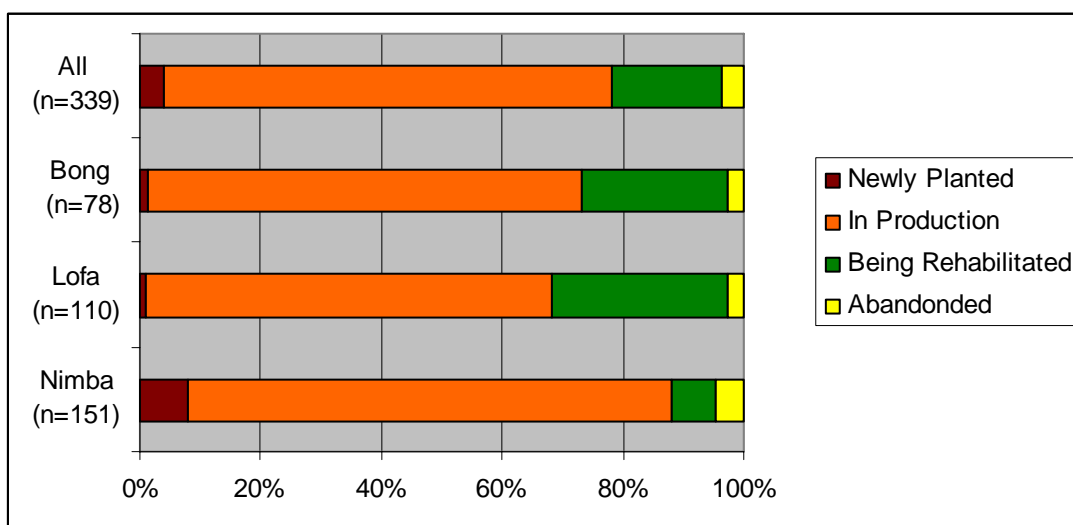


Figure 13: Current Status of Cocoa Farms Producing and Marketing Cocoa Households (n=339)

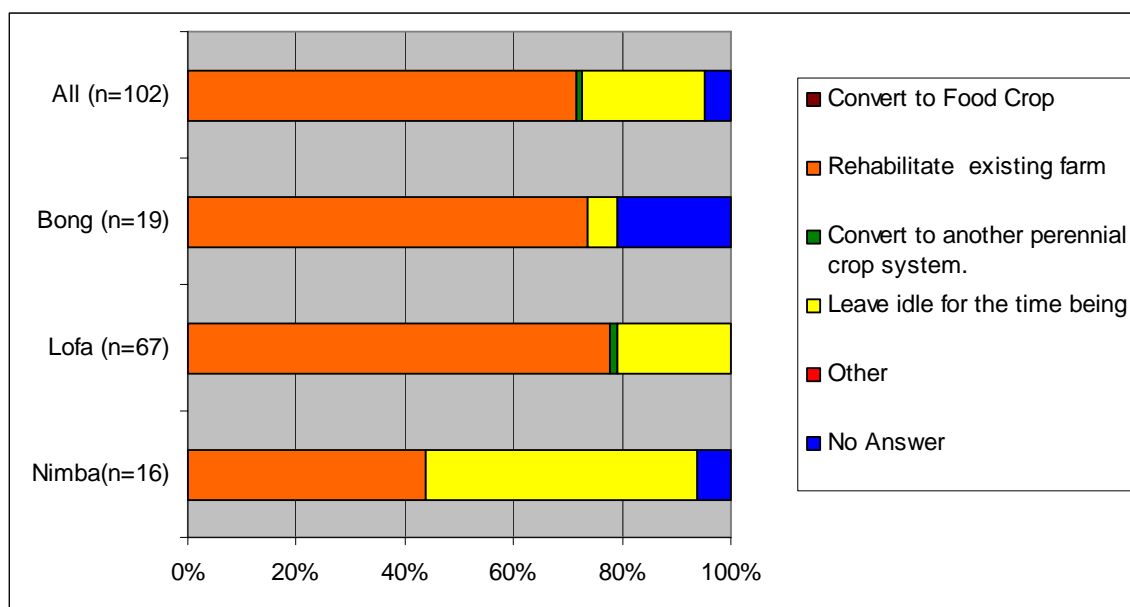


Figure 14: Future Plans for Abandoned Cocoa Farms for All Survey Respondents (n=102)

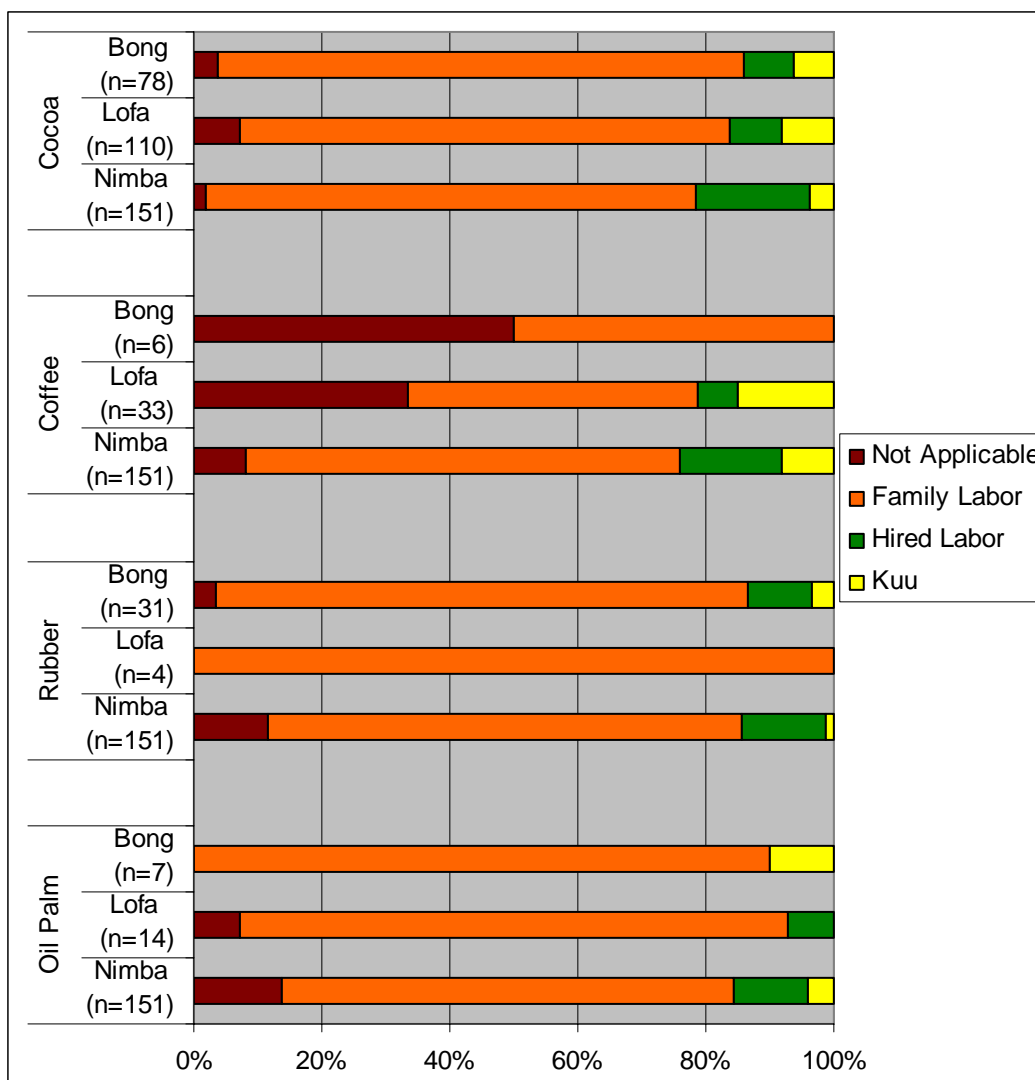


Figure 15: Principal Type of Labor for Tree Crops in Producing and Marketing Cocoa Households (n=332)

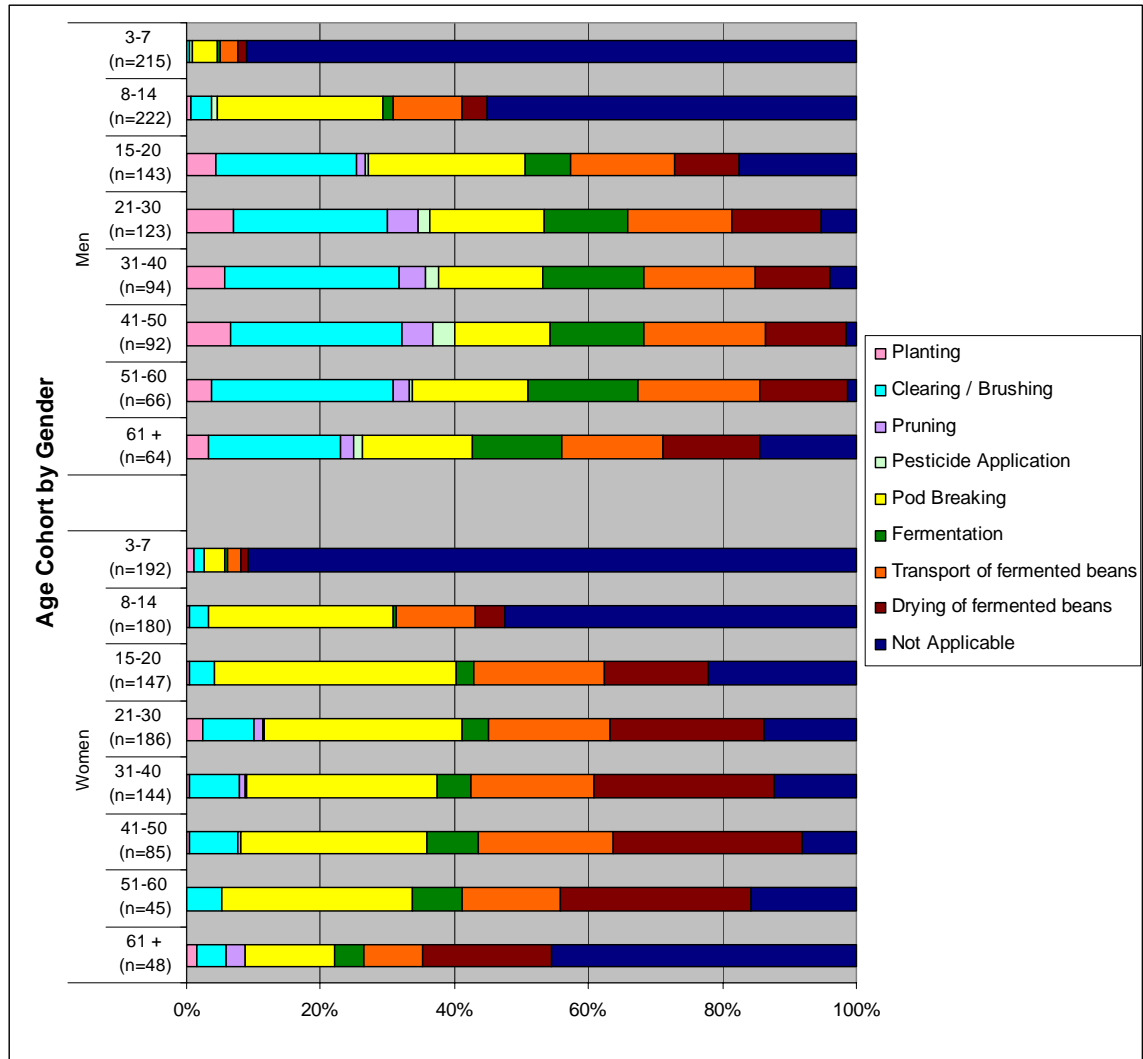


Figure 16: Cocoa Farming Labor Input of Household Members by Age Cohort and Gender for Cocoa Producing and Marketing Households (n=332)

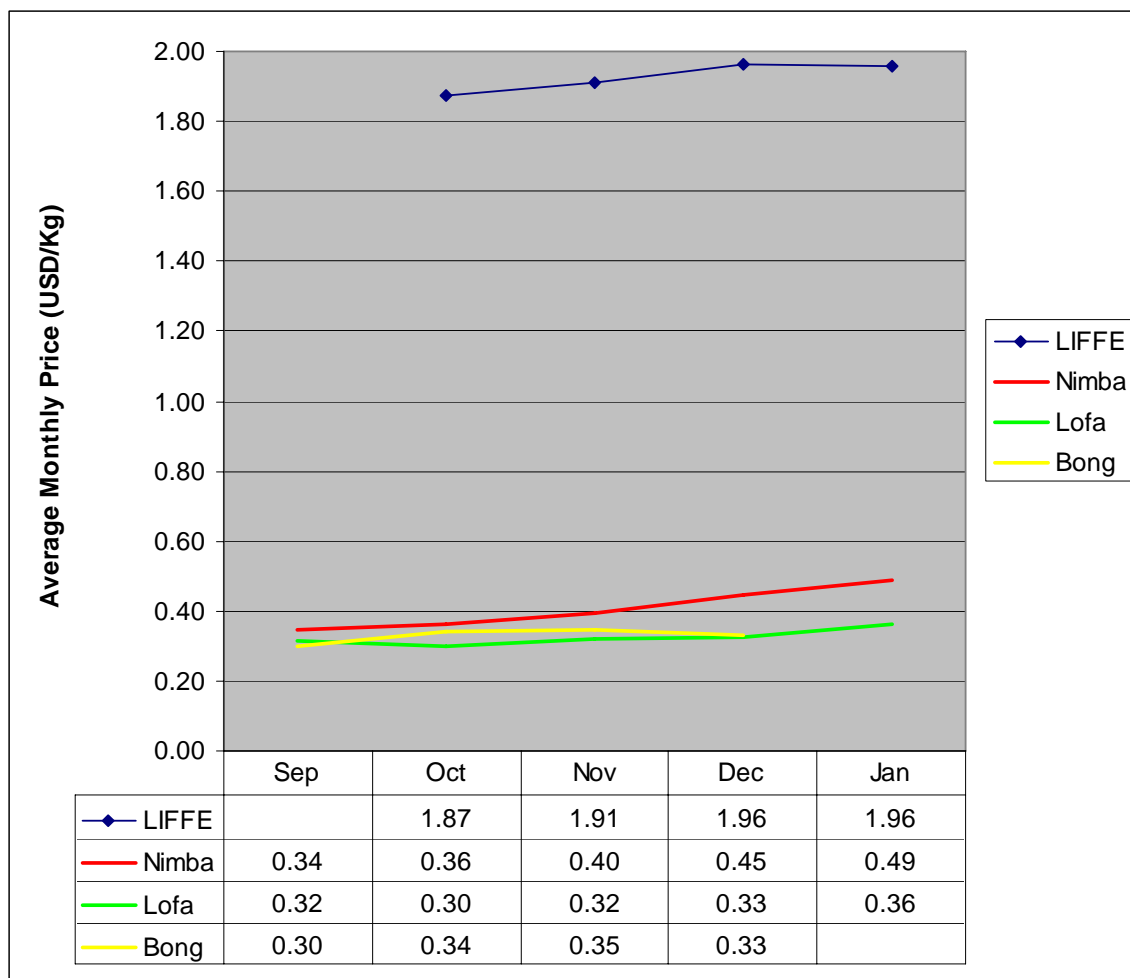


Figure 17: Average Monthly Prices Received by Surveyed Households, Weighted by Quantity Sold, by County Compared to LIFFE Price

Month									
	Quantity Sold	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Jan
Percent of Transactions									
	001-100 kg	0.18% (n=1)	0.36% (n=2)	1.07% (n=6)	5.16% (n=29)	16.37% (n=92)	21% (n=118)	21.17% (n=119)	4.63% (n=26)
	101-200 kg		0.18% (n=1)	0.18% (n=1)	1.6% (n=9)	1.96% (n=11)	7.12% (n=40)	9.43% (n=53)	1.25% (n=7)
	201-300 kg				0.71% (n=4)	1.42% (n=8)	1.25% (n=7)	1.6% (n=9)	0.71% (n=4)
	301-500 kg						0.36% (n=2)	0.53% (n=3)	
	500+ kg					0.18% (n=1)	1.07% (n=6)	0.36% (n=2)	0.18% (n=1)

Figure 18: Percentage of Sales Transactions per Month by Quantity

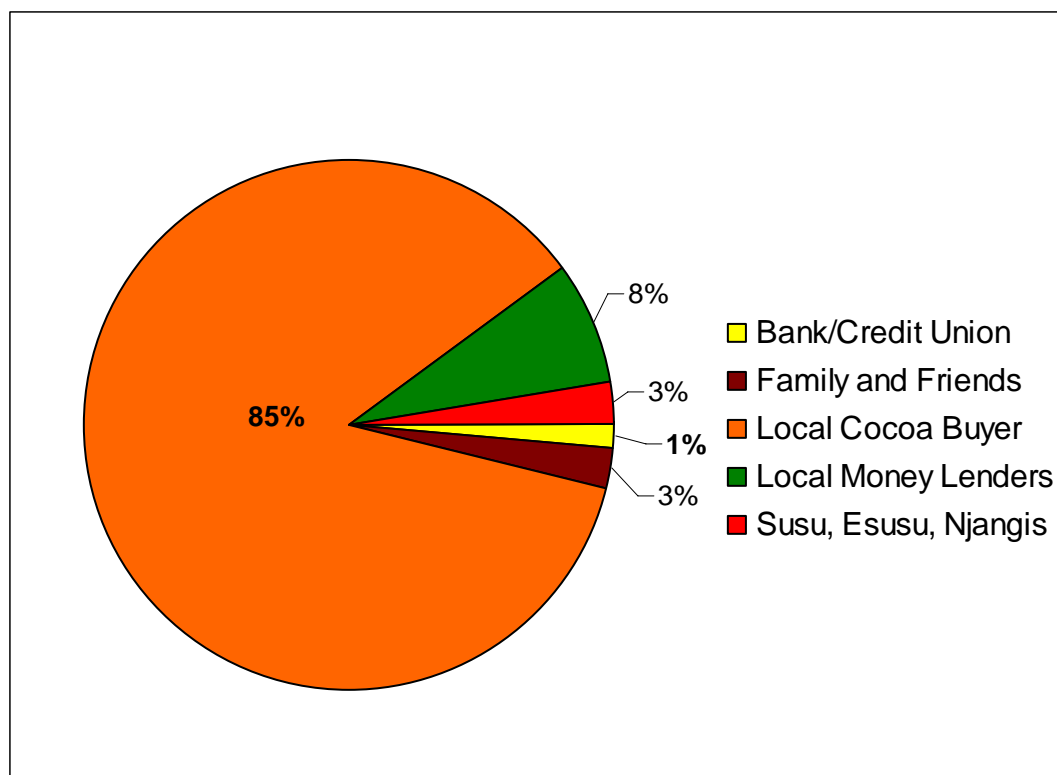


Figure 19: Sources of Credit for Cocoa Farming Received by Households that Producing and Marketed Cocoa in 2006/07



Source: ReliefWeb (2007) - Humanitarian Information Centre for Liberia (HIC-LBR)

Figure 20: Status of Roads in Liberia 2006

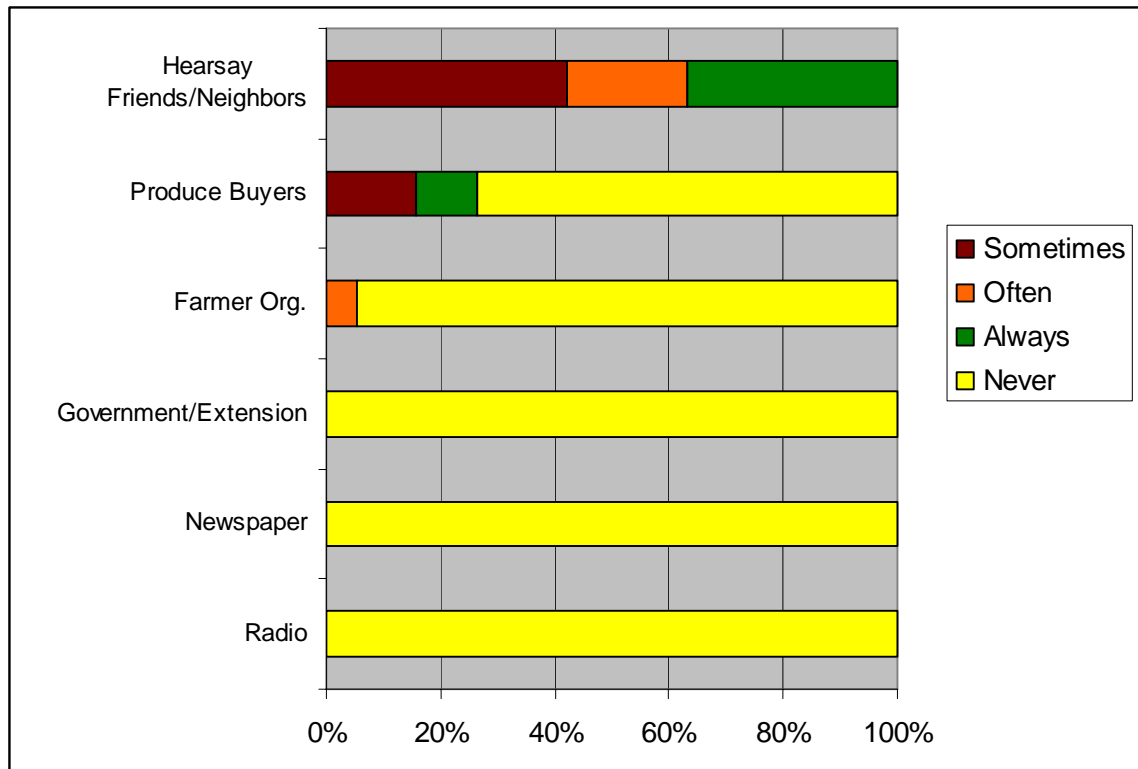


Figure 21: Sources of Market Information for Cocoa (n=19)

Appendix B. Baseline Survey



The information gathered by this survey will be used to inform managers along the supply chain, policy decision makers, and researchers about the current situation of tree crop production at the start of the new Liberian agricultural efforts. Accurate producer information is critical for devising solutions to the problems threatening sustainable rural livelihoods in the tree crops sub-sector and in improving export earning for the Liberian economy.

Start Time: _____ and Finish Time: _____

I. Locational details

L0. Questionnaire number	W _____ V _____ P _____	L6. Administrative Clan:	_____
L1. Name of interviewer:	_____	L7. Administrative district:	_____
L2. Name of questionnaire controller	_____	L8. County:	_____
L3. Full name of person interviewed	_____	L9. Distance to nearest paved all weather road _____ miles	
L4. Date of interview:	_____	L10. Distance to nearest telecommunication signal _____ miles	
L5. Village:	_____		

II. Household characteristics

VarNo	Question	Coded Response	Instructions/Notes
HC1	Materials used for walls of household	Concrete block _____ 1 Fired brick _____ 3 Mud block _____ 5 Stick & Poto-poto _____ 7 Raffia/Bamboo _____ 9 Wood planks _____ 11 Zinc _____ 13 Other (describe: _____) _____ 222	Place and "X" in the appropriate blank(s)
HC2	Material used for roofing	Tin/Zinc/Aluminum roofing _____ 1 Roofing tiles _____ 3 Palm fronds _____ 5 Grass / Thatch _____ 7 Tarp _____ 9 Other (describe: _____) _____ 222	Place and "X" in the appropriate blank(s)
HC3	How many of the following means of transport belong to any of the household members?	a. None _____ b. Bicycles _____ c. Mopeds/Motorcycles _____ d. Pickup trucks _____ e. Automobiles _____ f. Other (describe _____) _____	Enter number in appropriate blank. If none, place an "X" in a.
HC4	How many operating cellular telephones are owned by members of the household?	No. of cell phones _____	
HC5	How much does it cost for an adult to ride public transport from your household to Monrovia?	Cost of taxi ride to Monrovia \$ _____ per adult	
HC6	How many hours on average (assuming no vehicle breakdown) does it take to arrive in Monrovia from your household (includes walking time to nearest taxi stop)	Transport time to Monrovia (one-way) _____ hours	

VarNo	Question	Coded Response	Instructions/Notes
HC7	What are the three principal starchy staple foods consumed by the household in the last 12 months in descending order of importance? Staple codes: 1=rice 3=cassava 5=maize 7=sweet potatoes 9 = Eddoe 11=plantain banana 13=breadfruit/jackfruit 15=cocoyam 222= other (describe):	Staple code a. Principal staple #1 _____ b. Principal staple #2 _____ c. Principal staple #3 _____	Place appropriate crop code in each blank. If less than three crops, place an "X" in the remaining blanks.
HC8	Of the total amount of staple consumed by the household over the course of the last 12 months: 1) What proportion was produced by the household? 2) What proportion was purchased with cash in the market? 3) What proportion was bought on credit from an agricultural export marketer? 4. What proportion was received as a gift or food aid?	1. Produced 2. Cash 3. Credit 4. Gift/ On-farm Purchase Purchase Food Aid Staple #1 a. ____/10+ b. ____/10 + c. ____/10 + d. ____/10= 10/10 Staple #2 e. ____/10+ f. ____/10 + g. ____/10 + h. ____/10= 10/10 Staple #3 i. ____/10+ j. ____/10 + k. ____/10 + l. ____/10= 10/10	*NOTE: Shares must sum to 10
HC9	In the last 12 months, which of the following activities generated cash revenue for your household (includes all members)?	Income sources a. Working on farm for other farmers _____ b. Food crop sales _____ c. Tree crop sales _____ d. Remittances from family members _____ e. Non-farm employment income _____ f. Petty commerce _____ g. Other (Describe): _____	Place an "X" in the appropriate blank(s)
HC10	In the last 12 months, what was the approximate share (out of 20) of the following activities in terms of total income generated by your household (includes all members)?	Income share out of 20 a. Working on farm for other farmers ____/20 b. Food crop sales ____/20 c. Tree crop sales ____/20 d. Remittances from family members ____/20 e. Non-farm employment income ____/20 f. Petty commerce ____/20 g. Other (Describe): ____/20	*NOTE: Shares must sum to 20 (a + b + c + d + e + f + g = 20)
HC11	In the last 30 days, approximately how much cash income (L\$) did you personally earn or receive from the following sources?	Income (\$ Liberian) a. Working on farm for other farmers \$ _____ b. Food crop sales \$ _____ c. Tree crop sales \$ _____ d. Remittances from family members \$ _____ e. Non-farm employment income \$ _____ f. Petty commerce \$ _____ g. Other (Describe): \$ _____	Place response in blanks for those sources identified in HC9. 222 = Did not sell in last 30 days 888=unable to provide information
HC12	In the last 30 days, approximately how much cash income (L\$) did your spouse or spouses personally earn or receive from the following sources?	Income (\$ Liberian) a. Working on farm for other farmers \$ _____ b. Food crop sales \$ _____ c. Tree crop sales \$ _____ d. Remittances from family members \$ _____ e. Non-farm employment income \$ _____ f. Petty commerce \$ _____ g. Other (Describe): \$ _____	Place response in blanks for those sources identified in HC9. 222 = Did not sell in last 30 days 888=unable to provide information

III. Household demographics

Multiple answers are acceptable Not Applicable = if crop is not included among household enterprises or if this person did not participate in the listed activities										
HD1. First Name (Circle Interviewee's name)	HD2. Sex 1=woman 3=men	HD3. Age (yrs)	HD4. Ethnicity 1. Mano 3. Gio 5. Kpelle 7. Mandingo 9. Bassa 11. Jivaro-Liberian 13. Blandi 15. Bala 17. Kissi 19. Loma 21. Krahn 222. Other (describe)	HD5. Family Status 1=household head (HH) 3=spouse of HH 5=son/daughter of HH 7=extended family member 9=no family ties 11= employee	HD6. Education (Highest level of formal education attained) 0 = no formal education 222 = Pre-school Enter number of grade: 1 - 12 Post secondary: 13 - 16 Graduate school: 17-22 Technical/Professional = 444	HD7. Principal Economic Activity 0=none 1= self employed agriculture (farmer) 3= hired labor agriculture 5= salaried position (non ag) 7= salaried retired (pension) 9= student 11= petty commerce 13= Homemaker 222= other (describe)	HD8. Years as a cocoa farmer	HD9. Oil palm farming labor input 0 = not applicable 1 = clearing / brushing 3 = planting 5 = harvesting 7 = processing	HD10. Rubber farming labor input 0 = not applicable 1 = clearing/brushing 3 = planting 5 = tapping 7 = collecting	HD11. Cocoa farming labor inputs 0 = not applicable 1 = clearing / brushing 3 = planting 5 = pruning 7 = pesticide application 9 = harvesting pods 11 = field transport of pods 13 = pod breaking 15 = fermentation 17 = transport of fermented beans 19 = drying of fermented beans
1. (Head)				1						
2.										
3.										
4.										
5.										
6.										
7.										
8.										
9.										
10.										
11.										
12.										
13.										
14.										
15.										
16.										
17.										
18.										

IV. Farming System Characteristics

VarNo	Question	Coded Response	Instructions/Notes																																																																																
FS1	How many of the following animals belong to the members of your household?	<p>QTY Male QTY Female</p> <p>1. Chickens a. _____ b. _____</p> <p>2. Pigs c. _____ d. _____</p> <p>3. Goats e. _____ f. _____</p> <p>4. Sheep g. _____ h. _____</p> <p>5. Guinea Fowl i. _____ j. _____</p> <p>6. Ducks k. _____ l. _____</p> <p>7. Other (Describe _____) m. _____ n. _____</p>	If none, enter zero. Otherwise, enter number of each.																																																																																
FS2	For each type of animal raised on the farm which of the following best describes your management practices over the last 12 Months: 0= Not applicable 1=free range production 3=free range part of year and tethering/corraling of animal other 5=tethering/corraling/housing animals all of year. 222=other (describe)	<p>1. Chickens a. _____</p> <p>2. Pigs b. _____</p> <p>3. Goats c. _____</p> <p>4. Sheep d. _____</p> <p>5. Guinea Fowl e. _____</p> <p>6. Ducks f. _____</p> <p>7. Other (Describe _____) g. _____</p>	Place the appropriate code in each blank that received a non-zero response in FS1																																																																																
FS3	For each type of animal on the farm which of the following best describes your animal feeding practices over the last 12 months: 0= Not applicable 1=no feeds are given (animals left to fend for themselves). 3=supplementary feeding conducted at least part of the time 5=animals feed daily using a complete ration. 222=other (describe)	<p>1. Chickens a. _____</p> <p>2. Pigs b. _____</p> <p>3. Goats c. _____</p> <p>4. Sheep d. _____</p> <p>5. Guinea Fowl e. _____</p> <p>6. Ducks f. _____</p> <p>7. Other (Describe _____) g. _____</p>	Place the appropriate code in each blank that received a non-zero response in FS1																																																																																
FS4	How many of the following tools are used by your household for all types of agriculture and what condition are they in?	<table border="1"> <thead> <tr> <th></th> <th>1. Total Number</th> <th>2. Good condition</th> <th>3. Fair condition</th> <th>4. Poor</th> </tr> </thead> <tbody> <tr><td>a. Cutlasses/machetes</td><td></td><td></td><td></td><td></td></tr> <tr><td>b. Axes</td><td></td><td></td><td></td><td></td></tr> <tr><td>c. Hoes</td><td></td><td></td><td></td><td></td></tr> <tr><td>d. Pruning shears</td><td></td><td></td><td></td><td></td></tr> <tr><td>e. Oil press (capacity: _____ liters)</td><td></td><td></td><td></td><td></td></tr> <tr><td>f. Chainsaw</td><td></td><td></td><td></td><td></td></tr> <tr><td>g. Knapsack sprayer</td><td></td><td></td><td></td><td></td></tr> <tr><td>h. Irrigation pump</td><td></td><td></td><td></td><td></td></tr> <tr><td>i. Cocoa harvesting poles</td><td></td><td></td><td></td><td></td></tr> <tr><td>j. Jute bags</td><td></td><td></td><td></td><td></td></tr> <tr><td>k. Tarpsaulin</td><td></td><td></td><td></td><td></td></tr> <tr><td>l. Raffia drying mats</td><td></td><td></td><td></td><td></td></tr> <tr><td>m. Fermentation baskets</td><td></td><td></td><td></td><td></td></tr> <tr><td>n. Dibble planting stick</td><td></td><td></td><td></td><td></td></tr> <tr><td>o. Other (describe)</td><td></td><td></td><td></td><td></td></tr> </tbody> </table>		1. Total Number	2. Good condition	3. Fair condition	4. Poor	a. Cutlasses/machetes					b. Axes					c. Hoes					d. Pruning shears					e. Oil press (capacity: _____ liters)					f. Chainsaw					g. Knapsack sprayer					h. Irrigation pump					i. Cocoa harvesting poles					j. Jute bags					k. Tarpsaulin					l. Raffia drying mats					m. Fermentation baskets					n. Dibble planting stick					o. Other (describe)					<p>If none, enter zero in total number column. Otherwise, enter total number and then account for condition of each tool.</p> <p>Make sure that columns 2+3+4 = 1</p>
	1. Total Number	2. Good condition	3. Fair condition	4. Poor																																																																															
a. Cutlasses/machetes																																																																																			
b. Axes																																																																																			
c. Hoes																																																																																			
d. Pruning shears																																																																																			
e. Oil press (capacity: _____ liters)																																																																																			
f. Chainsaw																																																																																			
g. Knapsack sprayer																																																																																			
h. Irrigation pump																																																																																			
i. Cocoa harvesting poles																																																																																			
j. Jute bags																																																																																			
k. Tarpsaulin																																																																																			
l. Raffia drying mats																																																																																			
m. Fermentation baskets																																																																																			
n. Dibble planting stick																																																																																			
o. Other (describe)																																																																																			
FS5	How many of the following types of fields, does the household (all members) currently have in production? Indicate in the space provided the number of these fields (they may be in various stages of development. (e.g. cassava fields at 3 months and at 18 months would be counted as two fields.)	<p>a. Rice/Cassava/Mixed Food Crop Fallow Rotation _____</p> <p>b. Upland rice field _____</p> <p>c. Cassava field _____</p> <p>d. Sweet Potato Field _____</p> <p>e. Swamp rice _____</p> <p>f. Maize field _____</p> <p>g. Plantain field _____</p> <p>h. Tomatoes _____</p> <p>i. Pepper field _____</p> <p>j. Bitter Ball field _____</p> <p>k. Okra field _____</p> <p>l. Eggplant field _____</p> <p>m. Other food crop system1 (_____) _____</p> <p>n. Other food crop system2 (_____) _____</p>																																																																																	

VarNo	Question	Coded Response	Instructions/Notes
FS6	Who is chiefly responsible for the crop management in this field system? 1 = Women 3 = Men 5 = Both sexes	a. Rice/Cassava/Mixed Food Crop Fallow Rotation _____ b. Upland rice field _____ c. Cassava field _____ d. Sweet Potato Field _____ e. Swamp rice _____ f. Maize field _____ g. Plantain field _____ h. Tomatoes _____ i. Pepper field _____ j. Bitter Ball field _____ k. Okra field _____ l. Eggplant field _____ m. Other food crop system1 (_____) _____ n. Other food crop system2 (_____) _____	Place the appropriate gender code in each blank that received a response in FS5.
FS7	For how many years is the rice/cassava field cropped before returning to fallow?	Cropping Years= _____	
FS8	For how many years is the field allowed to lie fallow before it will be cropped again?	Fallow years = _____	
FS9	Which of the following methods were used to acquire the land that you are currently farming for food crops? 0 = Not applicable 1 = Inherited from parents 3 = Sharecropping arrangement with landowner 5 = Borrowed from neighbors 7 = Purchased land 9 = Renting from landowner 11 = Communal Land Arrangement 13 = Squatter 222 = Other (describe) _____	a. Rice/Cassava/Mixed Food Crop Fallow Rotation _____ b. Upland rice field _____ c. Cassava field _____ d. Sweet Potato Field _____ e. Swamp rice _____ f. Maize field _____ g. Plantain field _____ h. Tomatoes _____ i. Pepper field _____ j. Bitter Ball field _____ k. Okra field _____ l. Eggplant field _____ m. Other food crop system1 (_____) _____ n. Other food crop system2 (_____) _____	Place the appropriate number in each blank that received a response in FS5. Multiple answers per cropping system are acceptable (e.g. 1,7) If the cropping system is not part of the household's assets then leave blank.
FS10	Have you ever sold land to another person?	Yes ___ 1 No ___ 3	
FS11	Do you have official title to your land?	Yes ___ 1 No ___ 3 If no, explain how you are able to use it for farming: _____	
FS12	Is this your ancestral village?	Yes ___ 1 No ___ 3	
FS13	Please give us in descending order of importance the three most important agricultural products produced and sold (in terms of total sales) by the men in the household over the last 12 months Crop codes: 1-rice 17-cocoa 33-pigs 2-cassava 18-coffee 35-goats 5-maize 21-oranges 37-sheep 7-sweet potatoes 23-oil palm 39-fish 9-cocoyam 25-limatoes 41-Leafy Vegetables 11-plantain/bananas 27-melons 43-Guinea fowl 13-pawpaw 29-rubber 45-ducks 15-beans 31-poultry 222-Other (describe) _____	a. Most important commercial crop _____ b. Second most important _____ c. Third most important _____ <u>Crop code</u>	Enter crop code in the appropriate blanks. If more than one "Other," enter 222 and describe under crop code

FSI4	<p>Please give us in descending order of importance the three most important agricultural products produced and sold (in terms of total sales) by the women in the household over the last 12 months.</p> <p>Crop codes:</p> <table border="0"> <tr> <td>1=rice</td> <td>17=cocoa</td> <td>33=pigs</td> </tr> <tr> <td>3=cassava</td> <td>19=coffee</td> <td>35=goats</td> </tr> <tr> <td>5=maize</td> <td>21=oranges</td> <td>37=sheep</td> </tr> <tr> <td>7=sweet potatoes</td> <td>23=oil palm</td> <td>39=fish</td> </tr> <tr> <td>9=cocoyam</td> <td>25=tomatoes</td> <td>4= Leafy Vegetables</td> </tr> <tr> <td>11=plantain/bananas</td> <td>27=coconut</td> <td>43= Guinea fowl</td> </tr> <tr> <td>13=peas</td> <td>29=rubber</td> <td>45= ducks</td> </tr> <tr> <td>15=beans</td> <td>31=poultry</td> <td></td> </tr> <tr> <td colspan="3">222= Other (describe) _____</td> </tr> </table>	1=rice	17=cocoa	33=pigs	3=cassava	19=coffee	35=goats	5=maize	21=oranges	37=sheep	7=sweet potatoes	23=oil palm	39=fish	9=cocoyam	25=tomatoes	4= Leafy Vegetables	11=plantain/bananas	27=coconut	43= Guinea fowl	13=peas	29=rubber	45= ducks	15=beans	31=poultry		222= Other (describe) _____			<p>a. Most important commercial crop _____ <u>Crop code</u></p> <p>b. Second most important _____</p> <p>c. Third most important _____</p>	<p>Enter crop code in the appropriate blanks.</p> <p>If more than one "Other," enter 222 and describe under crop code</p>
1=rice	17=cocoa	33=pigs																												
3=cassava	19=coffee	35=goats																												
5=maize	21=oranges	37=sheep																												
7=sweet potatoes	23=oil palm	39=fish																												
9=cocoyam	25=tomatoes	4= Leafy Vegetables																												
11=plantain/bananas	27=coconut	43= Guinea fowl																												
13=peas	29=rubber	45= ducks																												
15=beans	31=poultry																													
222= Other (describe) _____																														
FSI5	<p>If your household were to deliberately choose one commodity to produce for cash income that you are not currently producing which would it be?</p> <p>Crop codes:</p> <table border="0"> <tr> <td>1=rice</td> <td>17=cocoa</td> <td>33=pigs</td> </tr> <tr> <td>3=cassava</td> <td>19=coffee</td> <td>35=goats</td> </tr> <tr> <td>5=maize</td> <td>21=oranges</td> <td>37=sheep</td> </tr> <tr> <td>7=sweet potatoes</td> <td>23=oil palm</td> <td>39=fish</td> </tr> <tr> <td>9=cocoyam</td> <td>25=tomatoes</td> <td>4= Leafy Vegetables</td> </tr> <tr> <td>11=plantain/bananas</td> <td>27=coconut</td> <td>43= Guinea fowl</td> </tr> <tr> <td>13=peas</td> <td>29=rubber</td> <td>45= ducks</td> </tr> <tr> <td>15=beans</td> <td>31=poultry</td> <td></td> </tr> <tr> <td colspan="3">222= Other (describe) _____</td> </tr> </table>	1=rice	17=cocoa	33=pigs	3=cassava	19=coffee	35=goats	5=maize	21=oranges	37=sheep	7=sweet potatoes	23=oil palm	39=fish	9=cocoyam	25=tomatoes	4= Leafy Vegetables	11=plantain/bananas	27=coconut	43= Guinea fowl	13=peas	29=rubber	45= ducks	15=beans	31=poultry		222= Other (describe) _____			<p>Commercial crop or livestock of interest _____</p>	
1=rice	17=cocoa	33=pigs																												
3=cassava	19=coffee	35=goats																												
5=maize	21=oranges	37=sheep																												
7=sweet potatoes	23=oil palm	39=fish																												
9=cocoyam	25=tomatoes	4= Leafy Vegetables																												
11=plantain/bananas	27=coconut	43= Guinea fowl																												
13=peas	29=rubber	45= ducks																												
15=beans	31=poultry																													
222= Other (describe) _____																														

NOTES: Please enter any additional field notes here while performing the survey.

V. Perennial tree crop investments and production (Please gather the following information for each tree crop farm belonging to the household including farms that have been abandoned. If no tree crop farms have been planted, then leave blank)

Farm	PT1. The principal perennial tree crop for the farm: 1-coconut 2-coffee 3-rubber 4-citrus (please specify) 5-oil palm ZZZ-other (describe)	PT2. Year established	PT3. No. of acres	PT4. Which of the following methods were used to acquire the land that you are currently farming? 1-Inherited from parents 2-Sharecropping arrangement with landowner 3-Borrowed from neighbors 4-Purchased land 5-Rented from landowner 6-Common land 7-Squatter ZZZ-Other (describe)	PT5. Estimate the number of trees	PT6. On average, how many feet/meters (circle one) separate each tree?	PT7. Current Status of Farm 1-newly planted not yet in production 2-in production 3-being rehabilitated 4-abandoned to bush ZZZ-other (describe)	PT8. If current status is abandoned, what are your intentions for this farm? 1-convert to food crop production system 2-rehabilitate existing farm 3-convert to another perennial crop system 4-leave title for the time being ZZZ-other (describe)	PT9. What type of planting material is currently used in this production system? 1-improved germplasm developed by research 2-unimproved local variety ZZZ-other (describe) 888-doesn't know	PT10. What secondary crops if any are or were associated with the principal perennial crop produced in this system: 0-none 1-food crops during establishment 2-avocadoes 3-mangoes 4-breadfruit/jackfruit 5-cola nut 6-plantain bananas 7-dessert bananas 8-timber trees 9-oil palm 10-plum ZZZ-other (describe)	PT11. What quantity of the principal product was produced and sold within the last 12 months from this particular farm? (If given in local units, e.g. bags, please convert to metric units (kg or liters)). 888-doesn't know	PT12. What was the principal type of labor employed on this farm in the last 12 months? 1-family labor 2-hired labor 3-share crop or tow 4-ku ZZZ-other (describe)	PT13. If share crop labor used, please indicate the owner's share (out of 10)
1													
2													
3													
4													
5													
6													
7													
8													
9													
10													

VI. Hired labor use for tree crop production (If the farmer doesn't have the particular crop or if no hired labor was indicated for the particular crop, then this section may be skipped.)

Hired labor for cocoa production		Check here if farmer does not have cocoa				Instructions or Notes
HLC1	What type of workers did you hire for cocoa production?	a. casual laborer hired on a task basis _____ b. seasonal labor hired for the cocoa growing and harvesting season _____				Yes = 1 No = 3
HLC2	Indicate the number of casual workers which were hired by task and the total amount paid to all workers for that task during the last growing season.		# of workers	Total amount paid for task	Est. # of hours worked	If paid with something other than cash, estimate total cash value in L\$
		Pruning				
		Brushing				
		Harvesting				
		Drying/Fermenting				
		Other (describe)				
HLC3	What were the origins of these workers?	Number of Workers 1= local community _____ 3= migrants from other parts of Liberia _____ 5= migrants from other countries of West Africa _____ If migrant, please list country _____ or country _____ of origin				Place number of workers in appropriate blanks and provide origin of migrants
HLC4	To your knowledge, were any of these casual workers under the age of 18?	Yes _____ 1 No _____ 3				
HLC5	How many were under the age of 18?	Number of workers _____				
HLC6	How many seasonal laborers were hired to produce cocoa in the last growing season?	Number of laborers _____				
HLC7	How much in total was paid for all of the seasonal workers hired during the last cocoa grown season?	Total wage bill for seasonal labor L\$ _____				
HLC8	What were the origins of these workers?	Number of Workers 1= local community _____ 3= migrants from other parts of Liberia _____ 5= migrants from other countries of West Africa _____ If migrant, please list country _____ or country _____ of origin				Place number of workers in appropriate blanks and provide origin of migrants
HLC9	To your knowledge, were any of these seasonal laborers under the age of 18?	Yes _____ 1 No _____ 3				
HLC10	How many were under the age of 18?	Number of laborers _____				
Hired labor for rubber		Check here if farmer does not have rubber				Check here if there was no hired labor of any kind for rubber
HLR1	What type of workers did you hire for rubber production?	1= casual laborer hired on a task basis _____ 3= seasonal labor hired for the rubber growing and harvesting season _____				Yes = 1 No = 3
HLR2	Indicate the number of casual workers which were hired by task and the total amount paid to all workers for that task during the last growing season.		# of workers	Total amount paid for task	Est. # of hours worked	If paid with something other than cash, estimate total cash value in L\$
		Brushing				
		Tapping				
		Collecting				
		Other (describe)				
HLR3	What were the origins of these workers?	Number of Workers 1= local community _____ 3= migrants from other parts of Liberia _____ 5= migrants from other countries of West Africa _____ If migrant, please list country _____ or country _____ of origin				Place number of workers in appropriate blanks and provide origin of migrants
HLR4	To your knowledge, were any of these casual workers under the age of 18?	Yes _____ 1 No _____ 3				
HLR5	How many were under the age of 18?	Number of workers _____				

HLR6	How many seasonal laborers were hired to produce rubber in the last growing season?	Number of laborers _____		
HLR7	How much in total was paid for all of the seasonal workers hired during the last rubber growing season?	Total wage bill for seasonal labor: L\$ _____		
HLR8	What were the origins of these workers?	Number of Workers 1= local community _____ 3= migrants from other parts of Liberia _____ 5= migrants from other countries of West Africa _____ If migrant, please list country _____ or country _____ of origin		Place number of workers in appropriate blanks and provide origin of migrants
HLR9	To your knowledge, were any of these seasonal laborers under the age of 18?	Yes ___ 1 No ___ 3		
HLR10	How many were under the age of 18?	Number of laborers _____		
Hired labor for oil palm production Check here if farmer does not have oil palm Check here if there was no hired labor of any kind for oil palm				
HLP1	What type of workers did you hire for palm oil production?	1= casual laborer hired on a task basis _____ 3= seasonal labor hired for the palm oil growing and harvesting season _____ Yes = 1 No = 3		
HLP2	Indicate the number of casual workers which were hired by task and the total amount paid to all workers for that task during the last growing season.	# of workers Brushing _____ Harvesting _____ Processing _____ Other (describe) _____	Total amount paid _____ _____ _____ _____	Est. # of hours worked _____ _____ _____ _____
HLP3	What were the origins of these workers?	Number of Workers 1= local community _____ 3= migrants from other parts of Liberia _____ 5= migrants from other countries of West Africa _____ If migrant, please list country _____ or country _____ of origin		Place number of workers in appropriate blanks and provide origin of migrants
HLP4	To your knowledge, were any of these casual workers under the age of 18?	Yes ___ 1 No ___ 3		
HLP5	How many were under the age of 18?	Number of workers _____		
HLP6	How many seasonal laborers were hired to produce palm oil in the last growing season?	Number of laborers _____		
HLP7	How much in total was paid for all of the seasonal workers hired during the last palm oil growing season?	Total wage bill for seasonal labor: L\$ _____		
HLP8	What were the origins of these workers?	Number of Workers 1= local community _____ 3= migrants from other parts of Liberia _____ 5= migrants from other countries of West Africa _____ If migrant, please list country _____ or country _____ of origin		Place number of workers in appropriate blanks and provide origin of migrants
HLP9	To your knowledge, were any of these seasonal laborers under the age of 18?	Yes ___ 1 No ___ 3		
HLP10	How many were under the age of 18?	Number of laborers _____		

VIII. Cocoa Marketing

CM1. Where sold? 1 = home 3 = town or buying center Other code and list name of village or town	CM2. Sale month and year (since August 2005)	CM3. Number of units sold (e.g. Enter 8 (80kg) bags or 3 (35kg) buckets)	CM4. Total number of kilograms of cocoa sold (kg) If 80 kg bag, 35kg bucket, etc., please convert number of standard units to kilograms	CM5. Unit price (\$/kg)	CM6. Total Weight reduction (kg) (e.g. If 8 kg per bag and 8 bags sold, then enter 64kg)	CM7. Reason for and amount of weight reduction (in kilograms) (e.g. If the buyer took 8 kg per bag (1 kg for bag and 7 kg for wet beans then enter 1 / 5 for reason and 7 / 1 for weight) 0 = No reason 1 = wet beans 3 = moldy beans 5 = bag ZZZ = other (describe) Reason Weight (if standard units)	CM8. Selling Agent 1 = Individual 3 = Farmer Group / co-op ZZZ = Other (describe)	CM9. Type of buyer 1 = agent for exporter 3 = exporter 5 = farmer group/co-op 7 = foreign agent ZZZ = other (describe)	CM10. Name and Origin of Buyer
1									
2									
3									
4									
5									

Storage & Drying

CS01	Since August 2005, have you stored cocoa?	Yes <u>1</u> No <u>3</u>	If no, skip this section
CS02	Where did you store it?	1 = House 3 = Field Shed 5 = Warehouse ZZZ = Other (specify)	
CS03	On average, for how long?	_____ Days / Weeks / Months	Circle one
CS04	On average, how much do you store	_____ kilograms or sacks	Circle one
CS05	What size sack do you use?	_____ kilograms	
CS06	What Drying method do you use during the season? Is the method elevated? Y N (circle one)	1 = Concrete Slab 3 = Road 5 = Bamboo mats 7 = Tarp 9 = Jute with fire ZZZ = Other _____	

What is the current farmgate price (per kg) for cocoa? _____ FCFA/kg at _____ (Buying Center) = _____ FCFA/kg at Maroua = _____ FCFA/kg

Credit From cocoa buyer or for cocoa production since August 2005

CSC1. Source 0 = None 1 = Local cocoa buyer (agent) 3 = Farmer group 5 = Bank / Credit union 7 = Susu/Esusu, Njangi 9 = Local money lenders 1 = Family and friends 13 = Other (describe)	CSC2. Month and Year	CSC3. Amount of loan (L\$)	CSC4. In what form did you receive the loan? 1 = cash 3 = fungicides 5 = insecticides 7 = fertilizers ZZZ = Other (describe)	CSC5. Payback period (months and amount that have been paid back)	CSC6. How much did you have to repay?	CSC7. What did you use the loan for?	CSC8. Repaid?
1							Yes <u>1</u> No <u>3</u>
2							Yes <u>1</u> No <u>3</u>
3							Yes <u>1</u> No <u>3</u>
4							Yes <u>1</u> No <u>3</u>

VIII. Oil palm processing and marketing

Check here if farmer does not produce oil palm

PM1	What do you do with the oil palm bunches once harvested from your farm? (Multiple responses possible)	0 = Home consumption only 1 = Sell bunches to oil processor _____ 3 = Pay a fee or percentage for processing and then sell oil _____ 5 = Process into oil on farm and then sell oil _____ 222 = Other (Describe: _____)	
PM2	What share of your oil palm bunch production is used/sold in this manner?	Home consumption _____/10 Sell bunches to oil processor _____/10 Pay a fee or percentage for processing and then sell oil _____/10 Process into oil on farm and then sell oil _____/10 Other (Describe: _____) _____/10	*NOTE: Shares must add to 10/10
PM3	Approximately how many palm nuts did you sell in the last 12 months?	Qty: _____ kg / drums / bags / bunches	Circle the appropriate unit
PM4	What is the price received for palm nuts sold?	L\$ _____ per kg / drums / bags / bunches	Circle the appropriate unit
PM5	Where are the palm nuts sold?	a. On edge of farm _____ b. At homestead in village _____ c. At processing plant _____ d. Other (Describe: _____)	
PM6	How much does it cost you to transport the palm nuts from the field to the point of exchange (includes transport from the field)?	Cost of transport L\$ _____ per _____ unit	
PM7	How much does it cost to process the palm nut bunches into oil?	L\$ _____ per _____ Or _____ % of oil processed is paid as fee	Convert non-cash payments to cash (L\$)
PM8	If processed on the farm, what methods do you use?	1=Traditional method, no use of mechanical press _____ 3=Hand-operated mechanical press _____ 5=Motor-driven mechanical press _____ 222=Other (Describe: _____)	
PM9	If palm oil is sold, who are your buyers and where are they located?	a = Consumers in local village retail market _____ b = Consumers in _____ (town) retail market _____ c = Retail sellers in local village retail market _____ d = Retail sellers in _____ (town) market _____ e = Wholesalers in _____ (town) market _____ f = Others (Describe: _____)	Check all that are appropriate and specify town if not in village
PM10	What was the price per liter of palm oil for the most recent sales to the buyers indicated above?	Current price per unit a. Consumers in local village retail market _____ b. Consumers in _____ (town) retail market _____ c. Retail sellers in local village retail market _____ d. Retail sellers in _____ (town) market _____ e. Wholesalers in _____ (town) market _____ f. Others (Describe: _____)	Please specify units (bottle, gallon, tin) and town (if not in village)
PM11	When did your most recent sale occur?	Type: _____ (a-f) Date: _____/_____/_____	Enter type and date
PM12	Over the last 12 months what has been the average total monthly sale of palm oil / palm nuts?	Average monthly sale= L\$ _____	
PM13	Over the last 12 months what has been the maximum total monthly sale? In which month did it occur?	Maximum monthly sale= L\$ _____ Month of maximum sale _____	
PM14	Over the last 12 months what has been the minimum total monthly sale?	Minimum monthly sale= L\$ _____ Month of minimum sale _____	

IX. Rubber Marketing

Check here if farmer does not produce rubber

RM1	What type of rubber do you sell?	a. Cup rubber _____ b. Liquid latex _____ c. Other (Describe: _____)	
RM2	To whom do you sell your rubber?	a. Factory _____ b. Local buyer _____ c. Other (Describe: _____)	

RM3	What was the price for rubber for the most recent sale to the buyers indicated above?	<div style="text-align: right;">Price Unit</div> a. Factory _____ b. Local buyer _____ c. Other (Describe: _____) _____	
RM4	When did this sale occur?	Date of most recent sale ____/____/____	
RM5	Over the last 12 months, how much rubber have you sold?	_____ kg	
RM6	Over the last 12 months what has been the average total monthly sale of rubber?	Average monthly sale= L\$ _____/kg	
RM7	Over the last 12 months what has been the maximum total monthly sale? In which month did it occur?	Maximum monthly sale= L\$ _____/kg Month of maximum sale _____	
RM8	Over the last 12 months what has been the minimum total monthly sale?	Minimum monthly sale= L\$ _____/kg Month of minimum sale _____/kg	

X. Rural Services

RS1	Have you ever received any type of formal training in any agricultural subject?	Yes ____ No ____3																													
RS2	If yes please describe the type of training received, the duration of the training and rate its relevance.	Type of training (describe) _____ Duration of training (# of months) _____ Relevance Score (scale of 5; 1=highly relevant, 5=not relevant) ____ Why was the training relevant or not? _____	If RS1 = 3 then leave blank.																												
RS3	In the last 12 months have you used any type of agro-chemical input (such as fertilizers, veterinary medicines or pesticides) or improved seed or animal variety?	Yes ____ No ____3	If no, leave RS4-6 blank																												
RS4	What type of input(s) was purchased or acquired in the last 12 months?	a. Fertilizer ____1 b. Herbicide ____3 c. Fungicide ____5 d. Insecticide ____7 e. Vet medicine ____9 f. Improved seed variety ____11 g. Improved animal variety ____13 Other (describe: _____) ____222	Check all that are appropriate, if not acquired then leave blank																												
RS5	How much did you spend on these inputs and to which commodities were they applied? (Note: If commodity was received at no charge to the farmer indicate zero expense and note commodity) If Other Describe: _____	<table border="1"> <thead> <tr> <th></th> <th>Expense</th> <th>Crop(s)</th> <th>Qty</th> </tr> </thead> <tbody> <tr> <td>a) Fertilizer</td> <td></td> <td></td> <td></td> </tr> <tr> <td>b) Herbicide</td> <td></td> <td></td> <td></td> </tr> <tr> <td>c) Fungicide</td> <td></td> <td></td> <td></td> </tr> <tr> <td>d) Insecticide</td> <td></td> <td></td> <td></td> </tr> <tr> <td>e) Vet medicine</td> <td></td> <td></td> <td></td> </tr> <tr> <td>Other (describe)</td> <td></td> <td></td> <td></td> </tr> </tbody> </table>		Expense	Crop(s)	Qty	a) Fertilizer				b) Herbicide				c) Fungicide				d) Insecticide				e) Vet medicine				Other (describe)				Be sure to specify units for quantity
	Expense	Crop(s)	Qty																												
a) Fertilizer																															
b) Herbicide																															
c) Fungicide																															
d) Insecticide																															
e) Vet medicine																															
Other (describe)																															
RS6	From whom were these inputs purchased or acquired?	Agent _____ Private seller _____ Government _____ Produce buyer _____ NGO _____ Project _____ Other (describe: _____) _____	List code numbers from RS4 for inputs. Specify units on distance.																												

RS7	How do you acquire information about the prices prevailing in the markets for the commodities you produce and sell? (Multiple responses are allowed). 1=From hearsay among friends and neighbors 3=From radio 5=From newspaper 7=From produce buyers 9=Farmer organization / co-op 11= Government / Extension 13=Unable to respond (if applicable, place in 'Always' row)	Cocoa	Oil Palm	Rubber	Food Crops	List codes in appropriate frequency category for each crop. Enter as range of numbers if many in one category (e.g. 3-8)
		Sometimes				
		Often				
		Always				
		Never				
RS8	Are you a member of a farmer organization?	Yes <u>1</u> No <u>3</u>				
RS9	If yes, how much do you pay in fees for the year?	L\$ _____				Note if fee is taken per kg when produce is sold
RS10	What are the benefits you gain from your membership in this organization?	a) Collective marketing <u>1</u> b) Transportation of produce <u>3</u> c) Provision of inputs <u>5</u> d) Technical advice <u>7</u> e) Market information <u>9</u> f) Other <u>222</u>				Place an "X" in the appropriate blank(s)
RS11	Where do you go to get information about your agricultural problems?	a) Government extension service <u>1</u> b) Other farmers <u>3</u> c) Farmer organization <u>5</u> d) NGOs <u>7</u> e) No available source of reliable information <u>9</u> f) Other (Describe: _____) <u>222</u>				

XI. Rural credit

. What were the terms of any loans received since August 2005 for any agricultural production reason other than cocoa production?

RC1. Source 0= None 1= Produce buyer 3= Farmer group / co-op 5= Bank / Credit union 7= Susu/Esusu, Njangis 9= Local money lenders 11= Family and friends 13= Other (describe)	RC2. Month and Year	RC3. Amount of loan	RC4. In what form did you receive the loan? 1=cash 3= fungicides 5= insecticides 7= fertilizers 222= Other (describe)	RC5. Payback period (month and season that loan was paid back)	RC6. How much did you have to repay?	RC7. What did you use the loan for? (specify crop or animal and general items purchased)	RC8. Has the loan been repaid?
1.							Yes <u>1</u> No <u>3</u>
2.							Yes <u>1</u> No <u>3</u>
3.							Yes <u>1</u> No <u>3</u>
4.							Yes <u>1</u> No <u>3</u>
5.							Yes <u>1</u> No <u>3</u>
6.							Yes <u>1</u> No <u>3</u>

Hired labor for coffee production		Check here if farmer does not have coffee		Check here if there was no hired labor of any kind for coffee	
HLCF1	What type of workers did you hire for coffee production?	3= seasonal labor hired for the coffee growing and harvesting season			Yes = 1 No = 3
HLCF2	Indicate the number of casual workers which were hired by task and the total amount paid to all workers for that task during the last growing season.		# of workers	Total amount paid	Est. \$ of hours worked
		Brushing			
		Harvesting			
		Processing			
		Other (describe)			
HLCF3	What were the origins of these workers?	Number of Workers 1= local community _____ 3= migrants from other parts of Liberia _____ 5= migrants from other countries of West Africa _____ If migrant, please list country _____ or country _____ of origin			Place number of workers in appropriate blanks and provide origin of migrants
HLCF4	To your knowledge, were any of these casual workers under the age of 18?	Yes _____ No _____			1 3
HLCF5	How many were under the age of 18?	Number of workers _____			
HLCF6	How many seasonal laborers were hired to produce coffee in the last growing season?	Number of laborers _____			
HLCF7	How much in total was paid for all of the seasonal workers hired during the last coffee growing season?	Total wage bill for seasonal labor L\$ _____			
HLCF8	What were the origins of these workers?	Number of Workers 1= local community _____ 3= migrants from other parts of Liberia _____ 5= migrants from other countries of West Africa _____ If migrant, please list country _____ or country _____ of origin			Place number of workers in appropriate blanks and provide origin of migrants
HLCF9	To your knowledge, were any of these seasonal laborers under the age of 18?	Yes _____ No _____			1 3
HLCF10	How many were under the age of 18?	Number of laborers _____			

Coffee Marketing		Check here if farmer does not produce coffee	
CFM1	What type of coffee do you sell?	a. Arabica _____ b. Robusta _____ d. Other (Describe: _____) _____	
CFM2	To whom do you sell your coffee?	a. Factory _____ b. Local buyer _____ c. Other (Describe: _____) _____	
CFM3	What was the price for coffee for the most recent sale to the buyers indicated above?	Price _____ Unit _____ a. Factory _____ b. Local buyer _____ c. Other (Describe: _____) _____	
CFM4	When did this sale occur?	Date of most recent sale: / /	
CFM5	Over the last 12 months, how much coffee have you sold?	_____ kg	
CFM6	Over the last 12 months what has been the average total monthly sale of coffee?	Average monthly sale= L\$ _____/kg	
CFM7	Over the last 12 months what has been the maximum total monthly sale? In which month did it occur?	Maximum monthly sale= L\$ _____/kg Month of maximum sale _____	
CFM8	Over the last 12 months what has been the minimum total monthly sale?	Minimum monthly sale= L\$ _____/kg Month of minimum sale _____	

Appendix C. Village Survey

Date: _____ (NT1) Interviewer: _____ (NT2) Interviewee: _____ (NT3) Title of Interviewee: _____ (NT4) Start Time: _____ (NT5) End Time: _____ (NT6)

Liberian Cocoa Marketing Survey – Village

General Information (G1)

County	District	Clan	Buying Center	Village	Location (Waypoint# =)		
G1	G2	G3	G4	G5	Lat: _____	Lon: _____	Distance from Buying Center: _____ miles or km (circle one)

Population		
# of People	# of Households	# of cocoa producing households
G6	G7	G8

Ethnic Groups Present in the Village				
Majority	Other			
G9	G10	G11	G12	G13

Infrastructure (I)

Electricity	Potable Water	Telephone		Roads			
		Cell / Mobile	"Pay Phone"	Based on quality of the main road to village			
I1	I2	I3	I4	I5	<i>if dirt:</i>	Clay	Laterite
0 = no 1 = no 3 = generators	0 = no 1 = running water 3 = pump 5 = well 7 = in catchments	1 = no 3 = yes		0 = path (no autos) 1 = dirt road 3 = paved	<i>Graded</i>	I6	I7
					<i>Un-graded</i>	I8	I9

Transport						Education	Credit Source <i>List all possible found in village</i>
<i>To Buying Center</i>			<i>To Monrovia</i>				
Type	Frequency	Price	Type	Frequency	Price		
I11	I12 _____ per _____	I13	I14	I15 _____ per _____	I16	I17 / I18	I19
0 = none 1 = daily taxis 3 = some taxis 5 = informal	0 = 1 – 5 1 = 6 – 10 3 = 11 – 15 5 = 16+		0 = none 1 = daily taxis 3 = some taxis 5 = informal	0 = 1 – 5 1 = 6 – 10 3 = 11 – 15 5 = 16+		List School types found in village / buying center: 0 = None 1 = Primary School 3 = Technical School 5 = Secondary School 7 = Post Secondary	0 = none 1 = Commercial Bank 3 = Credit Union 5 = Government 7 = Cocoa buyer 9 = Susu 9 = Other (Specify)

Date: _____ (NT1) Interviewer: _____ (NT2) Interviewee: _____ (NT3) Title of Interviewee: _____ (NT4) Start Time: _____ (NT5) End Time: _____ (NT6)

Cocoa Production (CP)

Cocoa Input Prices in the Village

Item	Fungicide A	Fungicide B	Insecticide A	Insecticide B	Fertilizer A	Fertilizer B
Specify	CPFA1	CPFB1	CPDA1	CPDB1		CPFT1
Price (L\$/ kg, L or sack)	CPFA2	CPFB2	CPDA2	CPDB2		CPFT2
Brand of Product	CPFA3	CPFB3	CPDA3	CPDB3		CPFT3

Cocoa Marketing (CM)

Farmer Groups found in the village

Name	Type
CM11	
CM21	
CM31	
CM41	
	0 = None 1 = Village-level farmer group 3 = Regional cooperative 5 = Kusu 7 = Other (explain)

Current Prices for Cocoa

What is the current farmgate price (per kg) for cocoa in this village? _____ FCFA/kg; (CM1)

at _____ (Buying Center name) = _____ FCFA/kg (CM2)

Possible buyers of cocoa in the village

Name	Type	Location			Comments – Used by Farmers? (Why or Why Not)
		of Cocoa Purchase		of Buyer	
		On Farm	Village/Town	Village/Town	
CM11	CM12	CM13	CM14	CM15	CM16
CM21	CM22	CM23	CM24	CM25	CM26
CM31	CM32	CM33	CM34	CM35	CM36
CM41	CM42	CM43	CM44	CM45	CM46
Name of buyer and company	0 = Cocoa buyer for company 1 = Independent cocoa buyer 3 = Co-op or Farmer group 5 = Foreigner	0 = No 1 = Yes	Name		0 = Too far 1 = Lower prices 3 = Already member of another GIC, Union, Federation 5 = Unfair measurement practices 7 = Corruption 9 = Other (specify)

VITA

Alicia English is a Colorado native. She was born in Fort Collins on September 1, 1983. She received a B.A. in Economics with a minor in Mathematics from Colorado State University in 2001. She was admitted to the Masters program in Agricultural Economics at the University of Tennessee in August 2006. During May 2007, she traveled to Liberia as part of her research duties, and was thoroughly amazed by the people and situations she encountered. She was granted her Master of Science Degree in August 2008.