UNDERSTANDING THE PERCEPTIONS OF TRACEABILITY SYSTEMS IN THE COCOA SUPPLY CHAIN: A CASE OF GHANA

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DECLARATION

To the best of my knowledge and belief, this doctoral thesis has not been previously published by any person, except for previously published material that has been duly acknowledged. The thesis has not been accepted for the award of any other degree or diploma in any university.

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Edem Amegashie-Duvon

August 2014

DEDICATION

This thesis is dedicated to the memory of my grandmother, Mable Logoh, who continues to inspire me in every endeavour. I also dedicate this work to my family (Aba, Sedem, Keli and CJ) who have supported my life and have encouraged me to complete this work. The ultimate dedication goes to the almighty God for his abundant grace bestowed on me.

ACKNOWLEDGEMENTS

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ABBREVIATIONS

AAMC	-	Akuafo Adamfo Marketing Company
AFCC	-	Association Français de Commerce Cacao
AGL	-	Armajaro Ghana Limited
AIDC	-	Automated Identification and Data Capture
BRICS	-	Brazil, Russia, India, China and South Africa
C&F	-	Cost and Freight
C&I	-	Cost and Insurance
CCA	-	Canadian Cattle Association
CCIA	-	Canadian Cattle Identification Agency
CIF	-	Cost Insurance and Freight
CMB	-	Cocoa Marketing Board
COCOBOD	-	Ghana Cocoa Board
CODAPEC	-	Cocoa Disease and Pest Control
CRIG	-	Cocoa Research Institute of Ghana
CSSVDCU	-	Cocoa Swollen Shoot Virus Disease Control Unit
DBA	-	Doctor of Business Administration
EAN	-	European Article Numbering
EID	-	Electronic Identification
FAO	-	Food and Agriculture Organisation
FBO	-	Farmer-Based Organisation
FCC	-	Federation of Cocoa Commerce
FCL	-	Federated Commodities Limited
FSQPD	-	Feasible Sequential Quadratic Programming
HACCP	-	Hazard Analysis of Critical Control Points
ICCO	-	International Cocoa Organisation
ICE	-	Intercontinental Exchange
ICT	-	Information Communication Technology
IUs	-	Identifiable Units
LBC	-	Licensed Buying Companies
LIFFE	-	London International Futures and Financial Exchange
MDGs	-	Millennium Development Goals

MOU	-	Memorandum of Understanding
NYSE	-	New York Stock Exchange
PBC	-	Produce Buying Company
PNB	-	Positive Net Benefits
QCC	-	Quality Control Company Limited
QCD	-	Quality Control Division of COCOBOD
RFID	-	Radio-frequency Identification
SQF	-	Safe Quality Food
STCP	-	Sustainable Tree Crop Programme
TPB	-	Theory of Planned Behaviour
TRA	-	Theory of Reasoned Action
UCC	-	Uniform Code Council
UNCTAD	-	United Nations Conference on Trade and Development
UNDP	-	United Nations Development Programme
WAMCO	-	West Africa Mills Company
WHO	-	World Health Organisation

ABSTRACT

Markets for agricultural commodities are characterised by high volumes of homogeneous goods, low unit value and high information asymmetries. As a result, transparency systems, such as traceability, are increasingly required in the international food commodity trade as producers and traders make efforts to differentiate their goods on the basis of quality. In its simplest terms, traceability refers to the ability to trace and track the sources of food and food inputs in supply chains. Researchers and supply chain participants, specifically in the cocoa sector of Ghana, have different perceptions of traceability systems. To explore this issue, a qualitative multiple case study research design was used to understand actors' perception of traceability systems in Ghana's cocoa supply chain.

Behavioural theories, technology and innovation diffusion theories, and decision-making theories were used as the theoretical frameworks to examine the differences in perception of traceability systems in the Ghana cocoa supply chain. A semi-structured interview guide was used to study 14 cases of farmers, middlemen, cocoa processors and regulators in the cocoa sector of Ghana. The research found differences in the perception of traceability systems among the different segments of the supply chain with respect to meanings of the term 'traceability', its perceived usefulness, actors' intention to adopt systems and motivations to implement traceability systems. The study found that the extra income in the form of traceability premiums, and the relationships that result from implementing traceability systems, are the two most important motivation factors. Based on these results, the study has contributed to agribusiness policy and literature.

Chapter 1: Introduction

1.1   Overview of the Thesis

Recent food crises in global commodity supply chains have raised public concerns over the quality and safety of food traded around the world. Especially in the chocolate and confectionery markets, consumers often cannot identify the quality credence and safety of ingredients that were used in making the final product. The subject of traceability has been at the centre of discussion within the international food policy community and among academics in recent years as a tool for achieving transparency in the food chains (Trautman *et al*., 2008). Traceability is an essential element of food safety and food security because it allows consumers to access sufficient and healthy food in a transparent manner. However, studies on traceability systems have reached different conclusions on the perception of traceability systems in food supply chains and the motivations for implementing them (Trautman *et al.*, 2008). In order to understand the perception of traceability systems in the cocoa supply chains, a qualitative case study of the cocoa sector of Ghana was used. Case study methods incorporate the perception of real world phenomena, which are "unobservable", and can address descriptive research questions rather than prescriptive realism (Perry, 1998). Furthermore, methodological literature suggests the increasing use of case studies to understand emerging and contemporary issues for which a single causal theory may not be sufficient (Patton, 2002).

In qualitative research, the role of theory is very important as it provides the researcher with direction and research conditions for phenomena that are often

ambiguous and complex (Denzin and Lincoln, 2005). Good social science enquiries are problem-driven and therefore require many theoretical avenues to address the problems (Flyybjerg, 2006). A mix of theories was chosen because social science research is based on multiple theoretical orientations compared to natural science (Denzin and Lincoln, 2005). The theoretical basis of this research comprises behavioural theories, technology adoption theories and decision-making theories. These theoretical orientations were applied to answer the research questions regarding the perception of traceability systems in Ghana's cocoa supply chain.

1.2   Transparency and Sustainability Concerns in Ghana's Cocoa Sector

The cocoa sector in Ghana is of vital importance to the economy and employs about 800,000 smallholder farmers (Anim-Kwapong and Frimpong, 2010). Gockowski *et al.,* (2010) estimate that cocoa provides a livelihood for some 6.3 million people in Ghana who live directly and indirectly on cocoa. Coulombe and Wodon (2007) indicate that the performance of Ghana's cocoa supply system has contributed to poverty reduction within the country and helped it to achieve its Millennium Development Goals (MDGs). The cocoa sector in Ghana is organised into sectors, comprising public institutions, private sector firms, farmers, individuals, technology, financial resources, information and services. However, there is growing international concern over the sustainability of the cocoa sector in Ghana.

The allegation of the use of child and forced labour continues to be associated with cocoa production in Ghana. According to reports made available to the United States Department of Labor, 50% of the children living in the households of Ghana work in agriculture, with 25% of these children working in cocoa (Tulane University, 2011).

The subject of ethical aspects of cocoa production has been explored regularly in the media, with articles linking child labour to cocoa published in major news media to increase awareness. In the context of food safety, consumers in Europe and North America especially have demanded traceability of the sources of cocoa that is used in the making of chocolates. ICCO (2012) indicated that governments in chocolate-consuming countries have responded to the public's transparency concerns with the following initiatives.

1. The government of the Netherlands, together with associated development institutions, signed a letter of intent in 2010 to set out the objective of demanding a 100% guarantee by 2025 that cocoa sourced for consumption in the Netherlands is sustainable and traceable.

2. The German government and German civil society organisations have launched a sustainable forum in 2012 to increase the amount of sustainable and traceable cocoa being sourced from Ghana for Germany.

3. The European Union expressed its concern to member states about the need to accept responsibility to ensure sustainability and traceability in the cocoa sector.

As a consequence, the European Union has constituted the European Standardisation Committee (CEN) to create European standards for traceability and sustainability. Other international organisations such as the International Cocoa Initiative, World Cocoa Foundation, International Cocoa Organisation and the Alliance of Cocoa Producing Countries have also taken various steps towards ensuring sustainability, certifications and traceability. In an effort to secure safe, ethical cocoa in a transparent manner, the major cocoa processors and chocolate manufacturers such as

Barry Callebaut, ADM, Mars, Hershey, Armajaro, Unilever, and Kraft have established programmes and projects to drive the acceptance of traceability and sustainability systems.

1.3   Sustainability of Transparency Systems in the Cocoa Sector

The annual growth in demand for cocoa is estimated at 3% while the supply of cocoa, especially from West Africa, has declined at an annual rate of 2% in recent years (ICCO, 2012). At the same time, there is growing international concern about the deteriorating quality of cocoa and the increasing levels of residual chemical substances. The aforementioned situation presents a danger to food security and food safety in the cocoa chain. Sustainability initiatives are aimed at meeting the present needs of this generation without compromising the needs of future generations (ICCO, 2012). Sustainability operates on three pillars: economic, social and environmental. Economic sustainability ensures the empowerment of farmers and supply chain participants through the provision of monetary and non-monetary incentives (Veerkat, 2009). It provides cooperatives with bargaining power, and ensures competition that leads to higher prices for farmers. It enhances market access and the stability of commercial relationships (Krain *et al.,* 2011). Sustainability projects in Ghana are often implemented through the commitment of stakeholders in the supply chain to offer special premium prices to farmers. This commitment takes the form of a floor price guarantee in the case of fair trade, or the payment of premiums. These arrangements enhance market access and ensure the stability of sale-of-cocoa contracts. Sustainability projects also target the social aspects of farming. They help improve cocoa producers' livelihoods with greater food security and also

increase their households' value (Potts and Giovannucci, 2012). The working conditions of farmers and the issue of child and forced labour are addressed through training and regular monitoring systems. The social interventions of sustainability projects ensure the use of protective clothing and the treatment of farm accidents. There is also an environmental benefit incorporated into sustainability programmes. This includes a reduced use of agrochemicals to mitigate negative environmental and health effects (Verkaart, 2009). Farmers are provided with environmental training to improve the management of natural resources including water conservation (Potts and Giovannucci, 2012). Sustainability also takes into account measures to restore the local ecosystem and biodiversity in the cocoa sector of Ghana. One of the important aspects of sustainability is the transparency that it brings to the cocoa chain. This is implemented through traceability systems that help engender trust in the cocoa that is produced.

1.4   Traceability in Supply Chains

The prominence of traceability systems in cocoa value chains is underpinned by the changing nature of consumer values and the transparency demands of today's dynamic business environments (Hofstede, 2003). The concept continues to evolve both in theory and in practice and has resulted in variations in definitions and perceptions (Trautman *et al*., 2008).   According to the ISO protocol for food, traceability is the ability to trace and understand the origin of materials, the processing history and the distribution location of the product after delivery (ISO, 2007). The European Union Food Law (178/2002) position is that traceability is central to the governance of supply chain and food law reforms. It defines traceability in Article 18

of the European Commission (EC) European General Food Law as 'the ability to trace and follow food, feed, food production or substances intended to be or expected to be incorporated into food or feed, through all stages of production, processing and distribution'. In view of imperfect information exchange in food supply chains, traceability has been approached at different levels. Traceability can be carried out from the farmer to the processor stage or to the final consumer stage. The latter is also known as farm-to-fork. Some studies of traceability have concluded that traceability from farm gate to the processing stage is sufficient (Bertolini *et al*., 2006; Bollen *et al.,* 2007; Regatierri et al., 2007), while other authors (Ammendrup and Barcos, 2006) have indicated that the application of farm-to-fork, or final consumer stage, is the most revealing traceability concept.

In Ghana, the actors within the cocoa supply chain have different perspectives of traceability systems with regard to its meaning and usefulness. This is could be similar to the literature on traceability, which describes the system as an evolving concept that attracts different meanings (Trautman *et al.,* 2008). Middlemen or LBCs in Ghana's cocoa supply chain implement traceability for reasons of marketing and supply chain management. According to COCOBOD (2011), cocoa traceability initiatives started in 2007 and have steadily grown. Investments in RFID systems to track bagged cocoa from farm gate to export destination are currently being undertaken by a leading LBC. Regatierri (2007) identified that the fundamental technology component requirements for traceability systems should be:

- Product identification and items associated with product data
- Product data carriers
- Data storage and transfer

- Data exchange and information transfer

Traceability programmes in Ghana's cocoa sector run in partnership with branded chocolate-making firms that procure cocoa from mapped cocoa communities in Ghana. To ensure the effective functioning of markets for chocolate products, transparency and information exchange remain an important element (ICCO, 2012). Chocolate manufacturers have voluntarily provided information on the amount of cocoa content of chocolates and the sources of cocoa. Some of these voluntary labels include information which provides assurances that the cocoa ingredient of the chocolate was produced under sustainable conditions, free from forced or slave labour. A number of studies have analysed the motivations behind implementing traceability and transparency systems.

Theuvsen *et al.,* (2005) identified six factors as important determinants for the adoption of traceability systems. Desureault (2006) further confirmed these factors as market differentiation; business process improvements; risk management; stakeholder demand; certification requirements; and response to legislation. In Ghana, different actors may have different motivations for accepting traceability systems. One important driver of traceability in Ghana is the extra premium paid for cocoa traded under a traceability label. Middlemen traders obtain premiums from chocolate makers and disburse these in proportions agreed by the Ghana Cocoa Board and traceability partners. These issues will be explored further throughout this research.

1.5.   Theoretical Overview

The perception of traceability systems in Ghana's cocoa supply chain rests on the behavioural attributes of actors in the cocoa sector. Sacks and Johns (2010) explained perception as the process of interpreting the messages of our senses to provide order and meanings. Perception is considered to be how people translate sensory impressions into a coherent and unified view of the world around them. The choice of case study as a research strategy allowed the researcher to closely examine the perception of traceability systems in a holistic perspective in order to identify the unique features and commonality of respondents (Riege, 2003). The behavioural Theory of Reasoned Action (Ajzen and Fishbein, 1980), the Theory of Planned Behaviour (Ajzen, 1991), the Technology Adoption Model (Rogers, 1995) and decision-making theories (Levi, 1974; Gardenfors and Sahlin, 1982) formed the theoretical framework, which was used to explore the perception of traceability in the cocoa supply chain in Ghana. Traceability is technology-based and the perception of traceability systems was examined under the five attributes of observability, triability, complexity, compatibility and the relative advantage of innovation (Rogers, 1995). The application of theories is further explained in Chapter 4 of this study.

1.6   Objectives of the Research

As the title of this research suggests, understanding the perception of traceability in supply chains principally involves behaviour and decision-making regarding new innovation systems in the cocoa supply chain. In this respect, behavioural theories, innovation diffusion theories and decision-making theories were used. Sacks and Johns (2010) explained perception as the process of interpreting the messages of our

senses to provide order and meanings. Perception is considered to be how people translate impressions into a coherent and unified view of the world around them. The behaviour of supply chain participants constitutes a major determinant of product value stream (Christopher and Peck, 2004). Therefore, in exploring the perception of traceability systems within the cocoa supply chain, different participants along the value stream are required.

The network characteristics of supply chains in respect of transparency concepts can become a source of competitive advantage for business and for policy development. Fentrup and Theuvsen (2006) identified the strategic importance of transparency and traceability systems as a way of bringing about reciprocal information flow, trust and business activity coordination within the supply chain. However different supply chain participants perceive transparency systems differently (Trautman *et al.,* 2008). Understanding the differences in perception of traceability systems in the specific context of cocoa in Ghana can support business strategy and the development of transparency policy towards food safety and food security. Food security, transparency and consumer protection are issues of priority outlined by the United Nation's Millennium Development Goals in a summit aimed at ending hunger and poverty by 2015 (UN, 2010).

Fritz and Sheifer (2010) also identified gaps in knowledge about the transparency concept itself and what it entails in commodity chains. These gaps, which exist in knowledge about transparency systems, can affect the perception of traceability systems. The gaps in knowledge of transparency systems, and differences in the perception of traceability systems, identified in the literature (Fritz and Sheifer, 2010;

Trautman *et al.,* 2008) have informed the development of the principal research questions as follows.

- How do different participants in the cocoa supply chain in Ghana perceive traceability systems?
- What are the factors of motivation for the implementation of traceability systems in the cocoa sector of Ghana?

The specific objectives for the above research questions are:

- To understand the perception of traceability systems in Ghana's cocoa supply chain
- To explore the factors of motivation for the implementation of traceability systems in the cocoa supply chain in Ghana
- To map the supply chain network for cocoa in Ghana

1.7   Significance

Traceability systems are essential elements for improving food security, food safety and sustainability. The increasing pace of globalisation and broader trade linkages comes with increased control of food safety and transparency standards in supply chains. Food safety and supply chain transparency has become a shared concern in international trade leading to demands for standards related to handling food from its origins (Unnevehr, 2003). Traceability can also have Country of Origin effects on consumers. Country of origin remains a relevant attribute in consumer purchase decision-making (Rodrigo *et al.,* 2013) and can influence the purchasing decision of international cocoa merchants. Thus, the significance of this research project has

theoretical implications for academics and practical implications for agribusiness policy.

There is no study of the perception of traceability systems in the context of the cocoa supply chain in Ghana. Therefore there is originality value to this study and also contributes to academic literature on the subject of the perception of traceability systems in Ghana's cocoa supply chain. For the practical application of this study, agribusiness consultants and their clients will benefit from knowledge of the network of key players in Ghana's cocoa sector and their perception of traceability systems.

The outcome of this study provides insight into the development of policy and business strategy in the cocoa sector. There is growing pressure on governments of cocoa importing countries and on civil society groups to promote traceability policies and standards in the cocoa trade. The International Cocoa Organisation and the Alliance of Cocoa Producing Countries have been engaged in programmes to promote the implementation of traceability and sustainability systems in cocoa supply chains. These initiatives in the cocoa sector can benefit from the results taken from the perception of traceability systems, and the motivating factors for implementing traceability systems in Ghana. The results can also be extended to international food safety and traceability policy in general.

1.8   Structure of the Thesis

The introductory chapter of this thesis provides an overview of the subject of traceability and its implication for food safety and sustainability in the cocoa industry of Ghana. The main body of the thesis begins with a review of the international and

local cocoa industry. This is followed by a review of the theoretical literature about supply chains, traceability systems and relevant theories. The reviews helped to identify gaps in previous research and also provided the researcher with the direction and conditions that are appropriate for the study (Denzin and Lincoln, 2005). This enabled the development of specific research propositions that were required to answer the research questions and objectives. The theoretical framework, which was used to guide this research process, was adapted from behavioural theories, innovation diffusion theory and empirical studies. The research methodology and design gives an outline of the processes, choices, considerations and justifications that were adopted to provide this study with validity, reliability and trustworthiness. In Chapter 5 and Chapter 6, within-case and cross-case study analysis is carried out. Within-case analysis enables a deeper understanding of each case as a unit and also facilitates familiarity with the data. Cross-case analysis enables the different findings to be pooled together and analysed. A mind map is used to present the outcome of the cross-case analysis. The findings of the case study analysis are triangulated with the literature and the outcome discussed. Rival explanations are also provided to support the findings of the study. In the general conclusions of this study in Chapter 8, the summary of the research and outline the contributions of the research to agribusiness policy and literature are presented. The research limitations are acknowledged and recommendations are made for the direction of future studies.

Chapter 2: A Review of the Cocoa Industry

2.1 Introduction

This chapter provides an empirical review of the global cocoa industry and Ghana's cocoa sector. It outlines the key activities in the international cocoa value chain from production to supply network as well as the trading channels of cocoa and chocolate products. A further review of Ghana's cocoa supply chain structures and activities highlights the Ghana Cocoa Board, farmers' middlemen and processors. The chapter also reviews the network of farmers and their work towards achieving traceability and sustainability standards. The purpose is to set out the empirical, industry and national context of transparency systems in global commodity supply chains, especially the traceability systems in the cocoa supply chain in Ghana.

2.2   The International Cocoa Value Chain

Cocoa is mainly consumed as chocolate bars, chocolate confectionery and chocolate components of products such as cakes, ice creams, biscuits and beverage snacks. Countries in Western Europe, such as Germany, Belgium, Switzerland and France, and North America constitute the world's leading cocoa consuming countries. The African region accounts for 77% of production for the world market, followed by Asia and Oceania, which export 16% of global cocoa production (ICCO, 2012). The Ivory Coast and Ghana are the world's leading cocoa suppliers, accounting for 57% of the total global cocoa output in 2012 (ICCO, 2012). The trade in cocoa flows between different regions of the world. The largest trade flow of cocoa beans is between Africa and the European Union, followed by trade between Africa and North America

(ICCO, 2012). Cocoa passes through different stages in the value chain before it is finally consumed as chocolate. Figure 2.1 shows the different stages in the transformation of cocoa into a final chocolate product.
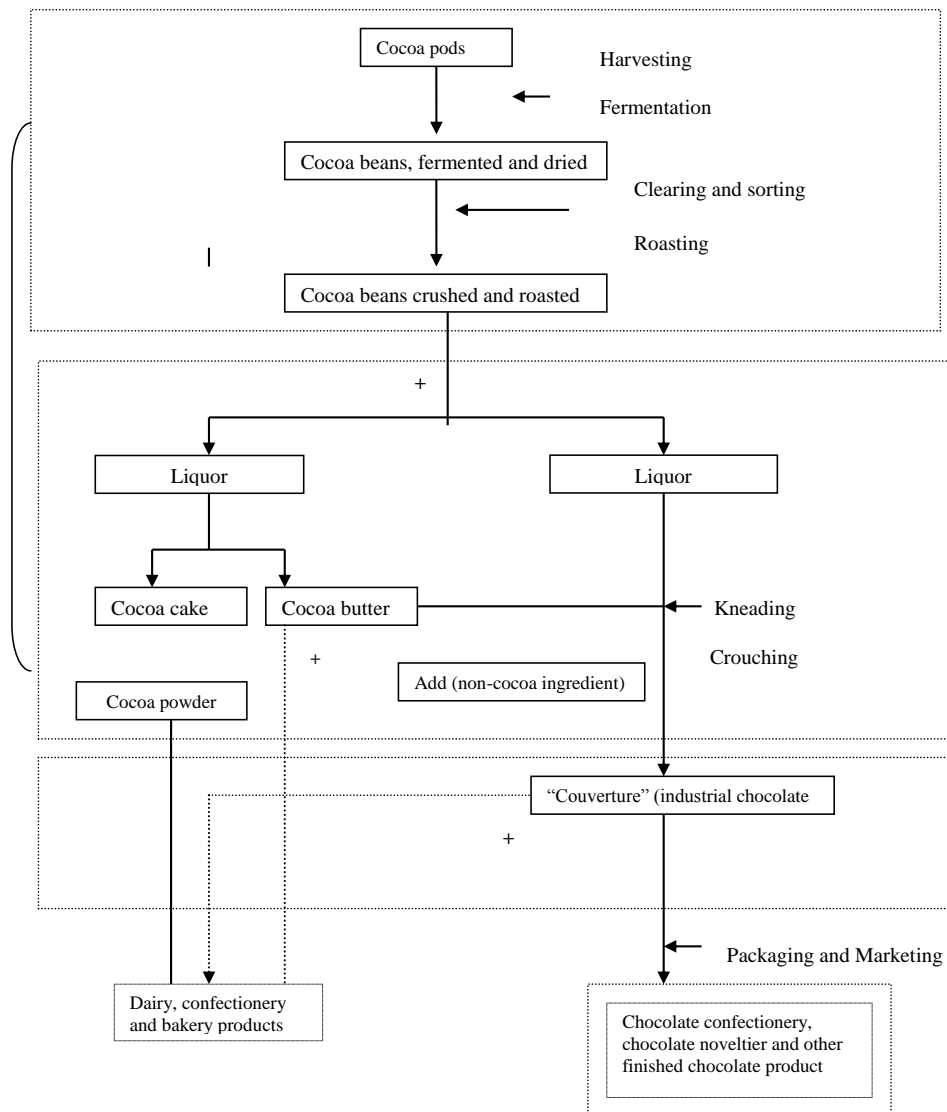
Figure 2.1: Transformation of Beans to Chocolate (Source: UNCTAD, 2008)

The value chain of cocoa starts from the cocoa fruit on trees to the making of finished chocolate products. The ripped cocoa fruit are carefully harvested from the trees using machetes during the cocoa harvesting seasons. The pods are broken and the raw cocoa

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beans, surrounded by a whitish slimy pulp are removed and heaped for fermentation. The fermented cocoa beans are sufficiently dried to reduce the moisture content such that the cocoa beans can readily crumble or make a rattling sound when squeezed in the palm.

When cocoa arrives at the processing stage, the whole beans are roasted, de-shelled and crushed into smaller components called nibs. In some cases, the nibs undergo industrial chemical processes, such as alkalisation, which gives special colour and flavour to the intended final product. Thereafter, the nibs are milled into a fine paste, called cocoa liquor, or cocoa paste. Cocoa liquor can be used to manufacture chocolate by the addition of other ingredients such as milk and sugar. The cocoa liquor can also be further transformed by hydraulic pressing to extract the cocoa fat, known as cocoa butter. The resulting solid 'residue' product from the pressing process is called cocoa cake, which can be ground finely into cocoa powder. Chocolate can also be made by the combination of cocoa butter and cocoa liquor with the addition of other ingredients such as sugar and milk. The different stages of activities in the cocoa value chain are discussed in this section.

2.2.1 Cocoa Production and Supply Processes

Cocoa is produced in a tropical climatic belt between 10 degrees north and 10 degrees south of the equator. The lower part of a rainforest with the appropriate climatic condition is the natural habitat for the cultivation of cocoa. The appropriate climatic condition comprises an annual average temperature between 21 and 32 degrees Celsius with rainfall distributed throughout the year at an average of 1500-2000 millimetres. Cocoa grows well in hot and humid conditions with an annual humidity

of 80-100% (ICCO, 2010). Cocoa traditionally grows under shade trees in the Amazonian and tropical forests, especially at the early stages of its development. The cocoa tree, however, makes optimum use of the light available to it through the forest shades. There are three main varieties of cocoa.

a. The *Criolllo* variety, which was the original dominant variety of cocoa until the middle of the eighteenth century.

b. The *Forestario* variety, which comprises a widely cultivated group of *amelonado* species cultivated in West Africa and Central America.

c. The *Trinitario* variety, which is a hybrid of *Criollo* and *Forestario* varieties of cocoa and is largely cultivated in the Caribbean, Asia, parts of Central America and Central Africa.

Cocoa is generally grown from the seedlings raised in nurseries, rather than planted directly from the seed. The seedlings grow to the height of about five centimetres before they are transplanted to the cocoa fields at a planting distance of three metres apart. The shade-providing trees are planted in between the rows of cocoa seedlings in order to protect young cocoa plants from strong winds and the harsh sunny conditions. It is common practice in West Africa for planters to grow subsistence crops such as maize, cassava, plantain and cocoyam at a cocoa plantation in the early stages. The seasonal crops serve as a source of income for farmers during the initial set-up of a cocoa farm. The most commonly grown type of cocoa starts yielding fruit after five years, although the period varies considerably according to the breed of cocoa and the condition of the farm.

The fruit containing cocoa beans grows from the trunk and branches of the cocoa tree. The ripped pods are harvested from the trees and the cocoa beans extracted from the pod. In the process of extracting the cocoa beans, the pods are split open using machetes or wooden clubs without any damage to the cocoa beans. The wet beans are removed and heaped together for fermentation. The heap of cocoa beans is covered with broad banana leaves, thereby allowing the growth of fermentation micro-organisms that produce yeast on the sweet pulps surrounding the cocoa beans. In scientific terms, the yeast converts the pulp sugars into ethanol, which is further converted by other bacteria into acetic acid, carbon dioxide and water. The temperature within the heap of cocoa rises as the fermentation activities continue. The heap is turned and mixed intermittently to enable a thorough fermentation process. The fermentation process is completed in five to seven days and the cocoa is transferred to concrete floors, raised bamboo mats or artificial dryers for drying. During the drying process, the moisture content of the cocoa is reduced from 60% to about 7.5%. Drying of cocoa takes place slowly so as to prevent unwanted chemical reactions that can increase the acidity of the cocoa beans and produce a bitter flavour. On the other hand, when drying takes place too slowly, it allows the cocoa beans to develop moulds and flavours that affect the quality. In Ghana, cocoa is dried by the sun-drying method on a raised bamboo mat.

Cocoa is supplied through different channels within the supply chain after it has been graded and certified for quality. The process of grading cocoa differs considerably across the different nodes of the chain of custody in the supply chain channel. The generally acceptable quality standard for cocoa relates to the percentage of major physical defects that can be found in 100 grams of a sample. The quality parameters

refer to the extent of moisture, mould, slate and other foreign matter contained in the sample of cocoa. The defects relating to smoky smell, oil stains, chemical content stains and high 'free fatty acids' are not tolerated for cocoa consigned for human consumption. By using smell, appearance and a cut test, the quality of cocoa is ascertained before it is passed through the different stages of the supply chain.

2.2.2   *The Global Trend of Cocoa Supply*

Over the past ten years, global cocoa production has increased by 3.3% on a yearly basis (ICCO, 2012). In West Africa, the annual rate of growth in cocoa supply is 3.7%. Cocoa supply in the Americas and Asia also shows a yearly increase of 3.1% and 1.5% respectively. The global supply of cocoa has increased from 3.2 million tonnes in 2002 to about 4 million tonnes in 2012 (ICCO, 2012). Ghana's cocoa supply in particular has increased by 438,000 metric tonnes, representing about 45%, followed by the Ivory Coast, where cocoa supply has increased by 112,000 metric tonnes. Cameroon and Nigeria have also increased their cocoa supply by 75,000 metric tonnes and 53,000 metric tonnes respectively (ICCO, 2012). Figure 2.2 shows the global supply distribution of cocoa.
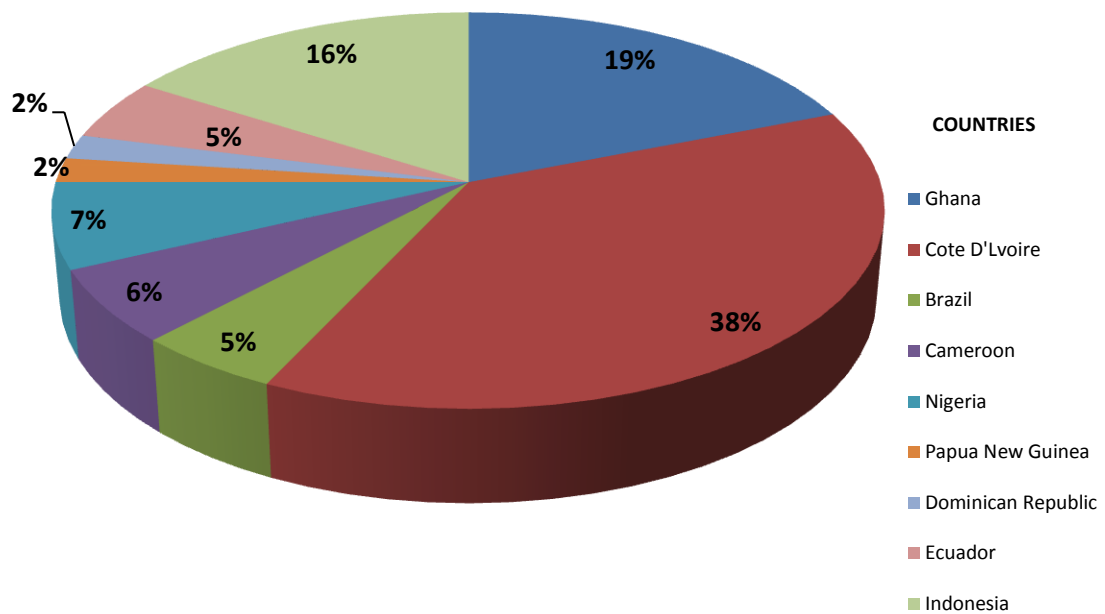
Figure 2.2: Global Supply Distribution of Cocoa (Source: ICCO, 2012)

The total volume of cocoa supplied in 2012 is about 4 million metric tonnes, with the Ivory Coast and Ghana supplying 1.4 million metric tonnes and 890,000 metric tonnes respectively, constituting 57% of global output. There is an increasing geographical concentration of cocoa supply in West Africa even though the majority of cocoa produced comes from small and medium-sized farms of less than two hectares (Losch, 2002). This author further attributes the increase of cocoa supply in West Africa to good climatic conditions, improved agronomic practices and economic factors. The region has witnessed a sustained programme for farm rehabilitation, fertiliser application and pesticide application in the cocoa sectors. West Africa has enjoyed good climatic conditions over the years with rainfall suitable for the cultivation of cocoa (ICCO, 2010). In addition, high international prices for cocoa passed to farmers serve as an incentive for increased production. Furthermore, in most West African countries, the liberal regimes have attracted significant funding from

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international development agencies and other interest groups to improve cocoa production and supply to the international market.

2.2.3   *The Cocoa Supply Network in Producing Countries*

Historically, the supply network of cocoa has been dominated by state marketing boards that control the supply system between the farmer and those who process cocoa into chocolate and other finished products. In recent years, structural reforms and market considerations have led to a systematic liberalisation of domestic marketing and supply chains in West Africa (Varangis and Schreiber, 2001). This notwithstanding, there are differences in the domestic supply chain system, which are largely influenced by local trade and competition policies. The flow of cocoa from the farmer through the supply system presents a challenge to the identity preservation of cocoa. Figure 2.3 illustrates a typical supply channel of cocoa through to the manufacturing of chocolate products.
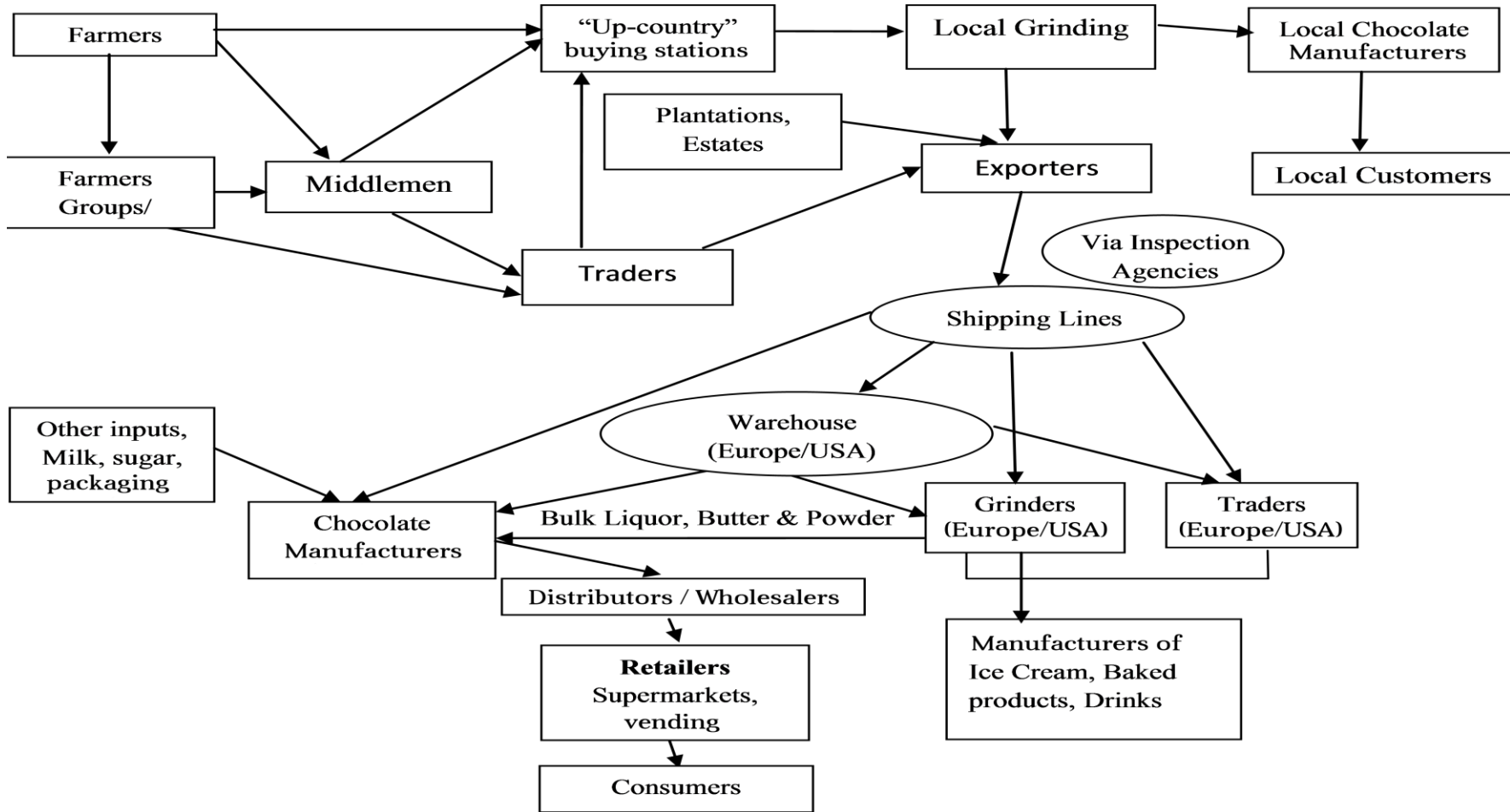
Figure 2.3: Flow of Cocoa from Farmer to Processing Plant (Source: Anti-Slavery Int. 2004)

In general, the farmer prepares and makes the cocoa beans ready for sale. The cocoa is first offered for sale either to the primary intermediary or through cooperatives at a price relative to the prevailing world market levels. In the international cocoa trade, it is common for cooperatives and the primary intermediary to sell the cocoa through other intermediaries or merchants who have access to processors either in the producing countries or abroad. Depending on the availability of market information and proximity to the source of international traders and processors, the cocoa supply chain can either be longer or shorter in length.

The nature of the cocoa supply chain varies in individual contexts amongst cocoa-producing countries. In the Ivory Coast, the cocoa supply is structured along three echelons of middlemen. Figure 2.4 shows the supply system in the Ivory Coast.
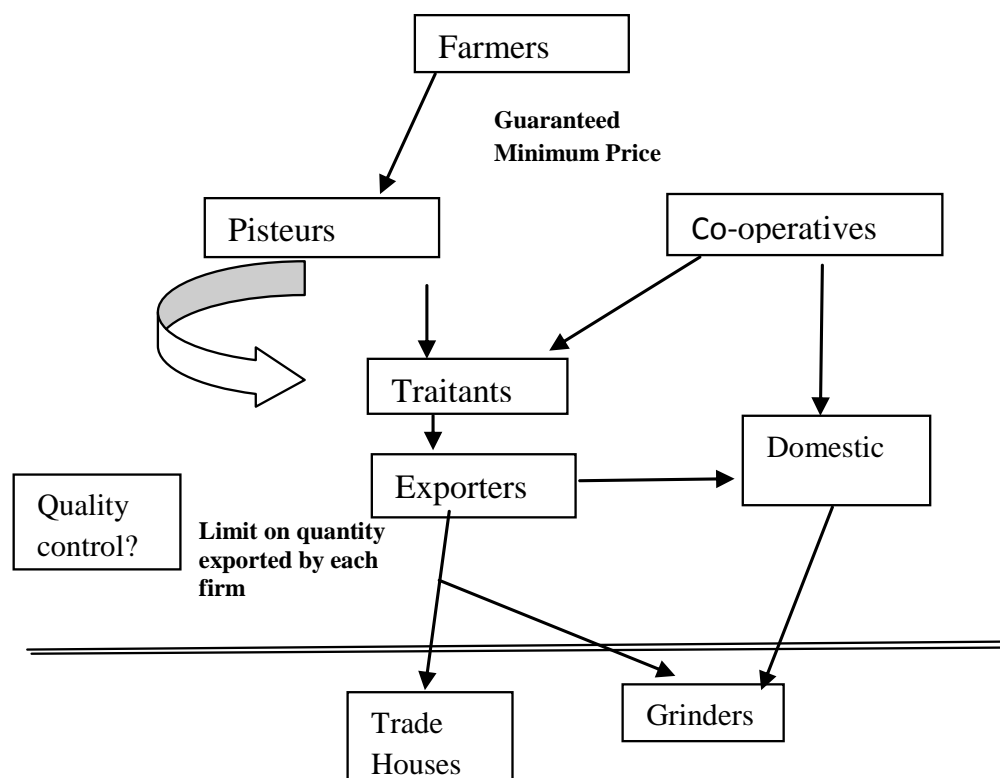
Figure 2.4: Supply Path of Cocoa in the Ivory Coast (Source: Anti-Slavery Int. 2004)

The key lesson from the cocoa supply chain design relates to the separation of responsibility among the different echelons of middlemen. Even though the supply chain channel gets longer by this arrangement, it is easier to trace by way of the intermediary activities, each of which is distinct. In the Ivory Coast, the private itinerant cocoa buyers visit farmers to buy cocoa. These buyers, known as 'pisteurs', often purchase on behalf of large local exporters called the 'traitants', or with the aim of selling to the large foreign-owned exporters. The farmers receive a minimum guaranteed price determined by the state marketing control agency, the BCC. The cocoa is transported to collection centres in large towns, where different purchases are aggregated. Thereafter, cocoa is sold to large exporters, who collect their purchases at export facilities in the shipping ports. In other instances, the large exporters supply cocoa direct to local processing facilities or to the international market.

Prior to export, the quality condition of the cocoa is checked at every stage along the supply chain whenever ownership or duty of care changes. This quality check is carried out by accredited local quality inspection authorities, or by approved personnel, who act on behalf of the exchange parties. Differences also exist in the supply chain arrangements in other producing countries. Figures 2.5 and 2.6 show the domestic supply systems in Nigeria and Cameroon respectively.
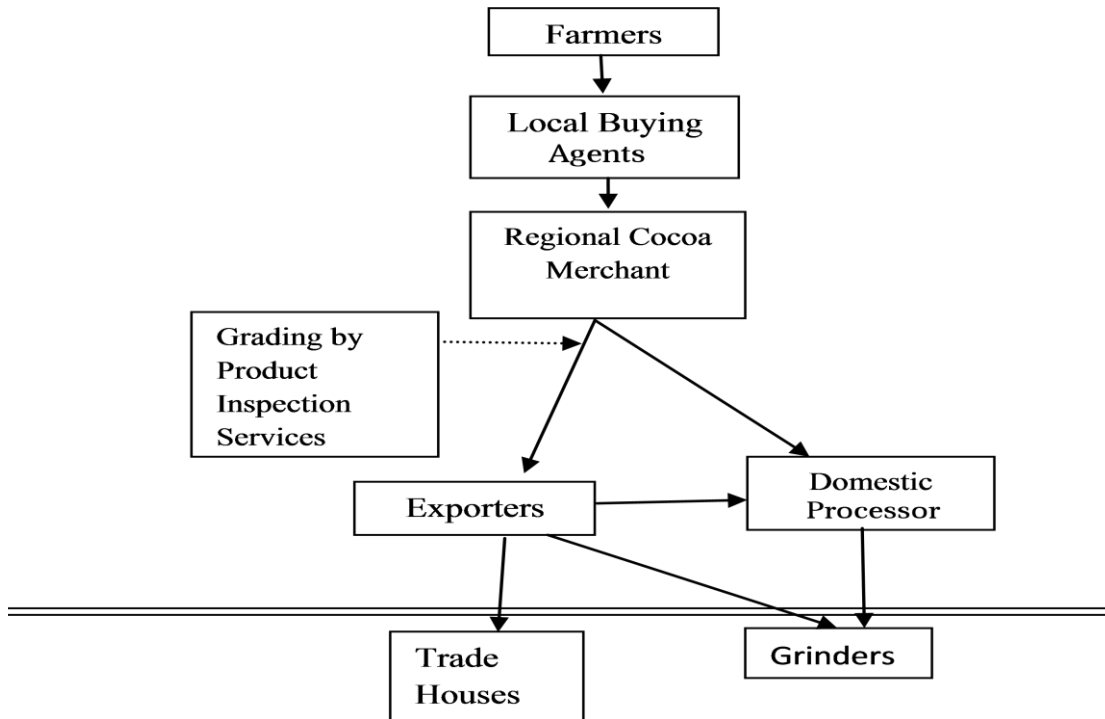
Figure 2.5: Domestic Cocoa Chain in Nigeria (Source: Anti-Slavery Int. 2004
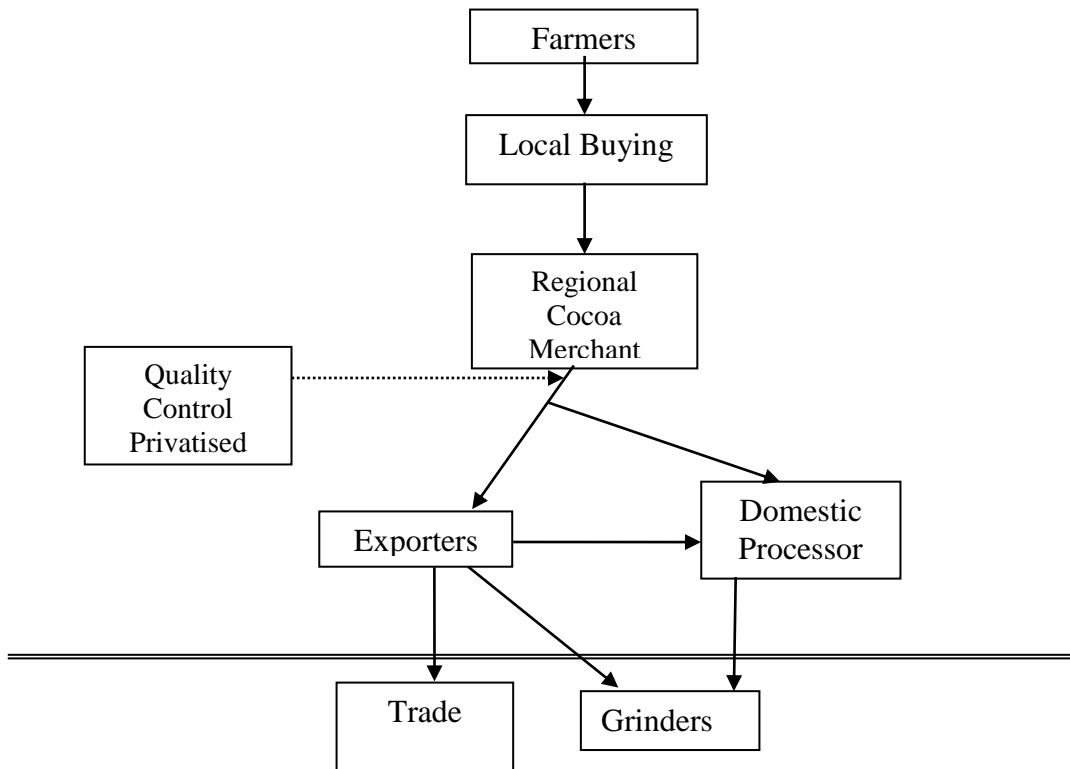
Figure 2.6: Domestic Cocoa Chain in Cameroon (Source: Anti-Slavery Int. 2004)

In Nigeria and Cameroon, differences exist in the domestic cocoa supply systems. In Nigeria, regional purchasing merchants typically commission a number of local agents to act on their behalf to purchase cocoa from farmers at the farm gate. The different purchases are pooled together and prepared for inspection and quality certification by the government-controlled inspection services. The merchants thereafter sell and supply cocoa to local processing factories, international trading merchants or cocoa processing companies based abroad. The international cocoa trading merchants or foreign processing companies typically set up local subsidiary divisions to facilitate the movement of cocoa as well as the payments to local merchants. In Cameroon, the supply chain is shorter and similar to the cocoa supply systems in Malaysia, Indonesia, Ecuador and Brazil.

Farmers in Cameroon typically sell to the exporter at the farm gate. The exporters sell and supply cocoa to domestic processing plants, international trading houses or cocoa processing companies based abroad. In Asia and Latin America, however, the chain is shorter because large-scale farmers sell cocoa direct to local processing facilities, international trading houses or processing companies. The smallholder farmers are organised into cooperatives, where they aggregate their produce to sell as a single unit in order to improve bargaining power. The cooperatives often sell their cocoa to international cocoa trading houses or cocoa processing companies operating either within the country or abroad.

2.2.4 International Markets for Cocoa

The subject of cocoa traceability features prominently during the international trade of cocoa across different regions of the world. Identity preservation of products in international trade channels is increasingly becoming an integral aspect of product quality in international trade. Africa is the largest net exporter of cocoa and accounts for 77% of the world's export, followed by Asia and Oceania, which export 15% of global cocoa, while the Americas export 5%. Figure 2.8 illustrates the regional flow of trade in cocoa beans.
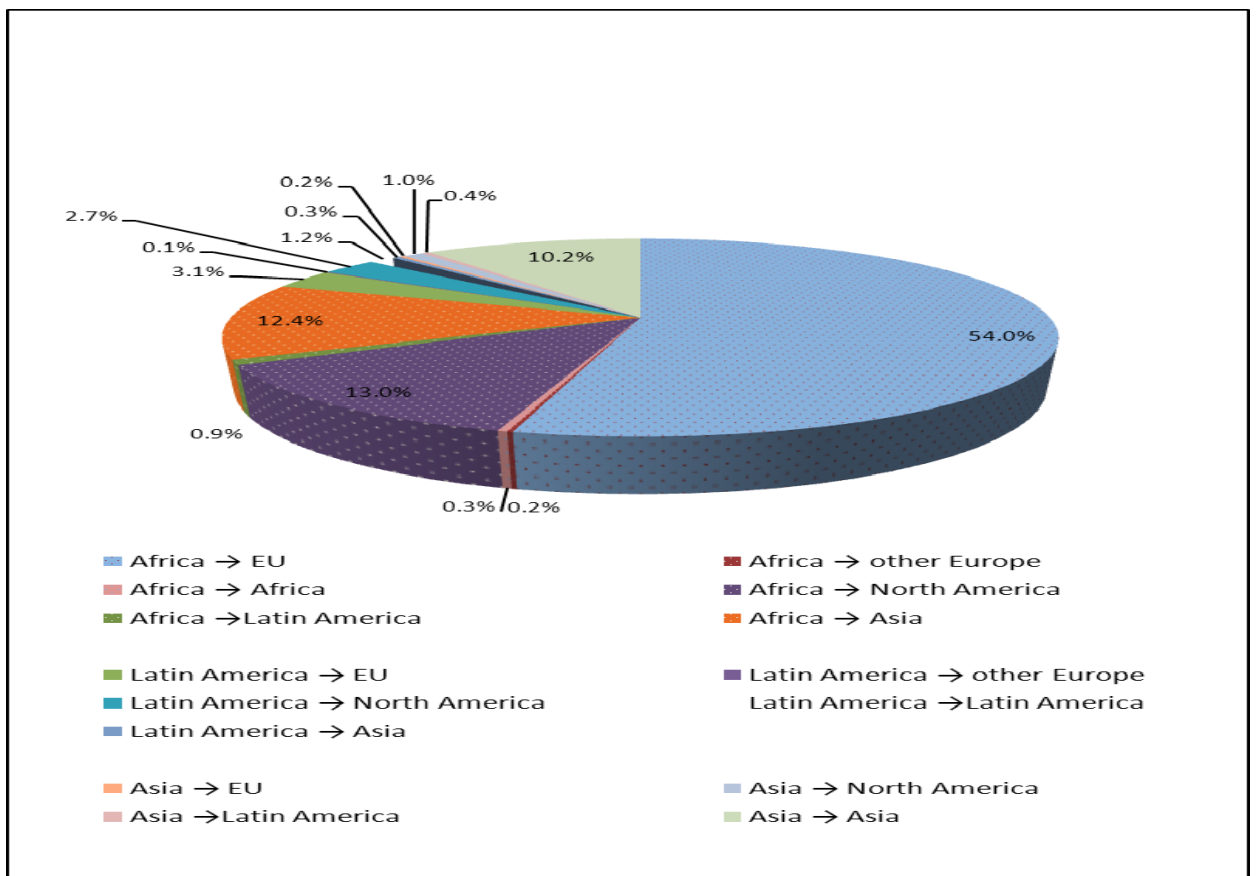
Figure 2.7 Regional Flow of Trade in Cocoa Beans in 2011 (Source: ICCO, 2012)

From the diagram above, it can be seen that the largest regional trade in cocoa is between the African region and the European Union. The African region represents

the largest block of cocoa exporting countries, while the European Union is the world's largest cocoa consuming region representing 54% of the total trade in cocoa. Figure 2.8 reveals that the share of cocoa exported by the Americas is small compared to its production because of the high volume of processing that takes place within the Latin American region. Furthermore, the increasing investment in cocoa processing facilities in Asia will eventually reduce this region's share of the export trade (ICCO, 2012). The top three leading cocoa producers, namely the Ivory Coast, Ghana and Indonesia are also the world's leading net exporters, representing 37%, 22% and 15% of the world trade respectively. The export of cocoa remains a significant source of merchandise trade revenue for cocoa producing countries, especially the Ivory Coast and Ghana. According to an IMF report, cocoa is the second biggest source of export earnings in Ghana after gold and generated some $2.2 billion in 2010 (IMF, 2011). During the same period, the economy of the Ivory Coast realised $3.8 billion from the export of cocoa, surpassing oil revenue.

The United States of America is the world's largest cocoa importing country, representing 20% of the total global trade. Countries in the European Union such as Germany, Belgium and France account for 13%, 7% and 6% of the global trade respectively. The Netherlands, however, imports a large amount of cocoa which is processed and subsequently re-exported. In spite of the complicated nature of trade flow, the identity of cocoa has to be preserved throughout the process of warehousing and shipping.

2.2.5   Cocoa Warehousing and Shipping

The marketing channels of cocoa between the suppliers and the end-users encompass different intermediaries who store cocoa along the supply chain. Cocoa is stored in clean and dry warehouse spaces. The temperature in cocoa warehouses is kept under control to avoid excessively high or low temperatures. Bagged cocoa is stored on pallets to avoid contact with the bare floor, while bulk cocoa is stored in heaps, separated by concrete fences. Warehouses observe different levels of phytosanitary and pest control systems with respect to fumigation and disinfestation of cocoa. For the purpose of tracing and tracking, there is increasing use of RFID technology in warehouses. Data readers are attached to shovels and transmitters attached to fences between heaps of cocoa that are stored in bulk. This enables the identity of cocoa to be preserved until it is delivered to customers or processed into chocolate and confectionery products. Some warehouses use HACCP systems to manage warehouse inventories that include bagged cocoa stored on different pallets. The Hazard and Critical Control Point Identification Systems (HACCP) allow for the recording and labelling of landing cocoa and sweepings, as well as for fumigation records of cocoa in store. An HACCP logbook tracks every event that takes place in the warehouse until the cocoa is delivered to the appropriate end-user.

Cocoa is transported by way of ships, lorries and railways. However, due to the geographical separation between the source of supply, mainly in Africa, and the markets in Europe, shipping is the predominant means of cocoa transport. Bagged cocoa is transported in containers or in the holds of vessels. Containers are thoroughly dry and covered with absorbent materials that absorb any moisture. A fully loaded container is separated by anti-condensation film to provide protection against dripping

sweat. A loaded container is stowed below deck, away from sources of heat because of the risk of self-heating that can result in combustion. Stowage below the water line allows the temperature and humidity of the hold air to become the decisive external influence on containers. In instances where containers are stowed on deck, they are best stowed on the inner deck. The containers are secured throughout the voyage until the cocoa reaches its destination.

On arrival at the port of discharge, the intrinsic quality of the cocoa is checked for water, sweat and vapour damage during the voyage. The risk of weight loss is also assessed at the port of discharge. Sweat damage is recognised on the bags by drops of water. Under the wet patches, clusters of cocoa beans are seen to have stuck together and are covered by white mould. The mould sometimes permeates the shell of the cocoa beans and can result in a musty taste and smell. Vapour damage is caused by excessive relative humidity in the hold of a ship or in containers. Vapour damage also results in mould and is more extensive than sweat damage. Water damage is caused by rainwater, condensation and seawater during a voyage. When such damage has occurred, the cocoa consignment is rejected and re-dried. Shrinkage between 1–3% may occur during the voyage and can lead to a loss in weight on arrival at the port of discharge. These different risks inherent in the shipping of cocoa are settled by the terms of trade which govern a particular shipment contract.

2.2.6   *International Cocoa Trading*

International trading and marketing of cocoa is the driver behind the direction of cocoa in the supply chain. It also drives the shipment schedules and places of storage, and influences the systems for identity preservation of cocoa. The international

market for cocoa consists of two types: the physical market, which is sometimes referred to as the 'actuals' market, and the terminal market, also known as the futures market (Dand, 2010). Cocoa futures contracts are generally designed to offset the adverse effect of price movement in the market place. A cocoa futures contract is only a commitment to take delivery or to make delivery of a specific quantity of cocoa beans at a predetermined time and place in the future. The cocoa contracts are specified in a standard format and are interchangeable. There are two major marketplaces in the world where cocoa futures are traded. These are the ICE Futures Exchange in New York in the United States, and the NYSE/LIFFE Futures and Options Exchange in London in the United Kingdom. Trading takes place at both exchanges using an open and competitive bidding process through an organised trading platform. These two markets provide a competitive environment that brings together a buyer and a seller to exchange bids and offers.

The exchanges also provide a 'clearing facility' by way of electronic trading systems. Each exchange's 'clearing facility' interacts with buyers and sellers, and matches trades between counterparties. The main category of participants in the futures market are the commercial hedgers, who include the end-users, and the intermediate traders and producers, who use the futures market primarily as a tool for price protection. All participants use the futures market to hedge against adverse price movements and to avoid the possibility of losses by undertaking equal and opposite transactions.

Speculators are the second category of market participants. They do not produce the commodity nor do they buy the commodity. Instead, they take a risk by betting on the market direction with the hope of making windfalls from market price movements. The speculators are system funds and index funds, and they bet on market price

movements on the basis of different considerations. To enter into a futures contract in an exchange, a trader is required to deposit a specific amount of money as a guarantee of commitment. This deposit is called the initial margin and set to about 2–10% of the total contract value (ICCO, 2012). When a purchase or a sale contract is entered into on the futures market, the position is marked against a daily price settlement. Whenever the cocoa market falls against a trader who has purchased the market, the amount of the change is deducted from the trader's initial margin. When the market continues to settle lower and beyond the trader's initial margin, the trader is called upon to top up to the variation level. This additional top-up payment is called the variation margin. The opposite scenario is true for a trader who entered an open position by selling the market. However, when the cocoa futures market rises in favour of a trader who has bought the futures contract, he benefits by receiving payment against the level of the rise from the point where the trade was first entered into.

The 'clearing house' furnishes a daily position report to traders on the situation of their trade positions. Commercials usually offset their position as soon as the physical cocoa has been disposed of. Traders can also resort to the use of market tools and strategies to hedge their positions as well as to profit from price movement. The use of Options tools and strategies has provided cocoa traders with a variety of low-cost choices to hedging without being subjected to margin calls. A variety of synthetic and 'over-the-counter' structuring options have also emerged as additional risk management instruments for traders.

2.2.7 International Cocoa Price Development

The trading system in the international cocoa market, as discussed in Section 2.2.6, underpins the development of the world market price for cocoa. The price for cocoa is fundamentally determined by global supply and demand. The total volume of cocoa grindings by processing companies measures the demand for cocoa, while the total production, which is the aggregate harvest from cocoa farmers, is the measure of global supply. The statistical measure of demand and supply is the stock–to–grind ratio of cocoa. The stock–to–grind ratio measures the ratio of all cocoa beans produced, including cocoa stocks in warehouses, against cocoa grinding and cocoa product stocks held by processors in a particular year. A study established through econometric analysis that 83% of price variations in the cocoa market are explained by stock–to–grind ratios (ICCO, 2010). The study further estimated elasticity of - 0.91 between cocoa prices and stock–to–grind ratios. This means that, for every 10% increase in stock–to–grind ratios, cocoa prices decrease by 9.1% in real terms. International cocoa price development over the past ten years was reviewed for the study. The period was chosen because of its relevance to the discussions of contemporary issues affecting price trends in the world cocoa market. Figure 2.9 presents a 50-year trend of cocoa supply, demand and prices.
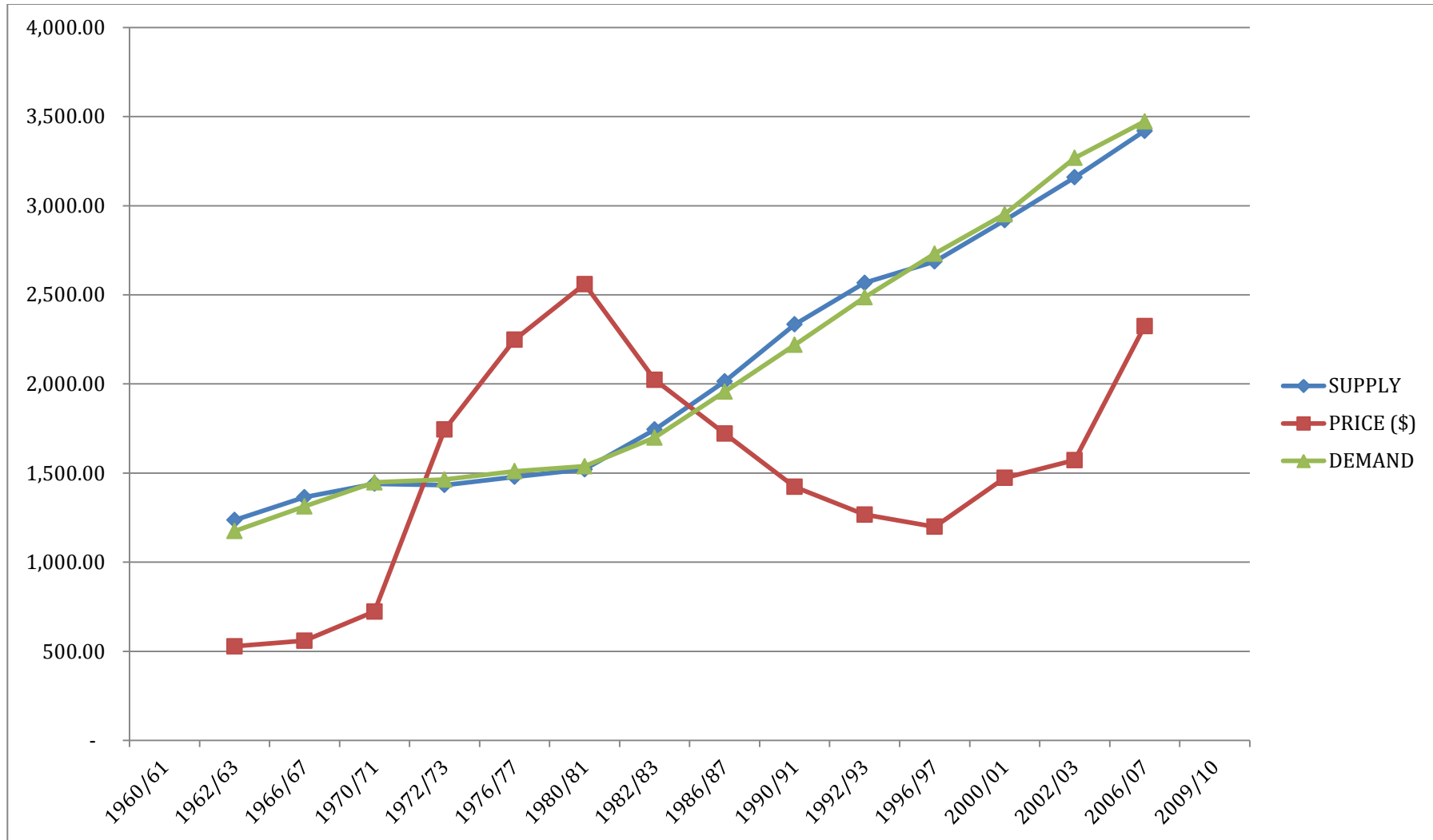
Figure 2.8: Trend of Supply, Demand and Prices of Cocoa from 1960/61–2010/2011 (Source: ICCO, 2010)

The graphs display the 'two-yearly' reporting system convention of the International Cocoa Organisation because of the nature of the cocoa production cycle. Also, the global demand of cocoa is measured as the amount of cocoa grindings, while the supply of cocoa is determined by the aggregate harvest of cocoa during the period. The period under consideration for discussion spans the 2001/2002 seasons to the 2010/2011 seasons. Over the period, cocoa supply increased at an annual rate of 3.7% while demand grew at an annual rate of about 3.3% (ICCO, 2012). ICCO further reported that the global cocoa supply at the beginning of the period was 3.179 million metric tonnes, and the demand for cocoa was 3.077 million metric tonnes during the 2002/2003 seasons. The total end-of-year stock was 1.395 million metric tonnes of cocoa, making a stock–to–grind ratio of 45.3% and leaving an average world market price of $1873 per tonne (ICCO, 2012).

Market prices dropped to an average of $1557 on the back of large supply surpluses that were recorded in 2005. During the period, the stock–to–grind ratio of cocoa rose sharply to 53.7% and thus confirmed the existence of large stocks of cocoa over and above global demand. The growth in cocoa supply in comparison to demand curtailed sharply in 2007, leading to a supply deficit of 279,000 metric tonnes and a 19% jump in cocoa prices to $1854 per metric tonne. Price rallies continued thereafter to a 28-year high of $3296 per metric tonne. During this period, the stock–to–grind ratios dropped back to 40.7% with annual demand continuously outstripping supply. On the basis of a number of other factors, including political crises in the Ivory Coast which restricted supply, the world cocoa prices continued to rally strongly to a 32-year high of $3730 per metric tonne in 2010/2011. There are external factors that also influenced price expectations and price movements during the period. The global

financial crisis, leading to the bankruptcy and collapse of key financial institutions, affected cocoa prices.

Economic issues, including volatile currency and interest rate regimes, affect consumer confidence and disposable income. These factors restricted cocoa demand and therefore resulted in lower international prices for cocoa in the world market. The extreme weather conditions, such as *el nino* and *la nina*, resulting in rainfall and dry weather spells, affected cocoa supply and price development. Political instability in the world's leading cocoa-producing nation, the Ivory Coast, as well as the activities of speculative hedge funds also influenced world cocoa market price movements during the period.

2.2.8   *The Global Chocolate Market*

There is increasing demand for new distinct chocolate flavours made from cocoa with a known origin traceable to the source of production (ICCO, 2010). These consumers are reported to be sophisticated, health-conscious and savvy in their choice of brands of chocolate (ICCO, 2010). Chocolate consumers, especially in Western Europe and North America, dominate this segment of the market. In Europe, Germany, the United Kingdom and France remain the leading chocolate-consuming nations, with annual consumptions of 946,000 kg, 605,000 kg and 410,000 kg respectively in 2010 (CAOBISCO, 2012). Also, the United States, Brazil and Japan consumed 1,649,000 kg, 562,000 kg and 268,000 kg respectively in 2010 (CAOBISCO, 2012). In terms of per capita consumption, however, Germany, Switzerland and Norway are the leading chocolate-consuming nations with annual per head consumption of 11.56 kg, 10.51 kgand 9.44 kg respectively (CAOBISCO, 2012). Figure 2.10 shows the global trend in chocolate consumption of the different regions of the world.
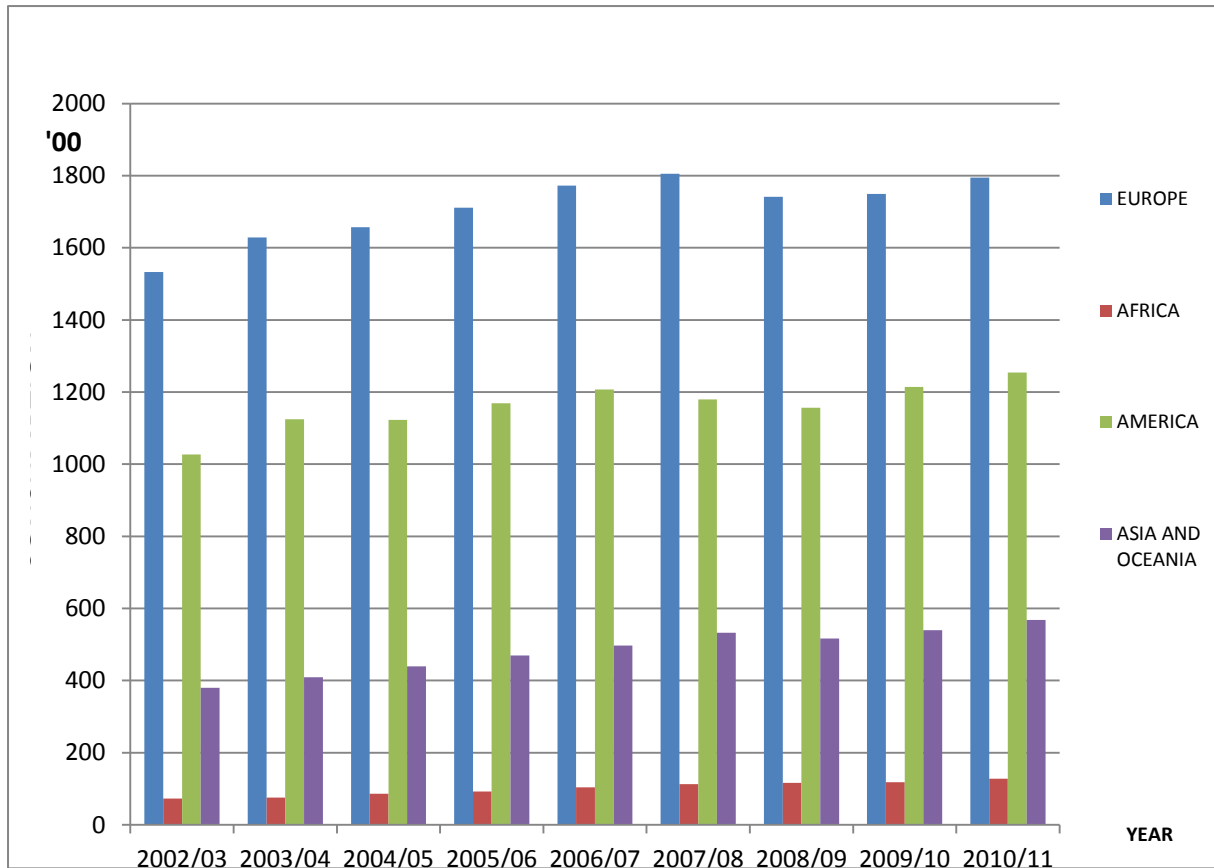
Figure 2.9: Trend in Global Consumption of Chocolate Products (Source: CAOSBISCO, 2012)

According to Figure 2.10, the global chocolate market expanded by about 10% over the period representing an annual growth of 1.2%. The increase in the standard of living in major chocolate-consuming nations, and the use of targeted promotional campaigns, has contributed to the rise in chocolate consumption. However, the chocolate market shrank by 2.4% in 2009 mainly due to the effects of the global economic crisis (ICCO, 2012). In terms of per capita consumption, the United States, Japan and Brazil lagged behind even small European nations such as Estonia and Lithuania, which consumed 6.21 kg and 5.40 kg per head in 2010.

In real terms, the global chocolate market grew from $52 billion in 2002 to $102 billion in 2011 (Euro monitor, 2012). The potential for further growth in chocolate consumption stems from the youthful populations and rapidly expanding middle

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classes of the BRIC nations of Brazil, Russia, India and China. In China, where chocolate is increasingly used as gifts, the expanding middle-class population of more than 300 million people constitute a major opportunity for growth in chocolate consumption. The Asian chocolate market is projected to account for about 20% of world chocolate consumption by 2016 (ICCO, 2012). On a regional basis, the European countries control 48% of the global market followed by the Americas at 33% and Asia at 15%. The African region, however, exhibited the highest growth potential with an increase of 74% followed by the Asian region with an increase of 50% over the period 2002 to 2011 (ICCO, 2012).

Table 2.1 shows the leading global players in the cocoa and chocolate market in 2012

Company	Market share ($ millions)
Mars Inc (USA)	16,800
Mondeléz International Inc (USA)	15,480
Barcel SA, division of Grupo Bimbo (Mexico)	14,095
Nestlé SA (Switzerland)	12,808
Meiji Co Ltd (Japan)	12,428
Hershey Foods Corp (USA)	6,460
Ferrero Group (Italy)	5,627
Chocoladenfabriken Lindt & Sprüngli AG (Switzerland)	2,791
August Storck KG (Germany)	2,272
Yildiz Holding (Turkey)	2,200

Table 2.1: Market Share of Leading Chocolate Makers (Source: Candy Industry, 2013)

The downstream consumer market chain of chocolate products can be categorised into three groups in terms of the business interest of manufacturers (UNCTAD, 2008). The first category represents a number of branded consumer chocolate makers who operate in the global context. This segment is dominated by known companies such as Hershey, Nestlé, Kraft, Mars and Ferrero, which have extended their reach to most global markets for branded chocolate products. There is also a number of smaller and medium-sized gourmet and artisanal chocolate makers who have over the years created niche markets. Large cocoa processing companies such as Barry Callebaut, Cargill and ADM have also moved into the downstream consumer chocolate-making business. Barry Callebaut, for instance, manufactures chocolate under the brand names Alprose, Sarotti, Sprengel, Jacques and Brach's. Developments in the retail sector also mirror the general trend of consolidation that can be observed in both upstream and downstream processing and manufacturing segments of the cocoa value chain (UNCTAD, 2008). Branded chocolate products are distributed through a worldwide network of warehouses and distribution centres supported by technology-based delivery systems. Chocolates are generally sold through convenience stores, petrol stations, food retail outlets, wholesale outlets and supermarket chains. Supermarket chains are the largest retail outlets for chocolate products, accounting for about 80% of retail in France (Euromonitor, 2010). The rapid consolidation of the retail sector at both domestic and international levels gives the large retailers a firm grip on the supply chain.

2.2.9   *Cocoa Processing and Chocolate Supply Network*

In order to serve the chocolate markets described in Section 2.2.8, cocoa is processed into various intermediate and finished products. The cocoa processing stage is critical

for traceability and for the preservation of other attributes. The cocoa processing and chocolate manufacturing industry is consolidated compared to the number of cocoa suppliers in the value chain (UNCTAD, 2008). A few cocoa processing firms dominate the cocoa processing chain because of the overlap of functions. The firms are vertically integrated and are involved in other upstream activities in the supply. These include cocoa sourcing, cocoa processing and manufacturing finished chocolate products. The different stages involved in the transformation of cocoa into finish products are shown in Table 2.2.

STAGES	ACTVITIES
One	The cocoa beans are cleaned to remove all extraneous material.
Two	To bring out the chocolate flavour and colour, the beans are roasted. The temperature, time and degree of moisture involved in roasting depend on the type of beans used and the sort of chocolate or product required from the process.
Three	A winnowing machine is used to remove the shells from the beans to leave just the cocoa nibs.
Four	The cocoa nibs undergo alkalisation, usually with potassium carbonate, to develop the flavour and colour.
Five	The nibs are then milled to create cocoa liquor (cocoa particles suspended in cocoa butter). The temperature and degree of milling varies according to the type of nib used and the product required.
Six	Manufacturers generally use more than one type of bean in their products and therefore the different beans have to be blended together to the required formula.

STAGES	ACTVITIES
Seven	The cocoa liquor is pressed to extract the cocoa butter, leaving a solid mass called cocoa presscake. For the manufacturer to produce presscake with different proportions of fat, it is required that the amount of butter extracted from the liquor is controlled.
Eight	The processing now takes two different directions. The cocoa butter is used in the manufacture of chocolate. The cocoa presscake is broken into small pieces to form kibbled presscake, which is then pulverised to form cocoa powder.
Nine	Cocoa liquor is used to produce chocolate through the addition of cocoa butter. Other ingredients such as sugar, milk, emulsifying agents and cocoa butter equivalents are also added and mixed. The proportions of the different ingredients depend on the type of chocolate being made.
Ten	The mixture then undergoes a refining process by travelling through a series of rollers until a smooth paste is formed. Refining improves the texture of the chocolate.
Eleven	The next process, crunching, further develops flavour and texture. Crunching is a kneading or smoothing process. The speed, duration and temperature of the kneading affect the flavour. An alternative to crunching is an emulsifying process using a machine that works like an eggbeater.
Twelve	The mixture is then tempered or passed through a heating, cooling and reheating process. Prevents discolouration and fat bloom in the product by preventing certain crystalline formations of cocoa butter developing.

STAGES	ACTVITIES
Thirteen	The mixture is then put into moulds or used for enrobing fillings and cooled in a cooling chamber.
Fourteen	The chocolate is then packaged for distribution to retail outlets.

Table 2.2: Stages of Activities Involved in Transforming Cocoa into Chocolate (Source: ICCO, 2012)

The cocoa processing industry shows that cocoa processing firms have moved into the more lucrative upstream manufacturing of chocolate (UNCTAD, 2008). Thus the business of cocoa processing firms can be grouped into three main categories: physical cocoa sourcing and trading; the production of semi-finished products and covertures production for third parties; and the production of branded consumer-market products. As evidence of consolidation grows within the cocoa-grinding segment, it is estimated that two-thirds of total global cocoa grindings are undertaken by eight firms (UNCTAD, 2008). Figure 2.10 shows the global share of the top eight cocoa processing companies.
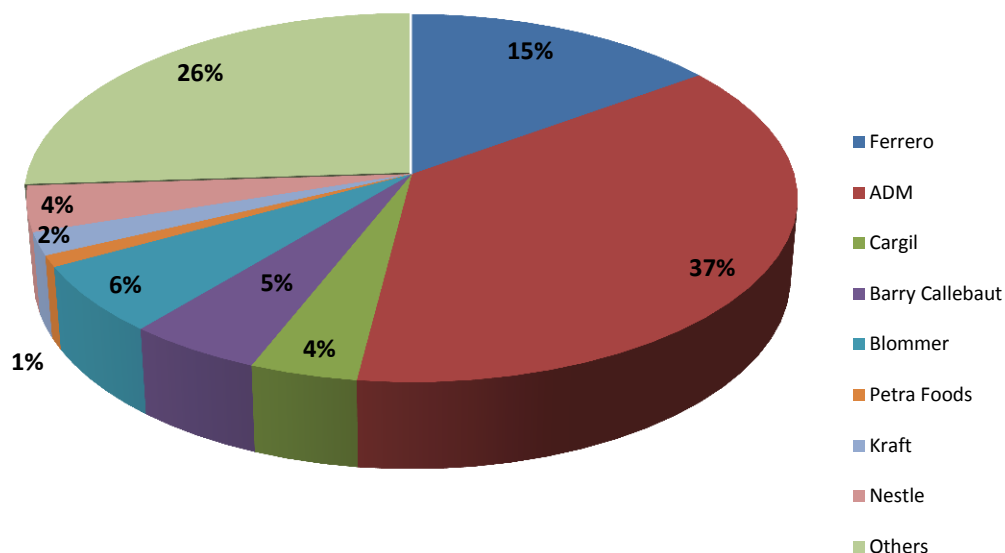
Figure 2.10: Market Share of Top Eight Cocoa Processing Firms (Source: UNCTAD, 2008)

The business consolidation witnessed in the processing sector, caused by corporate mergers and acquisitions, is designed to achieve economies of scale and competitive cost advantage. The increasingly stringent quality measures, and the product and delivery requirements, underscore the need for continuous investment in research and development. There is also a need to be competitive with costs as part of a sustainable business model in the processing sector. The creation of synergies across the industry and the development of expertise in logistics can result in cost savings that reinforce the competitive position of firms.

According to data available for industrial chocolate, also known as the couverture manufacturing segment, three-quarters of the world market for industrial chocolate is controlled by four companies, Barry Callebaut, Cargill, ADM and Bloomer, with Barry Callebaut alone contributing 40% of the total global supply of industrial

chocolate (UNCTAD, 2008). Mergers and acquisitions, as well as takeovers of smaller companies by larger global conglomerates, have also contributed to cocoa processing and chocolate industry consolidation. The reported trend of consolidation in the cocoa processing sector has led to a shorter supply chain, which can lead to better traceability of cocoa products to the origin of the cocoa beans. The following section will discuss the cocoa system in Ghana in the context of traceability within the supply chain.

2.3   Overview of the Cocoa Sector in Ghana

Ghana is the world's second-largest cocoa exporting nation, accounting for about 21.7% of the world's bulk cocoa export from 2006 to 2011 (ICCO, 2012). The cocoa sector in Ghana is of vital importance to the economy, employing about 800,000 'smallholder' farmers (Anim-Kwapong and Frimpong, 2010). Gockowski *et al.,* (2010) estimate that cocoa provides a livelihood for some 6.3 million people in Ghana, representing about 30% of the country's population. The supply chain for cocoa in Ghana is a dynamic network of organised sectors, comprising public institutions, private sector firms, farmers, individuals, technology, financial resources, information and services. Cocoa supply chain activities play an important role in the economy of Ghana as a contributor to job creation and the balance of payments. Coulombe and Wodon (2007) indicated that the performance of Ghana's cocoa supply system in recent years is contributing to poverty reduction within the country and helping it to achieve its Millennium Development Goals (MDGs). Table 2.3 shows the contribution of cocoa to the total export earnings of the Republic of Ghana.

2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
27.15 %	24.26 %	25.08 %	33.98 %	55.1 %	32.58 %	33.72 %	25.00 %	19.77 %	23.06 %

Table 2.3 Contribution of Cocoa to the Export Earnings of Ghana (Source: ICCO, 2012)

The growth in demand for the traceability of cocoa in Ghana has led to competition among traders to take advantage of emerging new markets. The drive towards the traceability of cocoa is motivated by a number of factors, including market forces, food safety, supply chain management and a response to emerging public concerns (Trautman *et al.,* 2008). The increase in consumer demand for differentiated chocolate products has also contributed to the growth in demand for source-specific chocolate products. Special characteristics, such as the environment, and social and cultural practices at cocoa's source, have become marketing features. In particular, the specific attributes of a cocoa source have become an important tool for chocolate marketing. The drive for traceability systems in commodity supply chains is supported by a stringent legislative regime governing international trade. In this context, the government of Ghana signed a Memorandum of Understanding (MoU) with a local cocoa-buying company in 2008 to implement a pilot project for the traceability of cocoa in Ghana. By 2012, four additional local cocoa-buying companies have signed a MoU to implement traceability systems for cocoa in Ghana. The sale and export of Ghana's cocoa under traceability labelling has increased from 5,000 metric tonnes in 2008 to about 45,000 metric tonnes in 2011 (COCOBOD, 2011).

2.4   The Structure of Ghana's Cocoa Supply Chain

The institutional mechanism for the traceability of cocoa in Ghana is structured on a Public-Private Partnership (PPP) between the Ghana Cocoa Board and private sector actors. The Ghana Cocoa Board is a state institution of Ghana, established by law to regulate all aspects of the cocoa supply chain. Individual farmers, cooperatives, licensed buyers, middlemen and cocoa processors constitute the private partners for traceability.

There are intermediary public and private institutions that supply inputs, services, quality control, transportation and auditing of private traceability standards. Inputs such as fertilisers and agrochemicals are supplied by approved private suppliers after successful testing of the products over three years. Figure 2.12 shows the service connections within the cocoa supply chain of Ghana.

KEY

QCD – Quality Control Division of COCOBOD

LBC – Licensed Buying Companies

CMC – Cocoa Marketing Company

Hauliers – Transporters of Cocoa
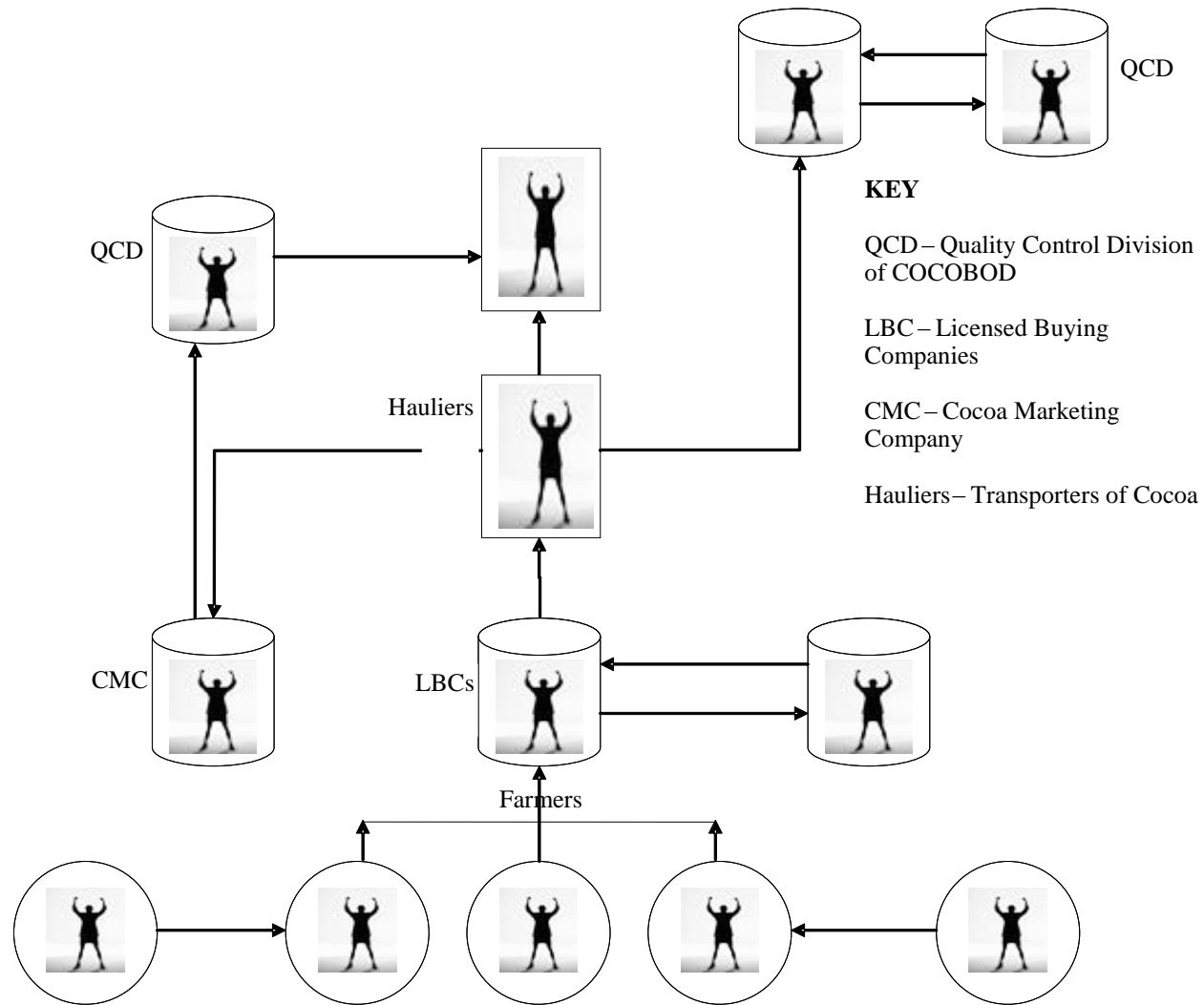
Figure 2.11: Cocoa Supply Chain in Ghana (Source: World Bank 2011)

Figure 2.12 describes the public and private sector links in Ghana's cocoa supply system. The cocoa chain in Ghana begins with farmers and extends to the factory gate of a cocoa processor. In between are the activities of middlemen known as the LBCs, and the Ghana Cocoa Board which regulates quality and marketing. In the cocoa supply channel, the unique identity of the produce is maintained at the different stages of custody until the cocoa reaches the factory gate of cocoa processors.

The supply network of cocoa in Ghana has been developed around the Ghana Cocoa Board, which plays a central role. The divisions of the Ghana Cocoa Board together with private sector actors provide resources, technology and services to keep the supply chain running. The Ghana Cocoa Board's presence both in functional and regulatory capacities attests to the importance that the government places on cocoa. The primary suppliers of cocoa in Ghana are the farmers who obtain inputs such as fertilisers, chemicals and seedlings from a network of providers and public sector actors. The farmer then sells cocoa to the LBCs, which act as middlemen in the supply chain network. The LBCs rely on services such as haulage, financing and warehousing from a network of private and public sector institutions. The Quality Control division of the Ghana Cocoa Board takes cocoa through a series of quality assessments before it is handed over for sales and export by the CMC. The CMC, which is the marketing arm of the Ghana Cocoa Board, sells and delivers cocoa to international cocoa trading houses and cocoa processors in Ghana and abroad. The cocoa processors transform the cocoa into various intermediate and finished products for local consumption and for export.

The ability to trace and track cocoa rests on an understanding of the activities of the supply chain actors. The key actors in Ghana's cocoa supply chain are the farmers, the

middlemen, the processors and the regulator. The role of these actors in the cocoa sector of Ghana is discussed in this chapter.

2.4.1 *The Regulator: The Ghana Cocoa Board*

The role of the Ghana Cocoa Board (COCOBOD) within the cocoa supply chain in Ghana is to facilitate the supply and marketing process of cocoa. COCOBOD regulates private sector activities within the cocoa supply chain. It is the central administrative body operating and providing services and resources to the various aspects of the cocoa supply chain. COCOBOD operates through specialised divisions and subsidiaries targeted towards the farmers' side of the supply chain as well as private sector businesses in marketing, logistics and processing. The specialised divisions of COCOBOD which perform the pre-harvest supply function for cocoa include the following:

- The Cocoa Research Institute of Ghana (CRIG)
- The Seed Production Unit (SPU)
- The Cocoa Swollen Shoot Virus Disease Control Unit (CSSVDCU)

The post-harvest supply functions, which comprised marketing, logistics and quality assurance, are organised under the following subsidiaries of COCOBOD:

- Cocoa Marketing Company (Gh) Limited (CMC)
- Quality Control Company Limited (QCC)

The quality control and cocoa marketing services of COCOBOD are central to the traceability of cocoa in Ghana. The activities of the Cocoa Marketing Company and the Quality Control Company of COCOBOD are discussed in the following sections.

2.4.1.1 Quality Control Company Limited (QCC)

Preserving and maintaining a high cocoa quality standard is central to the existence of COCOBOD. As with many other commodities, geographical indicators showing cocoa's place of origin depict product quality and reputation. In the cocoa supply chain, a reputation for quality is important and generates a premium or discount when the product is traded on the international market. In addition to the relatively higher fat content of Ghana's cocoa, which results in a higher cocoa butter yield, the low level of defects such as mould, slates and debris are measures of quality. Compared to cocoa from other producing countries, Ghana's cocoa commands a premium of about 5% relative to cocoa from the Ivory Coast on the basis of NYSE/LIFFE market information (Gilbert, 2009).

In order to maintain high quality standards within Ghana's cocoa supply chain, the Quality Control Company inspects and provides certification for storage facilities belonging to intermediary licensed buyers in the supply chain. The QCC also grades cocoa on the basis of samples and provides preservation seals on the bags in which cocoa is stored. Also, prior to the shipment of cocoa to overseas destinations, the QCC re-evaluates quality and ensures that containers and the holds of ships are sufficiently free of infestation. In effect, the QCC performs superintendence and phytosanitary functions at all stages of the cocoa supply chain.

2.4.1.2 Cocoa Marketing Company (CMC)

The CMC is a subsidiary of COCOBOD. It controls the marketing of cocoa and undertakes price hedges using the cocoa futures markets to protect farmers from excessive price fluctuations and other market volatilities. This protection is the most

cited reason for the establishment of the Ghana Cocoa Marketing Board (CMB) in 1947 (LMC, 1996). This logic is particularly supported by the events of the cocoa hold-up by farmers, due to fluctuating and low market prices, during the Second World War (Gunnarsson, 1978). Thus, the cocoa supply chain management structure in Ghana has established a monopoly for the sale of cocoa to foreign buyers, out of which a fixed annual local purchasing price is determined.

To undertake the sale and supply of cocoa to international markets, the CMC is structured in such a way as to manage forward price hedges and the shipment of cocoa from Ghana to international destinations. After establishing a contract of sale, the CMC allocates the various contract units to be carried by sea to different destinations. The cocoa stored in warehouses are carefully chosen from organised storage units in order to meet sale contract specifications. The shipments are accompanied by the relevant shipment and payment documentation. In response to the evolving structures and changes within the cocoa supply chain in Ghana, CMC has over the years expanded its role to include the receipt of cocoa purchased from farmers and delivered by middlemen licensed buyers.

CMC takes delivery of graded and sealed cocoa procured by LBCs and stores it in facilities at export centres known as take-over centres. Currently, the organisation operates three take-over centres where all cocoa supplied for export is temporarily stored before it is shipped to various destinations abroad. The CMC interfaces with cocoa hauliers (who transport cocoa), shipping lines, port authorities, insurers, destination inspectors, bankers, and cocoa processing and trading companies. The changing modes of shipment have led to cooperation with the private sector to provide facilities for the loading and storage of cocoa in bulk.

2.4.2 *The Cocoa Farmers*

The cocoa farmers are the primary suppliers within the supply chain of cocoa in Ghana. In the international chocolate value chain, famers are fundamental to the supply chain even though the farmers' share of the average milk chocolate bar in the UK is estimated at 4% (Gilbert, 2007). Anim-Kwapong and Frimpong, (2010) estimated that some 800,000 cocoa farmer families in Ghana, mostly smallholder farmers, own an average of three hectares of land. Furthermore, only 38% of these farmers have a legal title to their land (Hainmuller *et al.,* 2011). Productivity per hectare of land is 400 kg, and the average daily household income from cocoa activities is $0.42. An additional $0.62 is obtained from non-cocoa activities (Asenso-Okyere *et al.,* 2007). Cocoa is cultivated in six regions of Ghana, namely the Eastern Region, the Western Region, the Central Region, the Ashanti Region, the Brong Ahafo Region and the Volta Region. The supply distribution of cocoa in Ghana has shifted since the beginning of the commercial production of cocoa in Ghana in the mid-nineteenth century (Amanor, 2010). Amanor (2010) further indicated that the leading source of supply of cocoa in Ghana has moved to the four regional forested zones in Ghana.

The south-eastern corridor of Ghana started as the leading source of commercial cocoa supply in the Akuapem and Krobo districts. The conditions for supply, especially the revenue from the newly found cash crop, encouraged commercial farmers to explore new land westwards to the Ashanti region of Ghana. The remuneration offered to labourers by commercial farmers also attracted labour from the neighbouring countries of Mali and Burkina Faso. These labourers moved among

the regions to help establish the production and dominance of cocoa in Ghana (Amanor, 2010). Figure 2.13 shows the supply distribution of cocoa in Ghana.
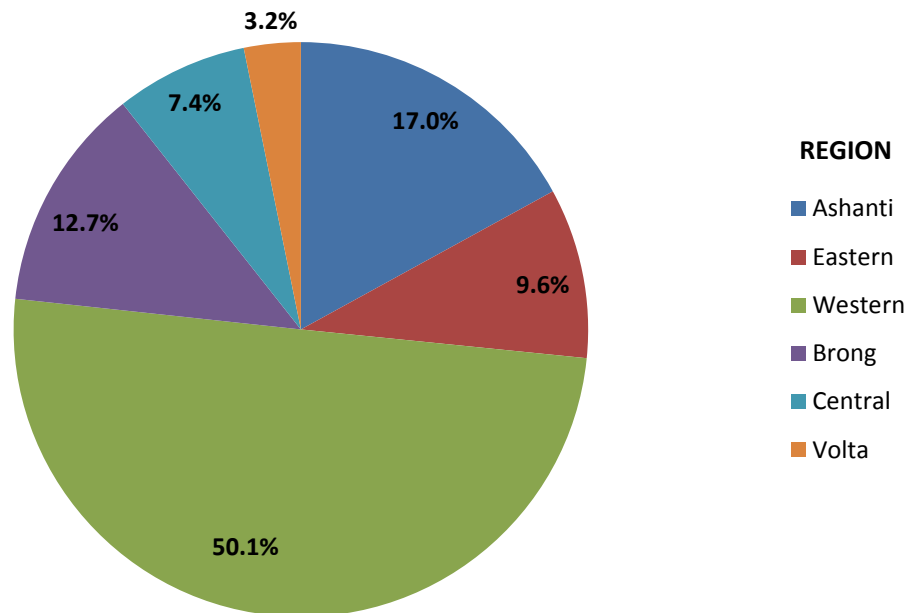
Figure 2.12: Regional Distribution of the Supply of Cocoa 2009–2011 (Source: Ghana Cocoa Board)

The Western Region of Ghana accounts for more than 50% of the total cocoa supply in Ghana. The Western Region alone produced 525,000 metric tonnes of cocoa out of Ghana's 1 million tonnes of cocoa production in 2011 (COCOBOD, 2011). The region has 75% of its vegetation within the high forest zone of Ghana and accounts for 44% of the total closed forest. The Western Region covers 23,921 sq. km, representing 10% of the total land area of Ghana. Of the other regions, the Ashanti Region is the second largest supplier of cocoa, while the Volta Region supplies the lowest amount of cocoa.

2.4.3   Middlemen Cocoa Buyers

In Ghana, middlemen, also called LBCs, purchase cocoa direct from farmers. LBCs are privately owned businesses which purchase cocoa from farmers at the farm gate at a guaranteed floor price. COCOBOD regulates the activities of LBCs and sets annual margins as compensation for their operations. COCOBOD undertakes offshore borrowing which is disbursed to LBCs at an agreed interest rate so that cocoa can be purchased at the farm gate. The LBCs buy cocoa at local society buying centres where the weight and quality of the cocoa is determined.

The cocoa is then moved to larger district sheds owned by the LBCs where the Quality Control Company of the Ghana Cocoa Board tests and grades the cocoa, and seals the bags. The LBCs then organise the haulage of the cocoa from their private depots to designated port centres called the take-over points. These are operated by the Cocoa Marketing Company, a subsidiary of COCOBOD. LBCs bear the responsibility for cocoa in transit until it has been handed to the CMC at the take-over points. There are 34 registered LBCs operating in Ghana, and the operation of the top six is illustrated in Figure 2.14.
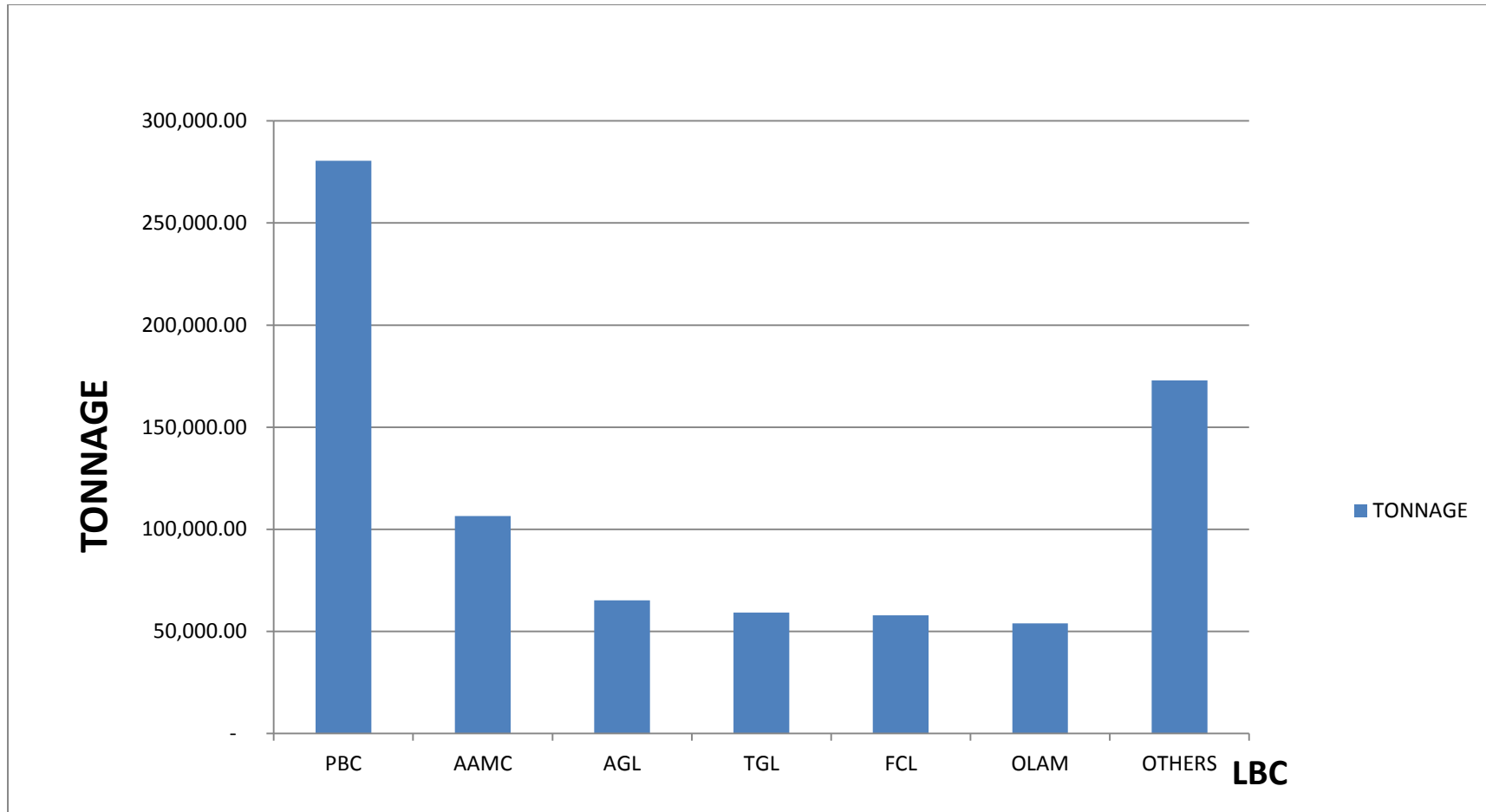
Figure 2.13: Market Share of LBCs (2009-2011) (Source: COCOBOD, 2012)

About 13 LBCs operate in Ghana and purchase a minimum of 2500 metric tonnes of cocoa annually from farmers. The Produce Buying Company (PBC), hitherto a subsidiary of COCOBOD, dominates the market and controls nearly 60% of all cocoa purchases in Ghana. The closest competitors are foreign-owned firms, Armajaro Ghana Limited and Olam Ghana Limited, which operate as LBCs in Ghana. These firms leverage their international networks and are able to obtain relatively cheap financing from abroad. As the competition among LBCs has increased, different types of incentive have been introduced to influence farmers and build loyalty. Incentive packages such as credit facilities, cash, material gifts and bonuses are paid to farmers. Other inducements include extension services as well as enrolment into niche market programmes with the promise of extra premiums.

Asenso-Okyere *et al.,* (2008), in a study of the cocoa chain in Ghana, concluded that among the leading reasons for farmers choosing a particular LBC are prompt payment, the offer of credit facilities and trust. The key success factor for LBCs, however, is based on the ability to optimise margins by operating efficiently.

2.4.4 The Cocoa Processors

There are eight cocoa processing companies operating in Ghana with an installed capacity of 370,000 metric tonnes (COCOBOD, 2011). There is mixed ownership of cocoa processing facilities in Ghana that includes foreign investments in cocoa processing plants. The main players in this segment are the global cocoa processing giants such as Archer Daniels Midland (ADM) and Cargill of the USA, and Barry Callebaut of Switzerland. The other players in the segment comprise firms owned by Ghanaians and includes Plot Enterprise, Niche Cocoa (formerly the Commodity

Processing Industry Limited) and the Cocoa Processing Company. West African Mills (WAMCO), Afrotropic Cocoa Processing and Real Products Limited have different levels of Ghanaian and foreign ownership. Table 2.4 shows the list of cocoa processing facilities and their installed capacities.

Cocoa Processing Companies	Installed Capacities (Metric Tonnes)
Cargill (Ghana)	65,000
Barry Callebaut (Ghana)	65,000
ADM (Ghana)	35,000
WAMCO	80,000
CPC	64,500
Plot Enterprises Ltd	32,000
Commodity Processing Industry Ltd	15,350
Afrotropic Cocoa Processing Ltd (ACPL)	12,500

Table 2.4: Cocoa Processing Capacity in Ghana (Source: World Bank, 2011)

Cocoa in Ghana is processed mainly into primary and secondary products such as cocoa liquor, cocoa butter and cocoa cake. A limited proportion of cocoa is converted into tertiary products of chocolate and other beverages for the domestic market. The intermediate products of liquor, cake and butter are sold to international chocolate and confectionery manufacturers abroad. The firms, which are part of international processing conglomerates, apply special marketing arrangements to their products in accordance with their parent companies. The cocoa processing firms source their cocoa supplies from the CMC, which sells different grades of cocoa that it has received in its warehouses. The firms also source cocoa from other areas such as the Ivory Coast, Togo and other countries in the West African region. Cocoa for the

factories is warehoused and segregated into production lots so that it can be traced in the event of contamination and product recall.

2.4.5 *The Scope of Cocoa Traceability in Ghana*

The European Union, the United States and Japan are Ghana's three most important cocoa trading partners. Following several publicised food scares in these markets, the need to identify the sources of food has become an important issue in cocoa trade. The general requirement for traceability includes the documentation of all stages of the supply chain from production to distribution. This works on the 'one-step-forward', 'one-step-backward' approach whereby records of operators to whom cocoa is supplied and from whom cocoa is received are taken.

The scope of the cocoa traceability system in Ghana starts from the level at which farmers and farms are located. This involves organising farmers into traceability cooperatives. Licensed buyers are the middlemen within the supply chain who coordinate traceability at farm level. Licensed buyers further cooperate with international sourcing companies. This cooperation serves as the marketing link between domestic and international markets. In performing the traceability management role, the middlemen design and provide resources, equipment, technology and software platforms upon which the traceability programme runs. The supply chain activities of operators in the supply chain are recorded, and shared with downstream retailers and consumers.

The information required at farmer level includes the name of the farmer, the farmer's passbook number, the volume and value of cocoa produced, and a record and estimate of farm input. In some cases, information on the use of agrochemicals and fertiliser,

as well as ecological and social issues, is collected. This information is used as a baseline database for the farmers' traceability system. The facilitating middleman develops identity marks. These usually reflect the company, the region, the district and the society so as to identify each bag of cocoa. Further to this, the buyer keeps data of any vehicular movement of the cocoa at all levels of the supply chain. When vehicles laden with traceable cocoa arrive at the export ports, the identity of the cocoa is verified on arrival for consistency with the information manifest. The information on the cocoa's origin is captured and cocoa is offloaded and stacked on the basis of arrival and source particulars. During loading of the batches for shipment, the history and detailed particulars captured for traceability are transferred to any intermediate or final off-taker.

There is no legislative requirement to implement traceability in the cocoa sector of Ghana. However, private standards emanate from the market guides of operators involved with the internal design of traceability systems. Priority information includes the name, location and nature of activities involved in the cultivation of the cocoa. Information on the different stages of handling in the cocoa chain of custody, and transaction and delivery dates, are also of priority. Information on volume, quantity, batch number and other supplementary product details are provided. Information on fertilisers, agrochemicals and other cultural interventions is kept as well. However, the literature is not clear about the length of time for which information relating to traceability can be kept. Nonetheless, because of the nature of cocoa processing and the chocolate retail cycle, it would be prudent to keep information for up to five years. The key institution which regulates traceability systems and practice in Ghana is COCOBOD. However, private sector operators and specialised non-governmental

organisations have supported farmer groups and networks with the aim of achieving traceability and sustainability in the Ghanaian cocoa sector.

2.4.5.1   Farmer Networks and Organisations in the Cocoa Chain

Even though cocoa farmers are fundamental to the cocoa supply chain, they remain the weakest link in terms of influence within the cocoa supply network (Gilbert, 2010). Farmer groups and cooperatives exist within the cocoa supply chain as a way of improving farmer influence and welfare in the network. There are a number of farmer groups in Ghana's cocoa sector which are formed to serve specific interests and objectives. Some of the prominent farmer groups in Ghana are the Kuapa Kokoo cooperative, the Cocoa Abrabopa cooperative, the Mars Partnership for African Cocoa Communities of Tomorrow (iMPACT), the Cocoa Organic Farmers Association, and the Nyinahinin Sustainable Cocoa Production and Community Empowerment Project. These farmer groups and networks are involved in cocoa traceability as part of the farmer programmes.

Kuapa Kokoo is one of the world's largest farmer-based organisations with a membership of more than 45,000 farmers operating in 937 communities, spanning five out of the six cocoa growing regions in Ghana. The cooperative operates on a democratic principle whereby leadership of the group is elected from among its members. It has various arms responsible for the provision of credit and banking services to members, the trading and marketing of produce, and the implementation of projects stemming from produce premium income. Kuapa Kokoo has an interest in the Devine chocolate processing factory in London where chocolate products from the company are sold under a fair trade certified label.

The Cocoa Abrabopa Association is made up of 18,000 farmers with the aim of working together to meet the needs of members as well as achieving a stronger market position. It operates on a public-private partnership basis, where private input suppliers provide input to farmers on a credit basis. Farmer training and capacity building programmes are part of the objectives of the association. Farmers also receive business training and assistance for small-scale business ventures which augment the revenue from cocoa farming. The cocoa produced by the association is labelled as certified and sold on the international market at a premium, which is used to develop farming communities.

Organic cocoa farming in Ghana has gained prominence in recent years. Cocoa farmers are organised into groups and trained to produce organic certified cocoa. The Cocoa Organic Farmers Association was formed in 2006 in Akwadum-Brong Densuso in the Eastern Region of Ghana. The group was formed with the support of the Dutch-based Rabobank Foundation to build capacity and to improve the livelihood of about 350 cocoa farmers in five communities. In 2011, cocoa from this organic farmers' network contributed to 200,000 organic milk chocolate bars for HEMA's Return to Sender chocolate project. The Aponoapono Biakoye Organic Cocoa Farmers Association (ABOCFA) is another organic farmers' network in the Aponoapono enclave in the Suhum Kraboa Coalter District of the Eastern Region of Ghana. The project has 400 farmers drawn from 13 communities and has the support of Cadbury on behalf of its organic 'Green & Black' brands.

The Mars Partnership for African Cocoa Communities of Tomorrow (iMPACT) is a network of farmers enlisted into the Mars development partnership framework. The network is made up of 10,000 farmers in 40 iMPACT communities in both Ghana and

the Ivory Coast. The farmers in the network have adopted sustainable agricultural practices and integrate shade trees and pest management techniques into cocoa farming. This has led to an improvement in cocoa quality for Mars bars, and increased productivity that has resulted in higher incomes.

The Cadbury Cocoa Partnership programme, sponsored by Cadbury/Kraft Company/Mondelez, empowers participating cocoa communities to take the lead in meeting their long-term social and economic goals. It involves youth-led community engagement work, community-based extension work and grants for pest control initiatives by member communities. The Sustainable Tree Crops Programme (STCP), supported by a number of multinational donors and firms within the global cocoa sector, has contributed to the improved livelihood of smallholder farmers. In these programmes, farmers are organised to address the social and environmental impacts of cocoa farming as well as to strengthen their management capacity. The STCP is modelled on community-based structures which focus on improving the livelihood of the farmer. Such networks of farmers within the cocoa supply chain contribute to the production and traceability of cocoa.

2.5   Summary

Cocoa is mainly consumed in Western Europe and North America as chocolate bar and confectionery products. Africa, especially West Africa, supplies 77% of the world's cocoa output (ICCO, 2012). The supply distribution channels for cocoa differ on the international market. Downstream activities in processed cocoa and chocolate markets respond to the supply chain arrangements for cocoa. Identity preservation and transparency systems remain a challenge in the global supply chain. Ghana is one of

the two leading cocoa suppliers in the world and accounts for about 22% of the global trade. The supply chain of cocoa in Ghana revolves around the Ghana Cocoa Board and its stakeholders of farmers, middlemen and cocoa processors. Traceability systems for cocoa have been built around the networks of these players in the cocoa sector. The aim of traceability systems is to achieve long-term sustainability in the supply of safe and sufficient cocoa to the global chocolate and confectionery industry.

Chapter 3: A Review of Theoretical Literature

3.1   Introduction

The aim of this chapter is to outline the relevant mix of theories which underpin this study. In line with the title of the study, an extensive amount of literature on transparency in supply chains was reviewed. Supply chain theories, framework design and risks were discussed. Literature on the concept and scope of traceability systems, and the motivations for implementing traceability systems, were also reviewed. Behavioural theories, technology and innovation acceptance theories, and decision-making theories were reviewed. This chapter underscores the application of theories to the empirical case study of traceability systems in Ghana's cocoa supply chain.

3.2   The Theoretical Context of the Study

The subject of transparency and traceability in the food supply chain has received attention in public policy and academic research in recent years (Schiefer, 2011). The awareness of consumer safety and sustainability issues in commodity supply chains has become topical in international trade. Reaching transparency depends on the degree of control and trust that exists about the origin of food and the processes in the food chain. Commodities traded across international boundaries present an even greater challenge for transparency because of the differences in information and regulatory mechanisms regarding food safety and ethical standards. Akerlof (1970) discussed information asymmetry as a major drawback in international trade. In this respect, information asymmetry in commodity supply chains remains an important barrier for achieving traceability and sustainability.

The increasing pace of globalisation and broader trade linkages can affect the control of supply chain networks. As a result, consumer interest groups demand that retail enterprises investigate the origin of food and provide information relating to production processes, procurement practices and the movement of food along the supply chain. In the cocoa chain, a number of individuals and groups are involved in traceability, although there are differences in culture, standards of living and ability. However, there are no uniform standards that regulate traceability across the length and depth of supply chains.

To explore this subject further, a number of studies were reviewed to understand transparency systems from the context of sociology and psychology (Jensen, 2001; Hofstede, 2003) as well as from the economic perspective (Krone, 2003). Many of these studies associate transparency with traceability systems, which provide information about what is produced and how it was produced. Traceability, according to the ISO protocol for food, is the ability to trace and relate the origin of materials and parts, the processing history, and the distribution location of the product after delivery (ISO 22005, 2007). In spite of variations in academic literature regarding a generally acceptable definition of traceability (Trautman *et al.,* 2008), this study applies the definition put forward by ISO 22005 since it sets out a broad guideline for the development of traceability policy and has been applied in the development of traceability standards by other international bodies.

Studies on traceability in food supply chains identified that the motivations behind the implementation of traceability systems include: cost–benefit incentives (Basarab *et al.,* 1997; Burh, 2003); consumer demands and market factors (Alfines and

Rickertsen, 2003; Barcos, 2001; Checketts, 2006); changes in regulations (Brester *et al.,* 2004); and the benefits of internal supply chain functions (Bailey *et al.,* 2005).

In a study of motivations for investment in traceability systems in the German agro-food sector, Heyder *et al.,* (2010) explored the psychological aspects of actors within a firm by applying behavioural theories. Their empirical work was based on a traceability model which was developed by Theuvesen and Hollman-Hespos (2005). The model was built on behavioural theories of the Theory of Reasoned Action (Ajzen and Fishbein, 1980), the Theory of Planned Behaviour (Ajzen, 1991) and the Technology Acceptance Model (Vankatesh and Davis, 1996). The present research also explores the behavioural aspect of supply chain actors in Ghana's cocoa supply chain with respect to the perception and implementation of traceability systems.

Schiefer (2011) identified that a knowledge deficiency among market participants affects and limits the development of transparency systems. Traceability builds on the availability of information that is shared and communicated to recipients. The common understanding about the actual information required, its packaging and uses still remains unclear among supply chain actors. Fritz and Schiefer (2010) identified key gaps and complexities in transparency systems in agro-food supply chains as follows:

- Information interest of consumers, policymakers and other stakeholders
- Information content, source, recipient, processing needs and formats
- Organisational, technological and intellectual requirements as well as legal and contractual rights to communicate information

To explore the motivations for the acceptance of traceability systems in Ghana's cocoa supply chain, and to address the gaps in literature with respect to implementing such transparency systems in the cocoa supply chain, this chapter is presented in five sections. The first section reviews the literature on transparency systems in commodity supply chains. This is followed by a discussion of the literature on supply chain systems, theories and processes, and a review of the cocoa value chain in international trade. Thereafter, the literature on traceability, as a fundamental measure of transparency in commodity supply chains is reviewed. The final section of this chapter reviews literature about the theoretical basis underpinning this empirical study on transparency and traceability systems in the cocoa supply chain in Ghana.

3.3   Transparency in Commodity Supply Chain Networks

The term transparency generally implies openness, communication and accountability in many disciplines. The review of literature on transparency in this section is limited to the perspective of transparency in the fields of economics and marketing, both of which are applicable to the study of transparency systems in commodity supply chains. Transparency in supply chain operations makes it easy for others to see what actions are being performed along the supply chain. It means the availability and supply of detailed and complete information of all market conditions to all participants (Krone, 2003). Market information relating to product and price is necessary for consumer choice and decisions. In commodity markets, three features differentiate product quality: product-oriented quality (i.e., physical characteristics); process-oriented quality (i.e., production and handling processes); and utilisation-oriented quality (i.e., subjective quality aspects as perceived by consumers). Transparency therefore allows for the disclosure of information pertinent to the

product and gives the buyer the opportunity to consider all risks and opportunities relating to choice. In psychology and behavioural science, transparency implies honesty and openness, which allows for the understanding of behaviour within an environmental setting (Hofstede, 2003). The effects and consequences of a decision or behaviour within the human environment are better understood by a greater degree of transparency. Transparency improves the global consciousness of cause and effect relationships, and enables human beings to be oriented in a complex environment because it seeks to meet targets in circumstances of uncertainty.

Gaining information and knowledge about an individual's environment is a motivational factor to prepare certain actions and behaviour, and forms a central aspect of the existence of a social system (Meyerhuber, 2001). As a multifaceted phenomenon, transparency means clearness and lucidity in the everyday sense. In this research, the definition of transparency is drawn from psychological and economic points of view so that it is situated within the objectives of the study. Supply chain management for commodities is particularly confronted by the need to reduce the risk of information asymmetry, enhancing consumer protection and gaining consumer trust.

Against this background, transparency in the commodity supply chain can be assured by legislation and laws passed by national governments. Hofstede (2003), however, characterised national legislation as a defensive tool which focuses on past events to allow for a rapid reaction in case of an unexpected chain outcome. That is why transparency and traceability systems are considered by some suppliers as being imposed by outside parties and government agencies on to the entire commodity value chain. However, the argument put forward by Hofstede (2003) sought to limit

transparency systems to traceability and international trade-related supply governance alone. A review of cross-discipline literature identified factors such as trust, communication, orientation and participation as important outcomes of transparency schemes in commodity supply chains. Transparency in supply chains can provide for voluntary sharing and exchange of information between businesses at operational and strategic levels.

In economic theory, complete transparency of traceability systems in supply chains is a critical requirement for competition, especially in a market environment where goods and services are freely exchanged (Krone, 2003). In reality, however, an environment of complete transparency remains an illusion because some level of uncertainty in the market environment encourages participants to avoid imitative behaviour and illegal arrangements that are counterproductive to market mechanisms (Jensen, 2001). Some degree of uncertainty amidst limited transparency is a feature of human decision-making in real life situations.

3.3.1 Determinants of Transparency in Supply Chains

Theuvsen (2004) classified the determinants of transparency into relational factors and structural factors. The structural factors relate to organisational issues within the supply network for the delivery of goods and services. The degree of transparency is influenced by the intensity of specialisation and process interdependence in the supply chain. Transaction frequency and the size of the supply chain network are considered to have an inverse relationship with transparency. Relational factors influence the quality of relationship and information exchange behaviour within the supply network (Theuvsen, 2004). Factors such as power asymmetries and tendencies for

opportunistic behaviour tend to limit the level of transparency among exchange partners. On the other hand, cognitive and emotional closeness, which emanates from trust, tend to improve information exchange and transparency. Transparency and trust are considered in the literature as sources of strategic advantage in a competitive business environment (Van Dijk *et al.,* 2003). However, it is not clear whether transparency builds trust or whether it is trust which improves transparency.

As a general framework, transparency and information exchange tend to improve the willingness to trust and to cooperate. Fentrup and Theuvsen (2006) identified two levels of transparency in supply chain exchanges: voluntary level transparency and obligatory transparency. Voluntary transparency is based on a strategic consideration of reciprocal information flow and leads to trust, which emanates from a common intention among partners. In the same respect, operation transparency, based on business activity coordination, leads to knowledge-sharing and trust. Obligatory transparency, on the other hand, can be based on the history of activities and processes in the supply chain. This type of transparency is calculated by the process of tracing and tracking systems, and leads to trust measured on economic calculations.

In process transparency, the necessity to trace and track in supply chain networks could result in mutually profitable relationships in the long term (Theuvsen, 2003). This form of transparency results in trust, which leads to cooperative behaviour among exchange partners. The absence of trust thus limits the extent of transparency in supply chain management (Hofstede, 2005). In pursuit of transparency, information cannot be guaranteed in the absence of trust. On the basis of this relational inter-dependence, Mayerhuber (2001) concluded that the precondition and the mediator for transparency in a business relationship is trust. On the back of this assertion, it is

important to examine the concept of trust as a mediator and precondition of transparency.

Rousseau (1998) explained trust as a psychological state of man, and comprises the intention to accept vulnerability on the basis of positive expectations of another person's behaviour or intention. The risk of being disappointed by another person's behaviour due to one's vulnerability is fundamental to trust. Trusting implies a conscious decision to avoid control. This means that the decision to trust someone also comes with the decision to eliminate the verification and checking of others' actions, intentions and behaviour. In sociology, trust is considered vital for the maintenance of cooperation and cohesion within society and is an important basis for behaviour (Zucker, 1986).

However, trust is built over time and requires reciprocal interaction to be generated successfully. Thus, trust-building starts by progressing from the impression of a less risky situation to a more important situation until a stable level of trust is manifested (Hofstede, 2003). In business relations especially, the development of mutual trust goes through stages, which means that to receive trust one has to trust.

Following from the above discussion, the mutuality of action and voluntariness of action are dominant manifestations of trust. If trust is a pre-condition and mediator for transparency (Mayerhuber, 2001), then the intention to share confidential knowledge, which is the source of power asymmetry and data, need not be compulsorily imposed. On the contrary, however, transparency measures such as traceability systems, which are often imposed from the external environment of the supply chain, contradict the relationship between trust and transparency.

Hofstede (2003) concluded that transparency systems imposed by governments inhibit the development of trust because of their institutionally obligatory nature. Traceability systems, which are considered as a measure of transparency, only serve to signal distrust among exchange partners within the supply chain because trust does not allow for tracing and tracking activities. Following from this, it can be concluded that voluntary information-sharing and balance of power as measures of transparency are important bases for building trust.

Therefore, the relationship between transparency and trust is unidirectional. Transparency in supply chains is a multidimensional concept which can be carried out at various degrees of depth. It requires information-sharing and trust within the supply chain network. At the same time, trust-building is equally enhanced by the existence of transparency.

3.4   The Nature and Performance of Supply Chains

Supply chain arrangements for commodities are the interconnections between networks, channels and notes from production to consumption. They include the design, planning, execution, control and monitoring of activities related to value creation. Supply chains have become fundamental to international trade and a major strategic component in the differentiation of products offered to markets. In today's competitive global market environment, supply chain management has become increasingly challenging. Hines (2004) proposed a customer-focused explanation for supply chains as the linkages that work together to create customer satisfaction at the end point. He maintained that a customer-focused approach to supply chains can

remove unnecessary bottlenecks and can result in chain performance management that provides additional value to customers.

Mentzer *et al.,* (2001), on the other hand, focused on systematic and strategic coordination across businesses for the purpose of improving long-term performance. Clearly, these authors differ in their view as to the actual driver of value and efficiency. While Hines (2004) considered the end customer as the key driver, Mentzer *et al.,* (2001) argued that a firm's determination to improve internal performance is the driver of supply chain functions. Lambert (2008) appeared to have embraced both schools of thought with a description of a global supply chain as an integration of key business processes for the purpose of creating value for customers, firms and other stakeholders.

Supply chain activities in cocoa are cross-functional in nature and include the movement of raw cocoa beans from farms to retail shelves as chocolate. Such activities embrace all the internal processes of farmers, middlemen and the processing of cocoa into chocolates, as well as the movements of the finished product towards the end customer. Organising supply chains involves a number of competencies and flexibilities within the supply channels. This has led to an increasing trend of outsourcing as a strategy that limits ownership and risk for complex international supply chains.

Greater uncertainties about the global supply systems of markets, shorter product and technology lifecycles, and the increased pace of outsourcing logistics partners have their own risks and exposures (Christopher *et al.,* 2002). These uncertainties and complexities can result in interventions, overreactions, mistrust, second-guessing and

the distortion of information throughout a supply chain (Childerhouse *et.al.,* 2003). As a result, there can be poor supply chain performance and high process variations that affect the entire network. Thus, supply chains are designed for agility and robustness, and at the same time increase their visibility and control.

There are several benchmarking models used in industry for understanding supply chain activities across the functional areas of organisations. One such model is the Supply Chain Operations Reference (SCOR) developed by PricewaterhouseCoopers LLP in 1996. SCOR is a reference supply chain model spanning the supplier to the end-user. It is a tool used to describe business activities associated with all phases of the supply chain process, using a set of activity building blocks. The second supply chain benchmarking model is an industry-neutral enterprise process known as the American Productivity and Quality Centre (APQC), which was deployed by the International Benchmarking Clearing House in 1992. The APQC allows actors within the supply chain to see their organisation's activities from a cross-industry viewpoint. The model is based upon the relationship between productivity, profitability and price discovery in supply chain management systems. There is a gap in the literature in respect of a single prominent theoretical basis for developing supply chains. For this reason, a number of authors have applied organisational theories to provide a foundation for understanding different aspects of supply chains (Halldorsson *et al.,* 2003; Ketchen and Hult, 2006; Lavassani *et al.,* 2009). The theories include Channel Coordination Theory, the Resource-Based View, the Knowledge-Based View, Agency Theory and Just-In-Time Theory among others. For the purpose of the study of the international commodity supply chain for cocoa, the Resource-Based View and Channel Coordination Theory are considered most relevant.

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3.4.1   Supply Chain Theories

As discussed previously, the supply chain theory of Channel Coordination aligns individual supply chain performance to its objective and provides the theoretical foundation for improving supply chain performance. It focuses on orders and inventory decisions for supply distribution among different actors. This includes a multiple decision alignment process, the alignment of information asymmetries and outsourcing in supply chains. The Channel Coordination Theory of supply chains was developed by Kumar (1992) and modelled on contract theory, in which economic actors construct contractual arrangements in the presence of information asymmetry. The theory supports the performance optimisation of supply chains by developing arrangements for aligning the objectives of different actors within the supply chain. This supports the control of the flow of information, materials, services and other relevant assets along the supply chain. This flow is controlled by contracts that regulate system-wide performance objectives. A second approach to understanding the implementation of the Channel Coordination Theory of supply chains is through the application of negotiation protocols. The negotiation approach enables iterative solution methods where partners regularly exchange proposals collaboratively to ensure mutual benefit. The negotiations typically deal with the critical nodes of supply chains in a collaborative manner. In the Channel Coordination approach to supply chains, a number of issues can emerge. These include the number of players in terms of customers, and suppliers at the different echelons of the chain where coordination is required. Another issue relates to the relationships and power relations of the players. The power relations in supply chains are influenced by several factors including information access, know-how, value creation and market access (Kumar,

1992). There can be cooperative behaviour or opportunistic behaviour depending on the duration of the relationship. In dealing with the coordination issues of supply chains, the use of independent and trusted third parties can be advantageous.

The Resource-Based View of supply chains primarily explains how the abundance of tangible and intangible resources at a firm's disposal can be transformed into short-run and long-run competitive advantages. These resources have to be mobile and heterogeneous but not perfectly imitable in order to support the Value-Based View of supply chains (Crook *et al.,* 2008). The individual characteristics of the resources are necessary but not sufficient to sustain competitive advantage. Instead, the weakest links of the chain within the framework of the Resource-Based View require a composite of the resource characteristics to be competitive (Bamey, 1991). The literature of the Resource-Based View can be traced to earlier research where emphasis was put on the importance of resources and their applications for firms (Rugman and Verbeke, 2002). A shift from a narrow neoclassical view of economics into a wider cross-disciplinary view of industrial organisation and organisational economics made significant contributions to the development of the Resource-Based View. Mahoney and Pandian (1992) and Lippman and Rumelt (1982) articulated a number of concepts that were integrated into it. The Resource-Based View of supply chains principally explains the ability of supply chain actors to deliver sustainable competitive advantage when their resources are managed in a way that the outcome cannot be imitated by competitors (Mahoney and Pandian, 1992). Priem and Butler (2001) criticised the Resource-Based View of supply chains by stating that the theory is self-verifying and considers competitive advantage as a resource-based value-creation strategy. They argued further that different resource configurations can

generate the same value for supply chain actors but cannot be a source of sustainable competitive advantage. On the basis of product markets, it was argued that the Resource-Based View has limited prescriptive implications.

Even though the different theories have contributed to the understanding and design of supply chains, it is believed that an all-embracing theory which takes account of organisational peculiarities in the presence of information technology is required (Deise, 2000). In the market environment, getting timely product information to customers at the right time can be important for competitive advantage and business survival. Christopher (2010) confirmed the importance of supply chains to business survival, and indicated that survival in today's business environment is no longer about competition between companies, but competition between supply chains.

3.4.2   *Supply Chain Design*

Supply chains are made up of a complex interplay of processes, sub-processes, activities and tasks which require careful design and management (Hammer, 2002). Christopher (2010) stated the need for making critical considerations to integrate the design of an individual supply chain into a larger network of activities aligned to achieve a particular goal. He further emphasised the need for collaboration and shared commitment among actors, even in competing supply chains.

The major considerations for the design of supply chains are the supply chain processes and the supply chain risks. Supply chain processes are a continuous and regular succession of actions, taking place or carried out in a defined manner and leading to the accomplishment of some objective in a continuous series of operations. However, this definition does not explain in sufficient terms the influence of space

and time, both of which bring order to the process with regard to input-output relationships. In essence, supply chains have a beginning and end within each specific task in a network of activities.

Hammer (2002) contradicted this assertion by claiming that a single definition may be insufficient to describe in detail the number of activities in a supply chain process. He indicated that supply chain processes are better recognised as groups of related activities that work together to generate value for the customer.

This means that due consideration is given to collective activities with a common outcome in the supply chain design process. The scale and scope of supply chain design processes vary from a simple set of tasks to complex sets of interrelated activities. They cut across organisational boundaries and comprise two elements: strategic and operational (Croxton *et al.,* 2001).

3.4.2.1   *Risks Considerations in Supply Chain Designs*

Risk is a major consideration in the design of supply chains. Risks in supply chains can be classified from different perspectives according to a firm's strategic objectives (Peck, 2004). Christopher and Peck (2005), however, proposed a general categorisation of risks into those internal to firms, those external to firms but internal to the supply chain, and those external to the network. Risks internal to firms emanate from supply chain processes and supply chain controls. They entail internal control systems that govern supply chain operations such as rules, systems, procedures and assumptions that expose the supply chain. External risks refer to actual or potential disturbances to the flow of information or products in a supply network but which are external to individual supply chains.

These sources of risk can reduce confidence and affect the performance of supply chains. In the design of supply chains, however, the integration of visibility and control systems can reduce risks. In the globalisation of supply chains, a number of actors and sub-actors in offshore sourcing contribute to the length and time required to complete a supply cycle.

Thus markets generally lack detailed knowledge of processes at different parts of the supply pipeline. Improving visibility in supply chain design involves a system of information sharing among supply chain members. Integrating traceability systems in the design of supply chains improves visibility and reduces risk. The ability to control supply chain operations tends to reduce risk identified by the visibility systems. George (2002) recommended 'Six Sigma' methodologies as helpful in identifying and controlling the risks of variability in the operations of supply chains.

Stiles (2002), however, criticised the 'Six Sigma' approach as being useful only to control risk in repetitive activities. He proposed a more flexible Supply Chain Event Management system which requires partners within the supply chain network to collaborate and to identify critical links or nodes in the supply pipeline across the network. The design of supply chains therefore integrates control limits at these nodes where the risk of variation of activities exists.

3.4.3   Supply Chain Framework and Structures

The supply of inputs may pass through a chain of different levels of suppliers on their way to the user. Also, output may pass through different levels of distributors and retailers before it gets to the final consumer. In recognition of this type of

arrangement, Ward and Peppard (2002) proposed that supply chains are often part of a larger and related supply network.

The supply chains of organisations may interact with those of third party logistics operators as well of those of competitors. As a consequence, supply chain management goes beyond an individual chain activity. It is about managing the chain of processes involved in the delivery of particular goods and services to the consumer (Lambert and Cooper, 2000). Supply chains as a network activity have influenced the nature of business activities among competitors and collaborators. They involve managing business relationships between collaborators and competitors with the aim of delivering value to the consumer. A successful supply chain system represents a coordination and integration of activities aimed at boosting the total process efficiency and effectiveness across the entire supply network (Croxton *et al.,* 2001).

In the face of many linkages, and interdependence among market participants within the supply chain network, competitive advantage lies in the ability to coordinate relationships effectively. The structure of individual activity within the broader network is critical for achieving this competitive edge. The key to achieving this competitive advantage lies in product and service differentiation, focus and cost leadership. Product and service differentiation determines the extent to which the product or service process appeals to the customer and how it differs from the other offerings within the same network. This involves understanding and anticipating customer preferences, and developing supply chain structures and processes to meet them.

In the cocoa supply network, the distinctive niche characteristics such as fair trade or certified traceability schemes require regimes within the supply chain structures and processes to meet market needs. Firms which have sustainable structures and supply chain processes tend to enjoy competitive advantage within the supply network.

Therefore, individual supply chain participants within the chain network must evaluate the linkages that are critical and beneficial to their competitive strategies and must develop structures and processes to sustain them. Developing the appropriate supply chain structures and processes requires the ability to share information and to leverage relationships with other actors within the supply chain network. The following discussion focuses on the impact of information sharing and relationships in a supply chain network.

3.4.4   *Information Sharing and Relationships in Supply Chain Networks*

The importance of information sharing cannot be underestimated in supply chains because it is information sharing that facilitates the collaborative relationships on which supply chains are built. Cooperation and collaboration between different units of the supply chains increases information exchange and develops relationships among actors. Stronger relationships between different aspects of the supply chain help to pool together specialised expertise and dispersed resources so as to build a sustainable supply chain. As a consequence, different types of relationships, ranging from one-off to a formalised partnership, have become prevalent in supply chain networks. Vertical integration through partnerships provides leverage based on shared expertise, information, risks and rewards. Thus partnerships require interactive and close relationships between supply chain partners.

Cooper *et al.,* (1997) considered that some features of partnerships in supply chains include joint planning, systematic operational information exchange, trust, shared benefits and burdens, shared cultures and shared control of tasks. Short-term relationships are associated with lean and periodic transactions aimed at achieving a particular goal. The social interaction in short-term relationships is rather limited.

Christopher *et al.,* (2010), however, suggested the need for a shift from narrow, economically rational, immediate-gain relationships to long-term, cooperative and mutually dependent ties in supply chain relationships. Jackson, Gorton and White (2009) found that one strategy for increasing trust in the supply chain is to provide regular feedback and to share performance data. Supply chain network relationships can also be characterised as middle-of-the-road depending on the degree of closeness and level of interaction. Teams made up of a small number of people also serve as facilitators of relationships in supply chains. Both within and between different organisations in the supply chain network, cross-functional teams with complementary skills work towards the performance of special goals and take responsibility for their actions. Teams bring knowledge and creativity, and have become successful in producing innovative and quality solutions.

Hammer (2002) supported this view, adding that for the common purpose of creating value within the supply chain, organisations should collectively work as a team of people rather than as individuals focusing on narrow tasks.

In conclusion, relationships within organisations and between organisations in the supply chain network tend to engender efficiency by pooling together dispersed skills and resources. This may result in different types of relationships which are sometimes

facilitated by functional teams. With the increase in global trade, supply chain networks and relationships cut across national boundaries and rely on information technology capabilities to share information and to build relationships. The issues identified from the review of the different aspects of supply chains also apply to the international cocoa supply chain.

3.5.   Concept and Scope of Traceability

Hofstede (2003) discussed the importance of changing demands for transparency in today's dynamic business environment. Traceability thus deserves prominence in agribusiness management studies because of its role in ensuring transparency in commodity supply chains. As indicated previously, the concept continues to evolve both in theory and in practice and has contributed to variations in the definitions of traceability. Different researchers define traceability from the perspectives of industry structure, business activity, geographic coverage, consumer perception, producer rights, time period, and legal and regulatory framework (Trautman *et al.,* 2008).

According to the ISO protocol for food, traceability is the ability to trace and relate to the origin of materials, the processing history and the distribution location of the product after delivery (ISO, 2007). Though the ISO definition has been widely used in literature, it posits traceability in general terms of tracing and tracking products and does not specify the characteristics of process precision that the concept intends to achieve. The generic sense of the ISO definition places less emphasis on quality and food provenance, but instead sets out the pathway for the ease of product recall in the event of food safety issues.

At the international policy level, disagreement continues to exist between the European Commission and the United States of America on the importance of food provenance and food safety in the definition of traceability at the United Nation's FAO/WHO food standards' body, Codex Alimentarius (Barling 2008). The European Union food law (178/2002) positions traceability as central to the governance of supply chain and food law reforms. It defines traceability in Article 18 of the European Commission (EC) European General Food Law as the ability to trace and follow food, feed, food production or substances intended to be or expected to be incorporated into food or feed, through all stages of production, processing and distribution.

In its definition, the European Commission seeks to clarify traceability by embracing the complete food supply chain network to enable operators to collaborate at different interfaces and sub-processes to meet the safety and quality expectations of consumers. The United States, however, rejects the total information concept, including information on raw materials, as necessary for traceability. The emphasis on tracing a product back along the food chain, mainly for reasons of product recall and safety concerns and as a risk management procedure for governing authorities, is favoured by the US (Barling, 2008).

While the debate on the appropriate framework for the definition and application of traceability continues, the Codex Alimentarius Commission defined traceability as the ability to follow the movement of food through specific stages of production, processing and distribution. The Codex definition is similar to the generic definition of ISO and does not provide specifications and standards against which traceability can be measured and implemented at the different stages specified.

Noting that the lack of a detailed definition of traceability has affected the possibility of establishing a common procedure for achieving food provenance, safety and assurance goals, the World Health Organisation and the Food and Agriculture Organisation have provided some meaning to traceability. They have defined traceability as a tool that may be applied within a broader food inspection and certification system as part of a risk management option for specific food safety or for fair trade practice. This definition introduces a new element, ethical trading practices, considered to have a similar weight of importance as food safety concerns in the food value chain. The definition also sets out a roadmap for certification along the supply chain, using a set of tools derived from tracing products back to their origin.

Variations in the definition of traceability are also prevalent in academic literature. In a study to understand the extent to which recall improvement, market response and regulations impact the perceived benefit of traceability, Dessureault (2006) applied the ISO definition, justifying that it is the one most widely used. Golan *et al*., (2004), however, criticised the broad definition of the ISO on the grounds that it lacked specification standards on measurement and location as well as the pathway of processes for information, technology and bookkeeping. Thus, they developed a definition for traceability that means a record keeping system designed to track the flow of products or product attributes through all stages of production, processing and distribution.

Even though Golan *et al.,* (2004) attempted to narrow down the meaning of traceability in their research to develop a framework on how the private sector meets social objectives of traceability, they proposed a definition that appears to perceive traceability from the channel of distribution to the consumer. Dickinson *et al.,* (2003)

also approached the meaning of traceability as the ability to track inputs used to make food products go back and forward to, and from, their sources at different levels of the marketing chain. This definition integrates identity preservation required for provenance certification while Hobbs (2004) introduced an element of distinction between ex ante traceability as information supplies on process attributes that verify product quality, and post ante traceability as the process of tracing a product to the source. A summary of definitions of traceability in the literature is presented in Appendix 1 of this study.

In the light of imperfect information exchange in the food supply chain, studies on traceability have been approached at different levels. Traceability can be carried out to the processor stage or to the final consumer stage, also known as farm–to–fork. A number of studies of traceability concluded that traceability should run from the farm gate to the processing stage (Bertolini *et al.,* 2006; Bollen *et al.,* 2007; Regatierri *et al.,* 2007). However, Ammendrup and Barcos (2006), in a study on the principal objective of traceability, its characteristics and depth, concluded that the application of the farm-to-fork or the consumer stage is the most revealing of the traceability concepts. Other studies (Becker, 2007; Davies, 2004; McKean, 2001; Moe, 1998) supported the view of Ammendrup and Barcos (2006) and concluded that traceability can only be established at the final consumer stage. Above all, the fact remains that achieving a robust traceability system in the food commodity supply chain is a complex task and often cannot be replicated between sectors. Despite this, traceability is the method for achieving end-to-end provenance in the food supply chain.

3.5.1   *The Traceability Framework and Technologies*

According to Engelseth (2013), food traceability systems in recent years have been developed to achieve seamless electronic processes that assure food safety through information technology. New and more sophisticated technologies are increasing the capacity to develop process and product differentiation to preserve distinct traits (Bourkalis *et al.,* (2011). Bourkalis *et al.,* (2011) further specified technologies such as telematics and radio frequency identification systems as the most promising way of product monitoring using real-time applications in food supply chains. Regatierri *et al.,* (2007), in their study to provide a framework for the identification of fundamental mainstays and functionalities of traceability systems, reported the traceability process as product identification, traceable data, product route identification and traceability tools. However, internationally recognised standards of ISO 22000:2005, Codex Alimentarius and GLOBAL GAP, and Global Food Standards and Safe Quality Foods (SQF 1000 & 2000) provide a codified guide to the implementation of traceability by prescribing core requirements.

By ISO standards, organisations operating traceability schemes shall trace the flow of all materials and ingredients used in production processes; identify and document the tracking of all stages of production storage and distribution; ensure adequate coordination between all actors involved in different stages; and ensure complete disclosure of processes by direct suppliers and clients. Out of the ISO guidelines, other traceability standards have been designed to trace and track the flow of products and their characteristics along the food chain. In general, the global standard for traceability requires a step-up and step-down approach to product tracing and tracking (Barling, 2008). The product tracking capability method allows a specific unit of a

product path to be followed through the supply chain, whereas product tracing identifies the origin pathway of a unit within the supply chain by way of referenced records (Regatierri, 2007).

In the implementation of traceability, the most common standard used is the EAN–UCC (European Article Numbering–Uniform Code Council) standards, which are now known as the GS1 Standards. Other traceability standards exist, depending on market norms, location, types of product and availability of technology. The fundamental technology component requirements include:

- Product identification and items associated with product data

- Product data carriers

- Data storage and transfer

- Data exchange and information transfer

The product identification requirement of a traceability system is the capacity to unambiguously distinguish one item from another by way of related and specific data information. Meaningful information can be generated from both qualitative and quantitative data features which accompany a product item. The data files can then be used for the purpose of tracing and tracking products. Data file carriers, and data storage and exchange, include handwritten paper-based systems, higher capacity two-dimensional bar/matrix codes, and advanced radio frequency identification (RFID) item data carriers and interchange systems.

The underpinning technology facilitates product identification as well as data and information interchange of traceability. The simplest form of product identification

and information is based upon human–readable quantitative and qualitative information, in the form of numbers and labels, communicated by hand to fulfil the requirement of one-up, one-down traceability. In more competitive business and credible supply chain environments with transactional transparency imperatives, there is progression from paper-based systems to automated identification and data capture (AIDC) systems, and the application of ICT systems, for the purpose of traceability.

Data captured by such systems is exchanged both vertically and horizontally between relevant agencies and businesses in the supply chain. An efficient information infrastructure and connectivity network among participants in the supply chain would enhance the ability to track and trace products.

3.5.2 *Motivations for the Adoption of Traceability Systems*

Traceability systems generally follow the flow of products and services from suppliers through production, distribution and retail to the last customer. Bourkalis *et al.,* (2011) have argued that financial information and purchasing data, which move in the opposite direction to the flow of products and services, also constitute traceability. The European Union food law (178/2002) considers all other ingredients intended to be used in the production of food products. These may include fertilisers, herbicides and other inputs as part of the traceability system. Information asymmetries in international commodity supply chains can influence product traceability in a significant way. To ensure the effective functioning of markets and to obtain competitive advantage, transparency and information exchange remain a key element. A number of studies have analysed the emerging concepts of trust, transparency and

traceability in food chains, but it is still unclear what exactly determines the adoption of traceability systems in supply chains.

Theuvsen *et al.,* (2005) identified six factors as the important determinants for the adoption of traceability systems. These drivers were further confirmed by Dessureault (2006) as: market differentiation strategies; business process improvements; risk management strategies; stakeholder demands; certification system requirements: and legislative requirement. These are now expanded upon below.

3.5.2.1 *Market Differentiation Strategies*

Product differentiation is one of the important factors mentioned in the literature as a reason for the implementation of traceability systems (Asioli *et al.,* 2011). For homogenous products such as cocoa, effective differentiations of the product in supply chains largely depend on origin and traceability attributes that are communicated to consumers. Casewell *et al.,* (2002) indicated that- changing consumer perception of product quality, and increasing the demand for differentiated products, have given greater impetus to traceability and private labelling of food.

Thus, traceability has gained prominence as a market differentiation strategy in the international commodity business. The origin of products and tracing labels provide information cues that help consumers to form opinions and to make purchasing decisions. Country of origin is a common resource in product differentiation and has a strong cultural link to product quality (Tregear and Gorton, 2005). A number of studies have concluded that consumers place value on traceability in purchasing a product. Caporale and Monteleon (2001) indicated that providing information on

sources of a product significantly increased its acceptability and created a positive perception of quality.

Loureiro and Umberger (2003) concluded that the willingness to pay a premium for traceable, labelled US steak and hamburger led to a rise in consumption of 38% and 58% respectively. Other studies in Europe also confirmed that consumer expectations underpin the adoption of traceability in supply chains. Roosen *et al.,* (2003), in a market survey in Germany, France and Britain, concluded that traceability, among other factors, is a strong demand attribute. Decisions about market differentiation and competitive positioning in product markets influence the decision to adopt traceability. Bernues *et al.,* (2003) found that the most important information for the European consumer includes nutritional and attribute elements such as traceability. Firms and traders thus escape price competition to a certain extent by creating distinct product niches and brands.

3.5.2.2 Business Process Improvement

In a survey about the German food industry, Gawron and Theuvsen (2007) reported that the adoption of a traceability system has a positive relationship with internal and external business processes including logistics, stock control, and improved quality. Business process improvement as a determinant of traceability is influenced by a firm's size, internal organisation, location and sector (Galliano and Orozco, 2008). Large firms usually have greater access to financial resources and benefit from economies of scale. Large firms also have a diverse workforce and a range of skill levels, and are receptive to technology and innovation compared to small firms. Firm size also determines the power to negotiate with suppliers and the ability to

implement supply chain improvement systems such as traceability. Rabade and Alfaro (2006) thus concluded that traceability activities employed by a firm have a relationship with its size and resources.

Internal and external organisational structures of firms are important drivers of business processes and traceability. Firms whose organisational structure relies on information technology as a tool for achieving competitive advantage and for business process improvements have a greater propensity to implement traceability systems. The multi-unit and multi-location structure of firms plays a positive role in the adoption of traceability as a supply chain improvement and control measure. The environment in which a firm is located can determine the willingness to adopt innovations to improve business processes.

Also, the level of specialisation in the area where a business is located could influence network relationships and collaborations with other firms. This collaboration, when extended to suppliers, can serve as the pathway for the adoption of traceability to improve business efficiency. A firm's sector of activity, including upstream and downstream relationships with stakeholders, and sector characteristics also influence the adoption of traceability.

The characteristics of the supply chain and product codes play a role in the choice of innovations to achieve competitive advantage. The roles of suppliers and downstream retail, and civil society regulations, remain an important element in the adoption of traceability systems. Firms take into consideration the general rules operating in a marketplace as well as civil governance standards in the design of traceability systems and other supply chain processes.

3.5.2.3 *Risk Management Strategies*

While the subject of risk was introduced in the discussion of risk consideration in supply chain design, it is worthwhile explaining the concept of risk as a motivation for the implementation of traceability systems. Risk, in decision theory, is a variation in the distribution of potential results and the probability of their occurrence (Arrow, 1965). However, the definitions and measurements of risk in literature vary from one field to another. In dealing with the globalisation of food marketing and simultaneously meeting changing consumer demands, trading companies tend to collaborate with suppliers and consumers within the supply chain. Risks and uncertainties become even larger and complex in the international supply of commodities such as cocoa (Doeg, 2005).

To mitigate supply chain risks, firms are motivated to adopt traceability systems as advanced risk management tools to alleviate the effects of the public recall of products and the resulting consequences (Doeg, 2005). Public recalls of products often come with legal and compensation payouts which affect organisational profit. Crisis communication within the supply chain, and the disposal of defective products, also require substantial media and process investments. Unstructured product recall results in attenuation of brand value, lower customer loyalty, and weaker competitive brand position. Traceability systems, however, tend to establish product identity, and pathways that allow for the identification of inputs, sources of defects and the location of affected products. Traceability as a transparency measure in cocoa supply chains tends to minimise incidents of recall and thereby strengthens cocoa supply chains.

3.5.2.4 Stakeholder Demands

Regulatory states have been developed as a feature of modern governance in the global economy. This is where states seek to expand their governance by utilising civil society and other non-governmental organisations. The private sector is passively directed to effectively self-regulate the supply chain within legal limits and standards. In Europe and other developed economies, central to the reform in food chain governance is traceability and provenance certification, which are taken up by civil society, consumer groups and other stakeholders. Manufacturers may be forced by stakeholders to implement or improve traceability systems intended for supply chains (Fritz and Hausten, 2008).

Powerful supermarket and retail chains can impose traceability and its standards on processors and suppliers in the food chain. Commodity financing regulations in the banking sector place emphasis on operational risk in the context of lending and require some level of traceability to influence the capital cost of supply chain participants. Other stakeholders, such as non-governmental organisations, are engaged in various campaigns to foster the adoption of traceability. These actions by stakeholders, pursuant to regulatory state concepts, motivate the adoption of traceability in supply chains. In the cocoa supply chain, consumer groups have actively campaigned against social and ecological issues regarding child labour and pesticide residues in cocoa. This has led to the upsurge of certification bodies that monitor the supply chain to report incidents of negative practices.

3.5.2.5 Certification System Requirements

The certification requirement for food products is based on ethical and safety concerns in the supply chain and the after-effects of consumption (Fritz and Canavari, 2010). While food safety matters are largely measurable, ethical concerns involve a range of subjective and objective values, against which certification standards are set. A system of measurement for both tangible and intangible values applicable to the particular sector can help in the drive towards sustainability in a commodity supply chain. As an all-encompassing concept, sustainability is aimed at protecting the environment to build economically viable and socially acceptable food chains (ICCO, 2007).

All consumers require safe food that meets their dietary requirements but not all consumers have access to safe food. The assurance of safe food requires that the entire processes in the food supply chain are transparent, verifiable and certified. A traceability system is required to trace and track products for which certification standards are needed. Traceability for the purpose of certification has turned international in scope, reflecting the length and depth of specific food chains. The retailer-led traceability certification standards have rapidly diffused through the supply chain and have tended to become mandatory for suppliers and therefore a motivation for adoption (Trautman *et al.,* 2008).

3.5.2.6 Legislation Requirements

The chemical and physical contamination of food, as well as contamination by biological agents, remains a risk in many countries around the world. The demand by civil society for high quality and ethical food has given impetus to governments to

enact regulations towards achieving food safety and security (Trautman *et al.,* 2008).

A number of OECD countries, including the European Community, the United States, Japan and Canada have enacted food safety laws and regulations with a view to influencing the entire supply chain for food and for food products.

Legislation such as the European Union Food Safety Law EC 178/2002 (EC, 2002), the United States Bioterrorism Act 2002 (US Congress, 2002), and the Japanese Food Safety Basic Law 2003 (Yokohama, 2007) underscore traceability as fundamental to food safety and credence assurance. The complex nature of international supply chains thus requires suppliers to meet domestic market legislation in all export destinations. In a competitive international market environment, suppliers are required not only to focus on regulations in their own countries, but also on those of other countries where their food or food products are consumed.

The need for traceability in the global food chain has become imperative for suppliers in other parts of the world. As an example, suppliers of cocoa products require Hala or Kosher accreditation if they intend to supply to specific markets. A number of mandatory and voluntary traceability schemes exist in many countries. These schemes are regulated by legislation or certification systems that set out the standards of operation. Examples of traceability schemes in England, Scotland, Australia and Japan are summarised in Appendix 4. These schemes often focus on animal products because of the propensity for contamination.

In conclusion, the changing consumer perception of food quality and the greater demand for transparency in food supply chains has contributed to the growing literature on traceability. The ISO protocol for food defines traceability as the ability

to trace and relate to the origin of materials, the processing history and the distribution location of the product after delivery (ISO, 2007).

However, the debate on a commonly accepted definition continues to evolve both in policy and academic circles. The fundamental features and functionalities of traceability systems include product identification, traceable data, product route identification and traceability tools. The processes of data storage and exchange can be carried out using basic handwritten paper-based systems, higher capacity two-dimensional bar/matrix codes, and advanced radiofrequency identification (RFID) systems. Theuvsen *et al.* (2005) and Dessureault (2006) identified factors such as market differentiation strategies, business process improvements, risk management strategies, stakeholder demands, certification system requirements and legislative requirements as motivating the adoption of traceability systems in supply chains. In the following section, the behavioural theories that underpin the perception of traceability systems will be examined.

3.6 Perception, Behavioural and Decision-Making Theories

It is fair to say that elements of perception, behavioural and decision-making theories are applicable in the context of Ghana's cocoa. This section discusses these theories because they underpin the theoretical framework of this study.

The subject of perception has been discussed extensively in literature. Sacks and Johns (2010) explained perception as interpreting the sensory impression of a phenomenon in order to understand it. Perception has three components: the perceiver, the target and the situational context. The perceiver's emotional state, motivations and experience influence perception. The emotional state of the perceiver

at the time, the state of need and motivation, and experiences and expectations influence the perceiver's interpretation of events. The ambiguity and lack of information about targets, and the context of a situation, greatly influence perception.

Bruner (1995) developed a model of perception that deals with a selection of cues about interpretation and the resulting perceptual consistency. According to Bruner (1995), when the perceiver encounters an unfamiliar target, he becomes open to information cues surrounding the situation. The perceiver, seeking information on which to base perception, will actively seek cues to resolve ambiguity. The perceiver encounters some familiar cues to form crude categorisations, which are refined with time. As categorisation becomes stronger, the perceiver becomes selective and ignores distortions that violate a stream of convictions. Perception thus becomes selective such that the perceiver begins to paint a constant and clearer picture of targets. Perception can influence behavioural patterns towards activities such as traceability systems.

A number of studies have applied behavioural theories to understand perceptions and motivations for implementing and investing in traceability systems in food supply chains (Theuvsen and Hollmann-Hespos, 2005b; Heyder *et al.,* 2010). These studies applied the Theory of Reasoned Action (TRA), the Theory of Planned Behaviour (TPB) and Technology Acceptance Theory. These theories have also been used extensively in agribusiness research and specifically applied to traceability studies relating to firms (Cebecci *et al.,* 2008; Heyder *et al.,* 2010; Theuvsen and Hollman-Hespos, 2005b). To understand the perception of supply chain actors towards traceability systems in Ghana's cocoa supply chain, this study applies behavioural theories to explain the perception of farmers, middlemen, the processing industry and

the regulatory authorities. There are a number of key terms to these theories, which are first defined.

Behavioural Intention and Behaviour. Behavioural intention is an assumed immediate antecedent of behaviour (Ajzen, 1991) and an indication of an individual's readiness to perform a given behaviour. It is based on an individual's attitude towards behaviour, perceived behavioural control and subjective norm, and acts as a predictor, weighted in order of importance in relation to the behaviour and social interest of the population. Behaviour, however, is the observable response of the individual towards a referenced target. Behaviour is a function of intention and the perception of behavioural control such that behavioural control moderates the effect of intention on behaviour. Favourable intention produces an expected behavioural outcome when perceived behavioural control is strong.

Behavioural Belief and Attitude towards Behaviour. Behavioural belief is a concept based on the subjective probability that behaviour will produce specified outcomes. It refers to an individual's belief about consequences of a particular behaviour. Attitude towards behaviour is an individual's assessment of self-performance towards a positive or negative outcome of a particular behaviour. The concept is based on the extent to which positive or negative behaviour is evaluated, taking into account a set of known behavioural beliefs which link behaviour to other attributes and outcomes (Ajzen, 2002).

Control Beliefs and Perceived Behavioural Control. Control beliefs refer to an individual's belief that the presence of factors may facilitate or impede the performance of behaviour. Perceived behavioural control, on the other hand, is

determined by the total set of accessible control beliefs relating to self-efficacy. Essentially, it is the individual's perceived difficulty or ease in performing target behaviour (Kraft *et al.,* 2005).

Subjective Norms and Normative Beliefs. Subjective norms refer to an individual's belief that a relevant society expects the performance of certain behaviour, or the perception of social normative pressures. Normative belief is an individual's perception to a particular behaviour, driven by considerations of the outcome of the behaviour (Burton, 2004).

3.6.1 The Theory of Reasoned Action

The Theory of Reasoned Action (TRA) is a predictive persuasion theory in social psychology that links attitude and behaviour. It postulates that the behaviour of an individual can be predicted by attitude and social factors (subjective norms) which are mediated by intentions. The social pressures emanating from personal and communal elements, known as 'normative beliefs', also influence intentions (Burton, 2004). Fishbein and Ajzen (1975) demonstrated the distinction between behaviours, intentions, attitude and knowledge, and further concluded that the fundamental indicator of behaviour is predetermined by intentions borne out of subjective norms and attitude.

The Theory of Reasoned Action is founded on the assumption that human beings are rational and make decisions based on information available to them. As such, the theory is based on an individual's thoughtful, rational and considered action, rather than influences of group action (Ajzen and Fishbein, 1980). This notwithstanding, TRA ranks among the leading theories in behaviour and attitude studies applied in

many fields of individual and firm research, including marketing, sociology and social psychology. Figure 3.1 below shows the basic pathway of TRA.
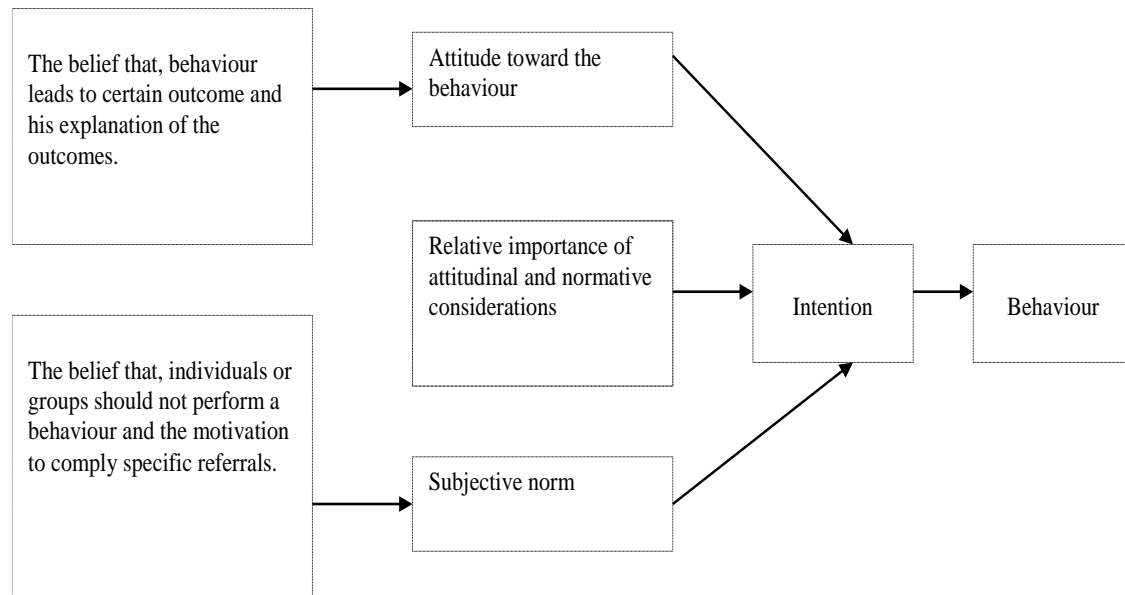
Figure 3.1: Pathway Model for the Theory of Reasoned Action (Source: Ajzen and Fishbein, 1980)

Despite the application of this theory to explain consumer choice and behaviour in the food and beverage industry (Thompson and Vourvachis, 1995), there are a number of studies which used the Theory of Planned Behaviour to explain behaviour in agribusiness technology and innovation. Rehman *et al.,* (2007) used the Theory of Reasoned Action to predict factors influencing the adoption of new technologies by dairy farmers in England. He identified farmers' beliefs as significant barriers to the adoption of technology. Thompson *et al.,* (1994) tested the TRA in a study of olive oil and adoption behaviour in British kitchens and concluded that attitude is the key predictor of behaviour compared to subjective norms. This did not contribute to the robustness of the model. Thompson and Panayiotopoulos (1999), using TRA to model

UK dairy farmers' feed buying habits, concluded that attitude improved the efficiency of the model most significantly and was a better predictor of behavioural intention.

Charing *et al.,* (1988), however, questioned the suitability of TRA to predict repeated behaviour. They tested models, using TRA to produce a good fit to support the prediction of intentions and behaviour for a one-off event. But they produced little evidence to show that TRA is useful in predicting repeated behaviours. It is the considered view of the author of this research that adoption of the concept of traceability is a one-off decision and that this can be supported by TRA.

3.6.2 Theory of Planned Behaviour

The Theory of Planned Behaviour partially informed this research. According to the Theory of Planned Behaviour, if an individual evaluates a behaviour as positive (attitude) and considers that 'significant others' expect the performance of that behaviour (subjective norms), there would be a greater intention and motivation to perform the behaviour. The subjective norm, which refers to the expectations of "significant others" informed this research in terms of behaviour of supply chain actors towards traceability systems in the cocoa supply chain in Ghana.

A number of studies do not show that behavioural intentions always lead to the performance of behaviour because of varying circumstances. Where behavioural intention cannot be the exclusive determinant of behaviour performance because of incomplete individual control, there is the need to introduce 'perceived behavioural control' to cover the volition for predicting behavioural intention and actual behaviour.

The Theory of Planned Behaviour (TBP) was developed as an extension of the Theory of Reasoned Action to the extent that 'perceived behavioural control' over a specific behaviour is included with 'subjective norms' and 'attitude' as a model construct in predicting intention. The key difference is that 'behavioural control' plays a central role in TPB as a predictor of intention. The concept of 'perceived behavioural control' originated from Self-Efficacy Theory, in which motivation, performance and feelings of frustration associated with repeated failures determine behavioural reactions (Bandura, 1977). Studies have indicated that self-efficacy is the same as 'perceived behavioural control' in an integrated model which also measured variables of self-efficacy in other studies (Ajzen, 2002).

Some studies have concluded that the Theory of Planned Behaviour was a better predictor of behavioural intention of farmers in agribusiness research than TRA (Jackson, 2008). Heyder *et al.,* (2010) studied the investment behaviour of German food manufacturers in traceability systems, using TPB to predict investment behaviour, and found that the model improved by using behavioural control factors. In the context of this overview of behavioural theories, the Theory of Planned Behaviour is a useful predictor of behaviour and is commonly applied in studies designed to understand the antecedent of a behavioural activity. This study relies on a combination of behavioural theories and decision-making theories to explain the perception of traceability systems in Ghana's cocoa supply chain.

3.6.3 Technology Acceptance Model

The choice of technology and innovation model depends on the coherence of activities, bearing in mind the goals of individual businesses within the supply chain. As discussed previously, adopting a technology infrastructure for activities requires organisational innovation to allow for the performance of the intended activity (Bocquet *et al.,* 2007). This can be applied to the study of traceability with respect to technology-based data capturing and dissemination processes.

Galliano and Roux (2008) and Battisti and Stoneman (2005) used technology models to explain the adoption behaviour of electronic–based traceability systems, using the equilibrium and epidemic models. Technology adoption models were previously used to explain ICT technology adoption in traceability systems (Galliano and Orozco, 2008) and can also be useful in the study of traceability systems in the cocoa supply chain of Ghana. There are two types of technology models: the equilibrium and epidemic models.

The equilibrium model explains the decision to adopt technology based on cost-benefit appraisal. It requires economic analysis by potential adopters who anticipate that the net benefit for adoption outweighs the net costs. This is based on the hypothesis that information on the technology is known and shared such that the heterogeneous nature of adopters remains the only factor that explains different adoption levels. The perceived benefit of technology depends on the adopters' characteristics and rank in the adoption order. Firms' needs for technology and propensity for adoption depends on size, financial resources, and present and expected market positioning (Galliano and Orozco, 2008).

The epidemic model explains the concept of adoption emanating from the predominance of information, and the way that information spillover affects the diffusion of technology. The epidemic model proposes that the more information that is available about technology or innovation, the faster the diffusion rate and the more numerous the adopters. It follows from the hypothesis that a potential user becomes a user of technology through contact and 'contamination' with an adopter. Thus, the greater the contact with adopters by non-adopters, the higher the probability of adoption.

3.6.3.1 Rogers' Diffusion of Innovations Theory

The concept of diffusion as described in the epidemic model is grounded in Rogers' Diffusion of Innovations Theory (Rogers, 1995). In this theory, the rate of adoption of innovation is impacted by five attributes: observability, triability, complexity, compatibility and relative advantage (Rogers, 1995). Rogers (1995) further states that with the exception of complexity, all other factors are positively correlated to adoption. The actual adoption is determined by the rate at which the innovation takes off and the rate of growth of the innovations. However, the cost of the technology can produce misleading outcomes, such that a relatively cheaper technology takes off much quicker that a more expensive technology. Research has, however, consistently found technical complexity, compatibility and relative advantage as the important antecedents to the adoption of innovation (Bradford and Florin, 2003; Crum *et al.,* 1996). Rogers (1995) described the adoption behaviour among different categories of people as S-shaped normal distribution. The different categories of adopters of technology include:

- Innovators, who are educated, venturesome and have multiple sources of information

- Early adopters, who constitute popular, educated and social leaders

- The early majority, who are those with many informal social contacts and are deliberate in their actions

- The late majority, who constitute a lower economic status of people who are skeptical and traditional in their approach

- Laggards, who are those who rely on their friends and neighbours for information

The categories identified in the S-curve generally represent the rate of adoption of innovation within the population. Technology adoption is a relevant theoretical contribution to the objectives of this study. However, it takes the ability of individuals or a group to make decisions to adopt innovations based on their perception.

3.6.4 Theory of Decision-Making

The perception of traceability systems in Ghana's cocoa supply cuts across different actors within the sector. The actors include individual farmers, middlemen, cocoa processing firms and government authorities. Theories such as individual theories, group theories, organisational theories and societal theories can be useful in explaining the perception of each set of actors in the supply chain. However, Carroll and Johnson (1990) indicated that decision-making theories embrace individuals, organisations and groups, and can go some way to explaining the perception of actors in the cocoa supply chain.

Rules regarding individual decisions are used in many circumstances for group or social decision-making (Freeling, 1984). This is illustrated by theories of legal decision-making, which do not distinguish between a single judge and decisions by several judges acting together as a court of law. The presumption is that groups act as if they were single individuals. Similarly, Freeling (1984) referred to decision-making by firms as if it were to be taken by a single individual decision-maker. Collective decision theory models show situations in which decisions are taken by two or more persons who may have conflicting goals or conflicting views on how the goals should be achieved. Individual choices are aggregated in a rational way into collective preferences.

Decision-making is goal-directed behaviour in the presence of options (Hansson, 2005) and can be applied in a number of academic disciplines including economics, statistics, psychology, agribusiness and social science. Decision-making theories can focus on individual decision processes or collective decision-making as in the case of group decision processes. The dominant feature of decision-making is the expected utility to be derived from the set of decisions. The section below discusses the theory of expected utility as an approach to decision-making.

3.6.4.1 Gardenfors-Sahlin and Levi's Decision-Making Theories

In making decisions under conditions of uncertainty, partial probability estimation involves some quantitative expression of the partial probability information (Ellsberg, 1988). Assigning partial probability can be approached by multi-valued measures, which represent numerical values between 0 and 1. A number of contemporary approaches have been developed in measuring decisions under conditions of

uncertainty. Levi's lexicographic test, developed by Isaac Levi (1980), assumes a permissible set of probability distributions and a permissible set of utility functions. Levi (1980) proposed three lexicographic order tests for uncertainty decision-making to include E-admissibility, P-admissibility and S-admissibility. This lexicographic test is built on Levi's Decision-Making Theory developed in 1974, which identifies the decision-maker's information about the state of nature. The information is contained in a convex set of probability distributions, which are referred to as permissible distributions. An alternative is E-admissibility where there is permissible probability distribution and permissible utility function such that their combination gives the best possible outcome. P-admissibility is possible in circumstances of E-admissibility where there is also opportunity for subsequent expansion to settle the decision subject by further enquiry. S-admissibility gives an option of an S-admissible situation with optimal security of decision-making amidst alternatives to the permissible utility function.

Gardenfors and Schlin (1982) proposed a decision-making theory which makes use of a measure of probability distributions that are serious possibilities. The theory measures a set of epistemic reliabilities distributed over a set of probabilities. The second step of the application of the Gardenfors-Sahlin theory is the probability assignment of the states of risk of decision outcomes. This led to the development of minimal and maximin rules for expected utilities.

Other measurements of decisions under conditions of uncertainty, relating to reliability-weighted expected utility, were developed (Howard, 1988). In such a model, if a multi-valued decision measurement is available, the weighted average probability is calculated by assigning a degree of reliability. Reliability-weighted

probability is applied in the same way as in the probability value used in decision-making under risk. A third approach to decisions under conditions of uncertainty is the Ellsberg's index, proposed by Ellsberg (1961). This index makes use of an optimism-pessimism index to combine maximum expected utility and reliability-weighted utility.

There are circumstances when decisions are made in the complete absence of information about the probability of the outcome. Under such circumstances, decisions are made under unknown but non-zero probabilities, or unknown possibilities. Due to the vague and elusive nature of uncertainty, the maximin principle was applied (Ellsberg, 1961). In this principle, the decision-making relies on the use of alternatives that have maximum security levels. The security level is the worst possible outcome with that alternative. The maximin principle therefore urges the choice of the worst possible outcome for decision security. This rule, in essence, illustrates extreme pessimism or prudence in decision-making.

An alternative in everyday life is the consideration of a middle way between extreme pessimism and maximum optimism. This was developed into the optimism-pessimism index (Levi, 1986). Another common approach to decision-making under ignorance is to reduce the risk of ignorance. This view is founded on the principle of insufficient reason, which states that if there is no reason to believe that one event is more likely to occur than another, the events should be assigned equal probabilities (Harsanyi, 1983). Harsanyi further criticised the principle of insufficient reason as not tackling the arbitrariness that is characterised with the choice of alternatives.

The perception of traceability systems in Ghana's cocoa sector is a behavioural attribute that is displayed by key actors in the supply chain. To this end, behavioural theories of the Theory of Reasoned Action (TRA), the Theory of Planned Behaviour (TPB) and the Technology Acceptance Model (TAM) were considered a useful theoretical basis to explain the behaviour of the actors within the cocoa supply network. Even though the behavioural theories of TRA and TPB were originally developed to explain the behaviour of individuals, they have been extensively applied in recent research to understand firm behaviour specifically relating to traceability systems in agribusiness (Cebecci, 2008; Heyder *et al.,* 2010, Theuvsen and Hollman-Hespos, 2005). The literature discussed the various concepts of TRA, TPB, decision theories and TAM, and justified their choice in understanding the behaviour of the cocoa supply chain in relation to the perception of traceability. The review of this theoretical background provided a further basis for the success of this research, and at the same time helped the researcher to understand the existing knowledge about behaviours and decision-making that allows robust research to be conducted on the perception of transparency and traceability in Ghana's cocoa supply chain network.

3.7   Summary

Establishing transparency for commodities traded across international boundaries presents a challenge for policymakers and traders because of the differences that exist in ethical and quality standards as well as in regulatory frameworks across supply chain networks. The supply chain is a collection of activities which interlink to support product or service delivery. Transparency in the supply chain network is best managed when traceability systems are put in place. This implies the ability to locate the sources and the channels of the movement of food and food ingredients within the

complex global supply network. The implementation of traceability systems in Ghana's cocoa sector can be affected by the perception formed by the actors in the supply chain towards the subject. To this end, literature on the behavioural theories of the Theory of Reasoned Action, the Theory of Planned Behaviour, the Technology Acceptance Theory and decision-making theories were reviewed to provide the behavioural basis of perception. From the review of the relevant literature, gaps were identified in the area of knowledge about traceability systems among food commodity producers. Heyder *et al*. (2010) identified the behavioural factors, which influence the willingness of industry to implement traceability systems. However, traceability cannot be complete if it is limited to industry-consumer side alone. It is a continuous process along the entire commodity chain from farm to the final consumer. This study extends the work of Heyder *et al* (2010) by building on the understanding of perceptions of traceability systems at the producers' end of the supply chain and the behavioural influences among cocoa producers in Ghana. Thus filling in the gap in literature and making contributions to scholarly knowledge of traceability systems. The theoretical framework in Chapter 4 is developed from this theoretical orientation.

Chapter 4: Research Framework and Methodology

4.1 Introduction

The purpose of this chapter is to outline the theoretical framework and the methodology which underpin this research. The research methodology sets out the criteria and the approach that was used to answer the research question. In answering the key research question, a key research proposition is developed to reflect the purpose and criteria by which the findings can be judged. In case study research, the application of theory is essential as it gives a blueprint for pursuing the purpose of the study (Yin, 2003). In this respect, a theoretical framework is developed from the previous theories which were discussed in Chapter 3.

This chapter discusses the research questions, objectives and the specific proposition of the study. It also outlines the theoretical framework and provides the justification for the choice of theories. The main research methodologies and the position of the case study methodology in this study are discussed. The theoretical and practical reasons for selecting a case study approach for this research are justified. Furthermore, the actual case study design is discussed. The design details the unit of analysis, the number of cases, the analytical strategy employed, the questionnaire design and the administration.

4.2 Research Questions, Objectives and Propositions

Specifying research questions is an important part of a research project because it influences the strategy to be employed in meeting the research objectives. It requires insights into the domain of study, particularly the literature and practice, and develops

the research questions. This enables the researcher to understand the research problems; to ensure they are worthy of investigation; and to establish the extent to which the findings contribute to the progress of research in the subject area.

Understanding the perception of traceability systems in commodity supply chains can become a source of business strategy-building and aid the development of international policy. The policy to achieve supply transparency, consumer protection and food security depends on the application of traceability systems. Food security, transparency and consumer protection are issues of priority outlined in the United Nation's Millennium Development Goals to end hunger and poverty by 2015 (UN, 2010). Fritz and Sheifer (2010), however, identified gaps in the knowledge about the transparency concept and what is entailed in commodity chains. In a study of the literature of traceability systems, Trautman *et al.,* (2008) identified differences in the perception of traceability systems by different actors. In pursuit of the differences in the perception of traceability systems, and the gaps in knowledge of transparency systems, this study seeks answers to the following questions:

1. How do different participants in the cocoa supply chain perceive traceability systems?

2. What are the factors of motivation for the implementation of traceability systems?

To answer the above-mentioned key research questions, the specific objectives of the research are:

1. To understand the perception of traceability systems in Ghana's cocoa supply chain

2. To find the factors of motivation for the implementation of traceability systems

3. To map the supply chain network in the cocoa supply chain in Ghana.

This study primarily seeks to understand the differences in perception of traceability systems and the factors of motivation for implementing traceability. In a study of traceability systems (Heyder *et al.,* 2010; Cebecci, 2008; Theuvsen and Hollman-Hespos, 2005) and behavioural studies in agribusiness research (Jackson, 2008), different behavioural constructs and variables were applied. Based on theoretical insights discussed in Chapters 2 and 3 and supply chain actors' varying understanding of traceability systems, differences in the perceived meaning, perceived usefulness, intention to implement traceability systems, internal and external influences are expected. The study explores how and why these variations occur by using five research propositions stated below;

   i.   Differences are expected in the perceived meaning of traceability systems in the cocoa supply chain in Ghana.

   ii.   Differences are expected in the perceived usefulness of traceability systems in the cocoa supply chain in Ghana.

   iii. Differences are expected in the intentions to implement traceability systems in the cocoa supply chain in Ghana.

   iv.   Differences are expected in the perceptions of variables internal to the theoretical framework of traceability systems

   v.   Differences are expected in the perceptions of variables external to the theoretical framework of traceability systems.

In order to address these research propositions, a theoretical framework was used to examine the specific issues of the propositions. The theoretical framework and the methodology applied are discussed in subsequent sections of this chapter.

4.3   The Theoretical Framework

The theoretical framework was used to provide the structure for how the research questions and propositions could be answered on the basis of the literature. This framework provided a guide to how the respondents' views were gathered and analysed. In qualitative case study research, where explanation building is sought from pattern-matching, existing theories were recommended (Yin, 2003). In developing the theoretical framework, prior related research on how similar concepts have been tackled was considered, and the approaches and lines of investigation were assessed. The pieces of related theories and concepts were gathered into a table to represent how and why traceability systems were perceived differently.

Sacks and Johns (2010) argued that perception could be viewed as the process of interpreting the messages of our senses to provide order and meaning. Perception is how people translate impressions into a coherent and unified view of the world around them. Even though information can be unverified or unreliable, perception is equated with reality for practical purposes to guide human behaviour. The perception of key individual members of an organisation generally influences behaviour towards particular events (Sacks and Johns, 2010). Other researchers assign causes, motives and attributes to explain behaviour. Bruner (1995) argued that dispositional attributes suggest personality or intellectual characteristics which affect perception, while situational attribution refers to the external environment's effect on perception. It is in

this respect that Denzin and Lincoln (2005) proposed a qualitative research paradigm to cope with the measurement of ambiguous latent variables used in understanding complex human processes.

From the above discussion, the perception of traceability systems can be posited as a behavioural study that requires behavioural constructs in a theoretical framework. In studies of behavioural aspects of traceability systems (Abatekassa and Peterson, 2011; Heyder *et al.,* 2010; Cebecci, 2008; Theuvsen and Hollman-Hespos, 2005), behavioural constructs were used in the conceptual framework. These constructs and attributes were based on behavioural theories, which were discussed in Chapter 3 of this study. In developing the rudimentary theoretical framework for this study, a tabular approach was adopted to categorise the theoretical attributes of the perception of traceability systems into three components: the internal factors, the external factors and the direct attributes of perception. This categorisation has been applied in previous behavioural studies (Heyder *et al.,* 2010; Jackson, 2008; Cebecci, 2008; Theuvsen and Hollman-Hespos, 2005; Corral, 2002). Internal factors relate to the perception of influences within the respondents' sphere of influence. External influences, on the other hand, are the perception of variables of traceability systems, a process which falls outside the direct scope of influence of the respondent. These two influences feed the general perception of attribute traceability systems and the willingness to implement traceability. Table 4.1 is the theoretical framework developed to explain the perception of traceability systems in the cocoa supply chain of Ghana.

CONSTRUCT ATTRIBUTES	THEORETICAL BASIS
INTERNAL FACTORS:	
- Gender, age, education, experience	-Jackson (2008)
- Knowledge of subject	-Jackson (2008)
- Income dependence	-McLeay and Zwart (1998)
- Location and size	-Fiegel (1993)
EXTERNAL FACTORS	
- As norm in the industry	Heyder *et al*., (2010)
- Marketing reasons	-Shulz and Tonsor (2010)
- Economic reasons	-Tan and Theo (2000)
- Relationship in the supply chain	-Shulz and Tonsor (2010)
PERCEPTION	
- Relative advantage	-Rogers (1995)
- Self-confidence and know-how	-Ajzen (1991); Rogers (1995)
- Complexity and compatibility	-Rogers (1995)
- Available support and advisory services	-Tan and Theo (2000)
- Risks	-Hardaker *et al.,* (2004)
- Intention to implement	-Ajzen (1991); Christian *et al.,* (2002)

Table 4.1: Theoretical Constructs of the Perception of Traceability Systems

Even though it is good practice to build a conceptual framework and to test the validity before applying it in academic research, this study only applied the framework as a theoretical guide to the research and to answer the research questions. The primary consideration for the choice of the theoretical construct attributes is the set of underlying theories. The behavioural theories of Reasoned Action (Ajzen, 1991), Planned Behaviour (Ajzen and Fishbein, 1980) and Roger's Diffusion of Innovations (1995) were used. Decision-making theories (Gardenfors and Sahlin,

1982; Levi, 1971) were also considered in the development of the theoretical framework.

The Theory of Reasoned Action (TRA) was chosen because it is founded on the assumption that human beings are rational, considered and thoughtful and that they make decisions based on the information available to them. In the context of this research, the TRA framework helps to explain the rationality underlying the assessment of traceability systems in the presence of alternative information available to supply chain actors from internal and external sources. The second behavioural theory is the Theory of Planned Behaviour (TPB). It postulates that decision-making behaviour is determined by evaluation of a phenomenon as positive or negative and by the consideration of expectations of important social actors. In this respect, the influence of international traders, opinion leaders in the cocoa industry and international cocoa organisations can influence the intention to implement traceability systems in the cocoa supply chain. Roger's Diffusion of Innovations Theory introduced important elements that influence the rate of adoption of innovation systems. The theory includes constructs of complexity, compatibility, know-how and the relative advantage of adopting traceability systems. The range of constructs and variables derived from theory and empirical studies were combined in the theoretical framework. Subsequently, the research methodology was aligned to the theoretical framework of the study. The justification for the choice of qualitative case study methodology in this study is discussed in the subsequent chapter.

4.4 Choosing the Research Methodology

In this section, different research methodologies and paradigms are reviewed. The decision about the choice of methodology for this research was supported by the relevant literature. By applying literature to the context of the research questions, a suitable methodology, a qualitative case study approach, emerged from the analysis.

Ellram (1996) classified research methodologies primarily into quantitative and qualitative depending on the nature of data and the subsequent type of data analysis used in the research. Table 4.2 shows the basic research designs based on the types of data and the analytical techniques used in the qualitative and quantitative research designs.

Primarily Quantitative	Primarily Qualitative
Survey data and secondary data in conjunction with parametric statistical analysis	Case studies, participant observation and ethnography characterised by limited statistical analysis, often non-parametric
- Simulation - Linear programming - Mathematical programming - Decision analysis	- Simulation - Role playing

Table 4.2: Types of Research Analysis (Source: Ellram, 1996)

The table suggested two types of data: empirical and modelling. Empirical data are gathered from real world circumstances mainly through the techniques of surveys and

case studies. Modelling data are manipulated through models such as simulation, linear programming and decision analysis (Ellram, 1996). Both types of data can apply quantitative or qualitative analysis.

Case studies are primarily qualitative and based on empirical data, and can be used to construct theories (Johansson, 2003). Theory development is based on two approaches: deductive theory testing and inductive theory building. The deductive approach, which is referred to as a phenomenological paradigm (Healy and Perry, 2000), is built on three sub-paradigms of critical theory, constructivism and realism. The second paradigm is the positivist paradigm, which understands reality through a 'one-way' mirror (Guba and Lincoln, 1994). Positivists believe that once gathered data are analysed the data do not change because they are being observed; therefore the findings are true and objective.

Critical theory criticises social, political, cultural, economic, ethnic and gender values. According to critical theory research, investigations are long-term historical processes. Critical theory research findings are value-based and subjective (Healy and Perry, 2000). Constructivists hold the view that reality is context-based and consists of 'multiple realities', therefore the research findings are probably true (Healy and Perry, 2000).

Case studies belong to the realism paradigm because case study areas are often contemporary and pre-paradigmatic (Yin, 2003). Therefore case study research is based on inductive theory building because of external reality and the realism of cases. This is different from the relativism aspects of constructivism and the critical theories approach to research. Healy and Perry (2000) further argued that the case

study method involves the perception of real world phenomena which are 'unobservable'; and since case studies address descriptive research questions rather than prescriptive, realism becomes the appropriate paradigm.

There are three elements to research paradigms: ontology, epistemology and methodology. Ontology is the 'reality' being examined by the research. Epistemology involves the relationship between the researcher and the 'reality' being studied.

VanWynsberghe and Khan (2007) proposed an entirely different logic. They suggested that case studies could be applied irrespective of different research paradigms (critical theory, constructivism, realism) and disciplines (social science, applied science, business, fine arts, etc.). Flyvbjerg (2006), on the other hand, stated that good social science enquiries are not methodology-driven but problem-driven. Therefore case studies enrich a social science enquiry with unexpected findings which quantitative methods alone cannot reach. The justification for the choice of case study methodology is discussed in Section 4.5

4.5   Justification of Case Study Methodology

The perception of traceability relates to how and why different people translate the impression of traceability systems. An understanding of the issues of perception of traceability within the cocoa sector satisfies the criteria for a case study because the literature proposed the use of case study when the study borders on a particular issue within a set-up (Noor, 2008). A case study approach was also selected for this research for a number of other reasons. First, it is considered that the overall objectives and research questions set out to establish how and why supply chain participants perceive the traceability of cocoa and why such traceability is perceived

in a particular way. Yin (2003) suggested two occasions for the choice of case studies: if the purpose of the research is to answer the 'how' and 'why' nature of research questions; and if it is necessary to discover the contextual conditions relevant to the reality in the study. In this respect, case study is especially applicable to the research. The researcher also sets out to understand the motivations for the implementation of traceability systems and to map the supply channel linkages in the cocoa supply chain. Therefore the main research objective and propositions were designed to understand the different perception of traceability systems in the supply chain. In considering the nature of the research questions and the underlying theories discussed earlier, the contextual approach to understanding behaviour, decision-making and supply chain networks was considered appropriate for the study.

Second, even though studies have identified differences in the perception of traceability systems (Trautman *et al.,* 2008; Shulz and Tonsor, 2010), there is limited research that seeks to understand the nature of the differences and why they occur. Schulz and Tonsor (2010) expressed the need to understand the perception of producers, who are the primary elements in the supply chain. Specifically, no research has focused on the perception of traceability systems in the cocoa supply chain in Ghana. Therefore, there was not sufficient literature to employ a quantitative approach for this research.

Third, methodological literature suggests that the case study approach is increasingly being used where researchers rely on mixed theories and logic models to deal with emerging or contemporary issues for which a single causal theory may not be sufficient (Patton, 2002). Case studies also allow the researcher to explore and address social intricacies that cannot be accounted for by other methodologies, and enable the

researcher to examine more closely a specific phenomenon in a holistic perspective (Eisenhardt and Grebner, 2007; Riege, 2003). Based on the above justification, the boundaries of the case study were defined to ensure that the 'case' was differentiated from the case study.

4.6   Setting the Boundaries of the Case Study

Once the decision was made to use a case study approach in this research, the boundaries of the case were defined. This helped to differentiate the 'case' from the case study. Differentiating a case from a case study as two distinct issues is important to a case study researcher (Johansson, 2003). A case study relies on the existence of a case in that a case is the object of the case study. In the simplest terms, a 'case' can be an event, an entity, an individual or a unit of analysis, while a case study is 'an empirical inquiry that investigates a contemporary phenomenon within its real life context using multiple sources of evidence' (Yin, 2003).

A case study is the most desirable method to investigate a phenomenon when the boundaries are indefinable between the phenomenon and its context (Yin, 2003). It provides a comprehensive understanding of a bounded system, event, activity or process with one or more people (Creswell, 2007). Case studies as investigations of how and why events occur can also be observed in a contextual reality. The case study method is appropriate when it is intended to explore and study an area in depth (Patton, 2002).

Taking the different viewpoints into consideration, a case study could be considered a trans-paradigmatic and trans-disciplinary heuristic that involves the careful delineation of the phenomena for which evidence is being collected (VanWynsberghe

and Khan, 2007). Furthermore, the case study is not about completely disclosing the case itself, but is about discovering the unit of analysis.

In consideration of the above points of view, the 'case' of this research is the cocoa supply chain of Ghana, while the case study is the 'perception of traceability systems'. To identify the units of analysis for the study of the 'case', the key players in the cocoa supply chain were identified. The actors are: the farmer, the middleman, the processor and the regulator. The units of case analysis were selected based on chain of custody consideration and supply chain theories (Kumar, 1992). Further details of alignment among the different actors in the cocoa supply chain were provided by the cocoa industry experts in Ghana. Therefore, the perception of traceability systems was studied in the context of farmers, middlemen, processors and regulators within Ghana's cocoa supply chain.

In case studies of perception, some researchers used open philosophical questions to solicit ideas from key supply chain actors relating to traceability (Shulze and Tonsor, 2010). This study, on the other hand, applied a theoretical framework which used different constructs and variables to capture the perception of traceability systems. Qualitative case study has developed over time to cope with the measurement of latent variables in understanding complex human processes and systems (Denzin and Lincoln, 1994). The variables which were applied in the theoretical framework of this study provided interpretive meanings with which the case study was measured. This approach was based on multiple theoretical orientations which provided direction as to how the case study was carried out. Rather than hypothesis testing, this study provided a set of propositions which were used to interpret the perception of traceability systems among the different case units. The propositions helped specify

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the things to be explored and enabled comparisons with the results of other studies. In order to conduct the case study, consideration was given to different types of case study. This allowed for the emergence of the appropriate category of case study strategy.

4.7   The Choice of Case Study Category

In order to decide on the category of case study to pursue for this study, different types of case study were reviewed. Also, different types of approach to meeting the purpose of the case study were outlined. The purpose was to provide a basis for a particular choice of case study strategy.

Yin (2003) classified case studies into single and multiple case studies depending on the number of cases used as units of analysis. Based on the overall purpose, a case study can be exploratory, explanatory and descriptive. However, there are no fine lines between these classifications in some instances because the different approaches merge into one another. Table 4.3 shows the meaning of different types of case study.

Type of case study	Definition
Explanatory	Presents a causal link between cause and effect. More often used when the research questions are too complex for a quantitative study.
Exploratory	Used when the reality being studied has no clear, single set of outcomes. Usually intended to define hypotheses and research questions of a subsequent study.
Descriptive	Used to describe a phenomenon comprehensively together with its real life context.
Multiple case studies	Employing more than one case in a single study. Used when a comparison is needed between cases based on a theory.
Single case studies	Focuses in depth on a single case.

Table 4.3: Definitions of Different Types of Case Study (Source: Yin, 2003)

The decision to adopt a particular category of case study approach is required prior to conducting the case study because this has an impact on the data collection design. A single case study is analogous to a single experiment, because many of the same conditions that justify experiment also justify single case study (Yin, 2009). A single case is used when it involves testing a well formulated theory and when the case is unique. Multiple case studies, on the other hand, are analogous to multiple experiments that follow replication logic. This approach can be used to show contrasting results by way of theoretical replication. Yin (2003) recommended the

application of a theoretical framework with a multiple case study strategy. As the major objective of this research suggests, understanding the differences in the perception of traceability systems required exploratory approach to compare contrasting results. The application of a theoretical framework is also compatible with the use of a multiple case study approach. Therefore, a multiple case study approach emerged as most suitable for this research. Multiple case evidences are found to be more convincing and have the advantage of examining the similarities and differences among different case units (Miles and Huberman, 1994; Yin, 2003). Having settled on the application of a multiple case study strategy for this study, the next step was to develop criteria for the case selection process.

4.8   The Case Selection Criteria

In the process of selecting cases for the multiple case studies approach outlined in the previous section, different parameters were considered. The relevant literature and theories, as well as advice from experts in the cocoa sector of Ghana, were used as a guide for case selection. The first criterion for the selection of a case was the ability to make decisions within the supply chain. The perception of respondents in decision-making roles could influence activities and operations within the supply chain. Also, in situations where the respondents formed part of an organisation, the perspectives of decision-makers could represent group orientation (Miles and Huberman, 1994). The second criterion was the selection of cases from the key actors along the cocoa supply chain. In defining the boundaries of the case study in Section 4.6, the key actors identified were farmers, middlemen, processors and regulators. This reflected the alignment processes of the cocoa supply chain and information flows between the

different nodes. The selection of cases from the boundaries also satisfied the chain of custody proposition in the value chain system (Hobbs *et al.,* 2004).

In consideration of the above, a total of 15 respondents were selected from the four key actor categories of the study. Miles and Huberman (1994) proposed that more than 15 sample cases in multiple case study analysis becomes unwieldy and provides too many data permutations for the researcher to scan visually. The following case selections were made.

1. Six individual farm-owner farmers from each of the major cocoa producing regions of Ghana who have implemented traceability or are involved in special cocoa initiatives which require traceability.

2. Four individuals who operate as middlemen at decision-making level and have implemented traceability or similar initiatives or are in the process of implementing traceability.

3. Two individuals who operate as cocoa processors at decision-making level who have implemented traceability or are in the process of implementing traceability.

4. Three individuals who have operated at senior level as regulators from the regulatory institutions of Ghana, and who are involved in policy and regulatory issues concerning traceability systems.

The literature suggested that sampling techniques in case study research are not statistically based and that such sampling does not usually have a foundation in theory (Eisendhardt and Graebner, 2007). Hence, the cases outlined above were purposefully selected to reflect the objectives of the study and the social settings of the respondents. Miles and Huberman (1994) believed that purposive sampling takes into

consideration a range of similar and contrasting features in intra cases. Eisenhardt and Graebner, (2007) supported such intra case polarity as increasing the internal validity of case study research. In order to select the specific cases, a list of key decision-makers among farmers, middlemen, cocoa processors and regulators were obtained from the Research Directorate of the Ghana Cocoa Board. With the help of the Director of Research and Extension Officers of cocoa districts, the individual respondents of the case study were identified. The overview of the respondents is presented in Section 4.9.

4.9   Overview of the Case Study

In this section, the profile of the 'cases' is presented. The selection of respondents was made by way of a purposive sampling technique to reflect the spectrum of activities in the cocoa supply chain in Ghana. With the selection of farmers, consideration was given to the four major cocoa growing regions of Ghana: the Eastern, Western, Brong Ahafo and Ashanti regions. Farmers were selected from the different demographic profiles that were made available to the researcher prior to the field study. The selection of middlemen, processors and regulators also followed a similar logic, and selections were made from the areas of operation and across the different features.

The respondents were drawn from southern Ghana, which is the study area of this research. The cocoa activities in Ghana are predominantly carried out in the southern half of the country. The southern half of Ghana is a forest zone that is suitable for the cultivation of cocoa. In addition, the seaports, warehouses and the operational area of the other players of the cocoa supply chain are also located in the south of Ghana. The researcher classified the educational background as 'high education' for a university

level education; 'low education' for up to primary school level education; and 'educated' for secondary level education. The profile of respondents is presented in Table 4.4.

Cases	Unit of analysis	Location	Characteristics		
			Age	Education	Experience
Case 1	Farmer/Owner	Fanteakwa/ER	45 years	Educated	15 Years
Case 2	Farmer	Sefwi-Wiawso/WR	57 years	Low education	20 Years
Case 3	Farmer	Goaso/BA	65 years	Low education	8 Years
Case 4	Farmer	Suhum/ER	62 years	High Education	12 Years
Case 5	Farmer	Obuasi/AR	65 years	Low Education	40 Years
Case 6	Farmer	Enchi/WR	67 years	Low Education	25 Years
Case 7	Middleman	Kumasi/AR	56 years	High Education	10 Years
Case 8	Middleman	Accra/GAR	62 years	High Education	3 Years
Case 9	Middleman	Accra/GAR	49 years	High Education	6 Years
Case 10	Middleman	Suhum/ER	50 years	High Education	5 Years
Case 11	Processor	Takoradi/WR	50 years	High Education	2 Years
Case 12	Processor	Tema/GAR	48 Years	High Education	8 Years
Case 13	Regulator	Accra/GAR	48 years	High Education	2 Years
Case 14	Regulator	Accra/GAR	56 years	High Education	12 Years
Case 15	-	-	-	-	-

Table 4.4: Overview of the Case Study Respondents

The profile of the respondents shows differences in the demographic features such as age, experience and levels of education. The differences were aimed at extracting different viewpoints which can be pooled together to answer the research questions. The use of a contact summary strategy (Miles and Huberman, 1994) suggested further areas to explore during the research process. Case 15 in Table 4.4 was discontinued because the respondent elected to opt out of the study when another round of interviews was requested to follow up on aspects of the initial interview. Thus, the final case study was conducted with 14 respondents and is discussed in subsequent section.

4.10   Conducting Case studies

This section explains the processes that were followed in conducting the case study research. First of all, a carefully structured interview guide was created, detailing the major themes, cross-follow-ups and anticipated follow-ups. The researcher received the support of the Director of Research at the Ghana Cocoa Board. The Director of Research facilitated access to the respondents of the case study and encouraged their cooperation. His role as the gatekeeper helped to gain local permission and to reach participants. Gatekeepers also validate case study research (Cresswell 2013). Identifying the interviewees who could best answer the interview questions was useful in obtaining quality research data (Miles and Huberman, 2013). A total of 14 interview guides were administered by prior telephone appointment with the respondents. A pilot interview was carried out with the Deputy Chief Executive of the Ghana Cocoa Board. This helped to fine-tune the interview guide. Testing interview guides by way of pilot studies prepares researchers against unanticipated outcomes and fine-tunes the interview guides (Yin, 2009; Creswell, 2013). The researcher also

relied on the experience obtained from the pilot study in the rehearsals of the interviewing process. The interview proceeded with the respondents in accordance with dates agreed through appointments. The researcher's position as an official of COCOBOD provided easy access to respondents. The interviewer ensured that all technical terms were clearly explained and that permission was granted in some cases to make audio recordings with a Dictaphone, mobile phone and iPod.

The researcher ensured immediate transcription and completion of contact summary forms after each interview as recommended by Miles and Huberman (1994). A sample of the contact summary is attached at Appendix 3. As an official of COCOBOD, the researcher enjoyed the support of colleagues and extension officers at the interview sites. The field data collection exercise, and travelling to interview sites, took six months to complete. Another purpose for visiting the interview sites was to collect documentary evidence, reports, audit reports, records of activities and physical artefacts, and also to make casual observations at the respondents' environments. It was difficult to obtain production data, traceability documents and documents involving finance from some respondents. The researcher, however, pursued this information during the interview process and also contacted the Ghana Cocoa Board for alternative data. The interview guide and the research questions that were used to pursue the research questions are discussed in Section 4.11. At the end of the data collection exercise, the researcher contacted the respondents to express gratitude for their time and contributions to the research.

4.11   Case Study Questions

The case study interview guide and questions for this research were aligned to the primary objective of the study. To answer the primary research questions, the five research propositions outlined in Section 4.2 were addressed. The propositions guided the set of questions, which were structured along the broad categories of the theoretical framework. A set of questions, targeted at answering the research questions, was posed within the three thematic areas of the theoretical framework.

The structured interview guide was divided into demographic questions, and questions involving the internal influence of the perception of traceability and the external influence of traceability. The final category of questions was used to explore the variables of the 'perceived usefulness' of traceability and the intentions to implement traceability systems. Under these broad categories, data pertaining to the objectives of mapping the cocoa supply chain network in Ghana and the motivations for implementing traceability systems were also extracted. The choice of individuals in a decision-making capacity in the cocoa supply chain satisfied the underlying behavioural theories of the research. Behavioural theories are individual theories which apply when an individual's decisions, perception and behaviour are examined. The interview questions explored variables which were previously used to understand individual behaviour and perception. Jackson (2008) applied a similar strategy in a behavioural study of the Australian agribusiness sector.

Riege (2003) highlighted exploratory interviews with experts of an industry in the early stage of qualitative research as an avenue for gaining insight and for establishing the direction of research. In the context of this research, the Deputy Chief Executive

and the Director of Research of the Ghana Cocoa Board were interviewed as a means of gaining insight into the research and for establishing its direction. These interviews also served as dress rehearsals. At the beginning of each interview, the subject of the research was introduced an the purpose of the research was explained. The ethical considerations, including the right to anonymity and the right of the interviewee to opt out at any time, were explicitly communicated. The main sections of the interview then followed and covered demographic questions, the internal and external factors of perception, and the perceived usefulness of traceability systems in the cocoa supply chain in Ghana. The **demographic questions** in the first section of the interview guide were used to build a sound picture of the profile of the case respondents in order to place their responses in context. Demographic data relating to the respondents' gender, age, education and experience were gathered. The importance of demographic data in behavioural research is well grounded in the literature (Heyder *et al.,* 2010; Jackson, 2008).

The second section of the interview dealt with attributes which were internal to the activities of respondents. Internal factors are influences of attributes of perception within the respondents' control. These factors are events which are influenced by the respondents' own choices and which affect their perception of traceability systems. Jackson (2008) applied a set of questions to explore factors, which underpin behaviour. Based on a similar logic, three main questions were used to explore the **internal influences of the perception of traceability systems**. The questions enquired about the respondents' understanding of traceability systems and the meaning of such systems. In addition, questions on the location and size of operation were asked.

The **external factors of the perception of traceability systems** were explored next. External influences of the perception of traceability systems are outside attributes that influence the perception of a phenomenon. External factors can impact on the ability of respondents to make judgements about traceability systems. The major external factors include the perception of economic and market influences, and the perception of traceability systems as an industry norm. During this line of questioning, the discussions were stretched to touch on factors of motivation for implementing traceability systems. The reason for this is the fact that respondents strayed into providing responses about their perception of the economic and market factors, and at the same time related their responses to their motivations for implementing traceability systems. The situation thus prompted the researcher to ask follow-up questions in that regard. The next line of questioning moved on to the **perceived usefulness of traceability systems**. This section explored attributes that show the extent to which respondents' thought that traceability systems played a role in their operations. The interview guide explored this construct by delving into the perception of the 'relative advantage' and 'compatibility' (Rogers, 1995) of traceability systems in cocoa supply chains. These perceptions were contrasted with the risks, costs and complexity of traceability in the operations of respondents. Similar variables have been used to examine the construct of perceived usefulness in behavioural studies (Rogers, 1995; Tan and Teo, 2000; Jackson, 2008). The questions further developed into an examination using a qualitative method of the intention to implement traceability systems. Again, this line of questioning evolved into enquiries about the motivations for implementing traceability systems, and followed up responses containing reasons for accepting traceability systems. During this line of enquiry, 'perceived usefulness' was matched against behavioural control factors which included

self-confidence and self-efficacy as well as the influences of other significant stakeholders in the cocoa sector. The final section of questions related to the intention to implement traceability systems. Questions reflecting whether respondents were willing to continue in the traceability programme were captured in the final section of the interview guide. The complete interview guide is attached at Appendix 2.

In the conduct of the interview, it was not possible to make a clear distinction between the different sections of the interview guide because the follow-up questions to certain responses reflected more than one section of the guide. The sequence of the interview guide structure was not allowed to affect the freedom of respondents to provide answers in their own way. However, the researcher redirected the respondents to the salient issues in the interview guide in such a way that the flow of discussion was not interrupted. This interview guide structure optimised the flexibility of the interview process (King, 1997) and allowed the researcher to capture the verbal and the non-verbal cues accompanying the answers. Information gathered from materials such as newsletters, communications and other sources of evidence were discussed during the interview process. Subsequent to the design of the interview guide, we collected data for the study. The data collection and the interviewing process are discussed in Section 4.12.

4.12   Interviewing and Data Collection Process

In this section, different approaches to conducting interviews in case study research and data collection methods are discussed. This provides both practical and theoretical justifications for the selection of a suitable interviewing and data collection approach.

The interview and data collection processes that were adopted in this study are outlined.

A good interview is important to the success of qualitative research. Some researchers have argued that interviewing is not merely a neutral exchange of asking questions and getting answers; it is about two or more people involved in the collaborative process that leads to a contextually bound and mutually created story (Denzin and Lincoln, 2005). A case study interview has a far greater demand on emotions, ego and intellect than other methods of enquiry (Yin, 2009). It is in this respect that the following principles were adopted during the case study interviews:

- Asking good questions and being able to interpret answers

- Being a good listener and not being trapped in one's own ideologies or perception

- Being adaptive and flexible to newly encountered situations and opportunities

- Having a good grasp on issues that are being investigated in theory, policy and practice

- Being free from the bias of preconceived expectations including those derived from theories

Noting the intellectual and emotional demands on respondents, the researcher first created a rich dialogue environment through prior conversations. This allowed for a better understanding of the socio-cultural intricacies of the interview environment. Even though the interview guide was used, the interview questions were framed in such a way that the interview proceeded in a form of continuous friendly conversation. The evidence gathered was continuously reviewed and immediate follow-up questions were asked in search of further evidence. The researcher ensured

that the lines of enquiry led to findings that were required to address the research propositions and to answer the research questions.

The recordings of the interviews were listened to, and the words were refined and transcribed into text. The handwritten field notes, which captured additional highlights and reflections of the researcher during the field interviews, were edited and the words refined. A contact summary note (Miles and Huberman, 1994) was developed to help the researcher undertake the initial summary of:

- The respondents' details, the situation, the events and the people involved in the field

- The main issues captured

- The issues relating to differences in perception that the respondents focused on

- New speculations or hunches about the subject that came out of the interview

- The kinds of information the researcher sought to understand at the next interview

This strategy influenced the researcher's ability to reflect on the interview guide as the interviews proceeded from one respondent to another. The contact summary also enabled the researcher to identify the general theme for assembling the major variables and the rapid retrieval of responses. The different variables were explored by using this approach to understand why and how the perception of traceability differ in the cocoa supply chain in Ghana.

As discussed earlier in this section, the process of data collection plays an important role in ensuring the validity of the case study approach. The data collection method was concurrently carried out with the interview process. The literature identified six

principal sources of data evidence in case studies (Yin, 2003). These are shown in Table 4.5.

Sources of Evidence	
Documentation	Letters, memoranda, agendas, study reports
Archival records	Service records, maps, charts, lists of names, survey data, personal records such as diaries
Interviews	Open-ended, focused or structured
Direct observation	Formal or casual activities
Participants' observation	Used in studies of neighbourhood, organisations and anthropological studies
Physical artefacts	Tools, artworks, notebooks, computer output

Table 4.5: Different Sources of Evidence in Case Study Research (Source: Yin, 2003)

Even though all the sources of evidence may not be essential in every case study, the use of multiple sources can be useful. This study relied on interviews as the major source of data but data were obtained from documentations such as reports, memoranda and field records. Archival records, such as diary records, list of network as well as physical artefacts in the form of computer-generated reports were used. These sources of evidence were used inform the construction of the interview guide and to provide background knowledge for probing during the interview process. This approach was useful in obtaining production data, records of activities and the network of people and institutions within the respondents' circles. Furthermore,

casual observation and personal experience were relied upon by the researcher to gain insight into the perception of traceability systems in the cocoa supply chain in Ghana. In the process of data collection, difficulties were encountered in obtaining documents and institutional records because of the sensitivity attached to them. However, the multiple sources of evidence used to gather data and the personal experience of the researcher helped to validate the information required of the study. The face–to–face interview approach provided a unique advantage in the process of data collection. It provided a platform to probe responses and to conquer any unwillingness to answer particular questions. Kvale (2010) described qualitative interviews as a key venue for exploring respondents and understanding their view of the real world. The data gathered at this stage were analysed in order to answer the research questions.

4.13   Analysis of Data

This section discusses the approach that was taken to analyse the case study evidence for the purpose of answering the research questions. To analyse the data, consideration was given to the relevant literature in order to justify the approach adopted by the researcher. In the process, different analytical tools were explained and the reasoning for the researcher's choice was outlined. As discussed in Section 4.4, one of the strengths of case study research is the ability to draw knowledge from different sources of evidence. The researcher's experience in the cocoa industry contributed significantly to understanding of the research data. Documentations such as reports, memoranda and field reports were used to validate the narratives from the interview data and to piece together knowledge of the cocoa supply system, which was not made explicitly clear in the interviews. Archival records such as respondents' diaries and physical artefacts in the form of computer generated reports were used to

understand the respondents' network and flow of activities within the cocoa supply chain. Yet, case study interview data remained the most the significant source of evidence of this study. A structured protocol for data analysis in the case study is least developed in academic research (Miles and Huberman, 1994). Also, statistical analysis is not compulsorily used in case study data analysis (Yin, 1994). For these reasons, the approach used in this study involved data examination, data reduction, categorisation, tabulation, recombination and the creation of displays using the case evidence. Also, the researcher's experience in Ghana's cocoa industry, and the literature on case study methodology, helped with the pattern matching and comparison of data.

The first approach to data analysis was the transcription of the interviews and making reflective notes. This enabled familiarity with the content of the interviews and also facilitated the understanding of the data obtained. Kvale (2010) described transcription as the foremost stage of data analysis because it gets the researcher closer to the case study evidence. A complete transcript of each respondent was read over thoroughly many times so that the broad themes and patterns pertaining to the research questions were obtained. Afterwards, the themes and patterns were organised and aligned with the construct variables and the research propositions discussed earlier in this chapter. The responses under each theme were carefully analysed individually and collectively. Eisenhardt and Graebner (2007) described the technique of scrutinising individual case evidence as 'within' case study analysis. The 'within' case analysis methods and techniques are explored further in Chapter 5 of this study. Subsequently, a case report was prepared for each respondent, detailing all aspects of the research propositions within the theme of the theoretical framework. The reports

were sent to the respondents together with the transcripts for their comments. Only two respondents, one regulator and a middleman, contacted the researcher to acknowledge receipt and to make oral comments following acceptance of the content. The preparation of the case report further helped the researcher to understand the depth of the responses to the various questions asked during the interviews.

Understanding the perception of traceability systems involves more than deriving the frequency of word usage from verbatim transcripts. Perception is a behavioural function and involves the translation of sensory impressions, and meanings, which can be attained by showing the salient concepts and themes of theoretical constructs. To achieve this, a cross-case analysis was undertaken to compare the meanings and impressions of the different categories of respondents. The data from the different respondents were classified using a common theme and pattern of attributes relating to the perception constructs. Chunks of phrases and illustrative quotes were filtered and phrases were clustered into 'intellectual bins' to aid the construction of logical path displays (Miles and Huberman, 1994). The differences in perception of the different categories of respondents were distilled from a process of data reduction and recombination. The different perspectives of farmers, middlemen, processors and regulators were placed on clustered mind maps. Mind maps are a relatively new and innovative approach to communicate meanings, and knowledge of a phenomenon, in qualitative research (Wheeldon and Faubert, 2009). The mind maps were used to show the replications and differences in the perception of different variables of traceability systems during the cross-case analysis. This is explained further in Chapter 6 of this research.

In identifying the factors of motivation for implementing traceability systems, a counting technique was used to identify themes and to isolate the consistency of themes. In order to make judgements about the dominant factors of motivation, the recurrence of themes were numbered and the most frequent factors were identified. Miles and Huberman (1994) identified the strengths of this technique as helping to identify a large batch of data rapidly and to ensure analytical honesty. In mapping the supply chain network in the cocoa sector of Ghana, the various linkages among stakeholders were extracted from the data. A mental map was developed to show the different linkages and interdependence. The map was used to exhibit the collaborations and cooperation among different actors in the cocoa supply chain. Hammer (2002) suggested that a common wisdom approach could be used to exhibit coordination and integration across the supply chain channel. This is explored further in Chapter 6.

In the processing of data, software systems such as Nvivo 10, AQUAD, HyperRESEARCH and NUDIST were reviewed. This is because computer software programs save time coding and are particularly suitable for data linking in qualitative research. However, they have a limited ability to identify the depth and metaphors embedded in the responses to some philosophical questions (Miles and Huberman, 1994). Because of the nature of this qualitative case study research, the perception of traceability systems in the cocoa sector of Ghana cannot be easily understood without unearthing the cognitive aspects of the data. The computer-aided programs were limited in analysing and unearthing the cognitive depths of responses to the interview questions. Manual methods of analysis tend to apply human judgement and reflective logic processes to unearth complex metaphors in data. Taking into account the nature

of the research questions, a manual approach to data analysis was adopted. This allowed for logical combination, reduction and reflections on data in order to explore the perception of traceability systems. It also allowed exploration of the factors of motivation for implementing traceability systems. Rodrigo *et al.,* (2013) applied a similar data analysis technique in the study of Country of Origin as a means to achieve consumer desired end goals. In the conduct of this study, the validity, reliability and trustworthiness of the research were ensured. The approach to achieving reliability, validity and trustworthiness of this case study is discussed in Section 4.14

4.14   Case Study Validity, Reliability and Trustworthiness

Generally, case study research suffers from the threats of reliability and validity, which can raise questions about the trustworthiness of a study (Yin, 2003). In this section, the strategies adopted in this study to improve reliability and validity, and the overall trustworthiness of the approach, is discussed. Reliability of case study refers to the degree of consistency with which instances are assigned to the same category by different observers on different occasions. Case study reliability is determined by transparency and replication, especially in multiple case study analyses (Gibbert and Ruigrok, 2010). Transparency in case study research is also achieved through maintaining a consistent record of case study protocol and procedures. In this research, a multiple case study strategy to ensure replication and validity was used. The within-case data analysis process was replicated across the 14 other cases of the research. The replication followed the case study protocol, which was developed by the researcher to ensure transparency. Yin (1994) suggested that the replication method should focus on the overall pattern of results and attempt to determine the

extent to which predicted patterns are similar to observed patterns. In this study, within-case analysis explored each single case to identify a pattern and then investigated subsequent cases in order to make sure that the same pattern existed. Patterns aligned to the theoretical framework of the research were observed over multiple cases, thereby assuring the literal replication in this study.

The second approach to achieving the trustworthiness of this case study was to ensure validity. Validity is the accuracy of results obtained through case studies, and takes different forms as shown in Table 4.6.

Design test	Operationalised Through:
Construct validity	1. Triangulation through multiple sources of data or interviews 2. Providing readers with a chain of evidence using cross-case tables or quotes from informants 3. Allowing interviewees to review the draft case and give feedback
Internal validity	1. Pattern matching through cross-case analysis 2. Searching for negative cases, ruling out or accounting for alternative explanations 3. Time series analysis
External validity	1. Specification of the population of interest 2. Replication logic in multiple case studies
Reliability	1. A standardised interview protocol 2. Constructs well defined and

| | grounded in extant literature |
| | 3. Providing an audit trail by providing access to data |

Table 4.6: Validity and Reliability of Case Study (Source: Beverland and Lindgreen, 2010)

The validity of case study research takes many forms: internal validity, external validity and construct validity. Internal validity is applicable to both single and multiple cases whereas external validity is considered only in multiple cases. In case study research, external validity is the ability to generalise results to a broader theory (Yin, 1994).

However, generalisation in quantitative research and case study methods is different. While tests for statistical generalisation are performed in quantitative research, analytical generalisation is obtained through case study research (Gibbert and Ruigrok, 2010). Replication of case study results signifies the external validity of findings of a multiple case study. In this research, the external validity was ensured by way of replicating within-case findings in cross-case analysis. Internal validity, on the other hand, is considered in explanatory case studies to be the researcher's effort to identify a cause-and-effect relationship of the phenomenon being studied. Internal validity is used to explain the reason for an outcome being demonstrated in a particular phenomenon (Yin 2003). The approach to ensuring internal validity in this research was the use of a pattern matching strategy which was based on the theoretical framework. Eisenhardt and Graebner (2007) explained that internal validity is pattern matching through which observed or predicted patterns are compared with patterns observed in the literature. Yin (2003), on the other hand, proposed triangulation as a way of ensuring internal validity. In triangulation, different theories and research frameworks are used as guidance for data analysis and the interpretation of findings.

In the same way, this study applied different sources of theory and literature for the development of the theoretical framework and the explanation of results. The third approach to validity is construct validity. This refers to the formulation of appropriate operational measures for the concepts being studied (Yin, 1994). Denzin and Lincoln (1994) explained construct validity as the extent to which research accurately observes reality.

However, qualitative research is not intended to reveal reality; instead, different perspectives of the same phenomenon are employed to measure perceived reality (Denzin and Lincoln, 1994). It is in this respect that this research applied a different measure of the perception of traceability systems by way of a theoretical framework. The use of theories and literature to develop different measures of perception were intended to improve the construct validity of this case study research. The approach taken to ensuring reliability, internal validity, external validity and construct validity in this research was aimed at improving the trustworthiness of the study.

In ensuring the trustworthiness of case study research, Healy and Perry (2000) suggested comprehensive criteria to evaluate validity and reliability within the realism paradigm. These criteria were developed based on each element of the realism paradigm. Each research paradigm consists of three elements: ontology, epistemology and methodology. This notion is presented in Table 4.7.

Trustworthiness criteria for each element of realism paradigm	Description of each criteria in terms of realism	Techniques in case study method to establish trustworthiness
Ontology 1. Ontological appropriateness	Whether the research problem deals with a complex phenomenon in social science.	Whether the research problem being studied is a how and why problem.
2. Contingent validity	Validity about the social phenomenon as an open system which involves contingent generative mechanisms of different contexts.	Theoretical and literal replication, in-depth questions, emphasis on "why" issues, description of the context of the cases.
Epistemology 1. Multiple perceptions of participants and peer researchers	Whether the researcher is value-aware (realists believe that there is a real world to discover even though it is imperfectly apprehensible).	Multiple interviews, supporting evidence, broad questions before probes, triangulation, self-description and awareness of own values. published reports for peer review.

Methodology		
1. Methodological trustworthiness	The degree to which the research can be audited by the use of quotations in the written report and by developing a case study	Case study database, use in the report of relevant quotations and matrices that summarise data, and descriptions of procedures such as case selection and doing interviews
2. Analytic generalisation	Theory building rather than statistical theory testing	Identify research issues before data collection for confirming or disconfirming theory
3. Construct validity	How well the constructs explained in the theory are measured in the research	Use of prior theory, case study database, triangulation

Table 4.7: Trustworthiness of Case Study Research (Source: Healy and Perry, 2000)

Ontology is the 'reality' being examined by the researcher. Epistemology involves the relationship between the researcher and the 'reality' being studied. Instead of using a direct questioning approach to seek the perception of traceability (Shulz and Tonsor, 2010), the 'reality' of the perception of traceability was approached with a methodology based on a theoretical framework and the experience of the researcher in the subject. This approach improved the reliability, validity and trustworthiness of the study. Furthermore, ethical considerations were made in the data collection and the research process. These ethical procedures are highlighted in the next section.

4.15 Data Collection Ethics and Confidentiality

A number of ethical issues were considered in the context of this study. Due to the sensitivity and controversy surrounding the subject of traceability systems in Ghana, respondents were assured of confidentiality and anonymity. Respondents were guaranteed that the disclosures containing their responses to the interview questions were not to be passed to third parties for commercial gain. Rather, the research project was solely for academic purposes. Prior to each interview, the interviewee's informed consent to participate in the study was obtained and permission was sought before recording the interviews. Kvale (2010) explained the need for informed consents and consistency between transcripts and oral interview statements. In this research, there were instances where the researcher carefully excluded some information that was found to be repetitive in the case study report. Issues that were unclear and judged not worth pursuing were also excluded. The respondent's title and case number were used as a reference to an individual's opinion and illustrative quotations were given in the cross-case analysis to add depth to the data analysis.

4.16 Criticisms of Research Methodology

A case study methodology is useful in addressing contemporary issues (Yin, 2009). The concept of traceability is a contemporary issue in food commodity supply chains and require a case study methodology to understand the perceptions of traceability systems in the cocoa supply chain in Ghana. However, the conventional approach to academic research believes that a case study will not be of value unless it is connected to hypothesis testing. Flyvbjerg, (2006) outlined the following criticisms of case study methodology;

- Case studies are biased because the researcher is trying to verify a preconceived notion

- Case studies cannot contribute to scientific development because they cannot make generalisations

- Case studies are extremely contextualised and therefore cannot be used for predictions

- Case studies are more useful in the first phase of total research design

- Generally, it is difficult to summarise case studies and develop theories and propositions based on them

The current research used a number of steps to address the key areas of criticism about case study methodology. The issue of generalisation of findings was addressed by comparing findings within the context of Ghana's cocoa supply chain with previous knowledge, experience and theories. Even though hypothesis was not developed and tested, the study used a statement of proposition to direct the focus of the findings. The outcome of the case study contained narratives and illustrative quotes that cannot be summarised into formulae for hypothesis testing. For this reason, a unit of analysis was carefully selected to reduce and recombine the findings for display in mind maps. VanWynesberghe and Khan (2007) argued that a clearly defined unit of analysis in case study research can lead to a clearer outline of the key research message. Despite the criticisms, there is a growing trend for using a case study approach in business research (Yin, 2003). In this section, the acknowledged criticisms against the use of a case study approach to answer the research questions, and the strategies adopted to address them were discussed.

4.17 Summary

This study applied a case study method because it seeks to find, in-depth, the perception of traceability systems in the cocoa supply chain in Ghana. Traceability as a part of transparency systems is a contemporary issue in commodity supply chains. To understand the perceptions of traceability systems in Ghana's cocoa supply chain, the key research questions and propositions were outlined. A theoretical framework was developed to help address the research questions and to meet the objectives of the study. A number of methodologies were reviewed and justifications were provided for the choice of case study methodology. Furthermore, a suitable case study category was selected and the boundaries of the case study were set. A multiple case study methodology was selected and the key actors in the cocoa supply chain, namely the farmers, middlemen, processors and regulators, were selected as the cases.

Having done all this, the overview of the units of analysis drawn from farmers, middlemen, processors and regulators were presented. The case study questions, interviewing procedures and data collection methodologies were outlined and justified. Different approaches to data analysis were reviewed and the selection of a manual approach in this research was justified. The various steps taken to ensure validity, reliability and trustworthiness of this case study research were outlined. Also, the ethical approach to conducting this study, including confidentiality of data, was discussed. Finally, the inherent criticisms of case study research, and the steps taken by the researcher to minimise such criticisms, were outlined.

Chapter 5: Within-Case Analysis

5.1   Introduction

The within-case analysis of this study is the first step in the data analysis process. Each case study was analysed on the basis of the theoretical propositions, which were previously set out in Chapter 4. Eisenhardt and Graebner (2007) argued presenting a relatively complete and unbroken narrative of each case in a multiple case study is not be feasible, particularly for a large number of cases. They further recommended the extensive use of tables and other visual devices in multiple case studies as a trade-off against the rich stories in single case studies. The use of separate tables to summarise the evidence derived from analysis of theoretical construct is a particularly effective way to present the case evidence (Eisenhardt and Graebner, 2007). The analytical protocol reflected the alignment of the set of research objectives and the theoretical variables to answer the research questions. Unlike other research methodologies, analysing case study evidence is particularly difficult because the strategies and techniques have not been well defined (Yin, 2003). However, analysis of case study data depends on the researcher's rigorous thinking, along with a sufficient presentation of evidence and explanations (Yin, 2003). Adapting the case study analytical technique of Miles and Huberman (1994), the case study evidence was presented along with a table summarising the attributes of perception of traceability systems. This was aimed at an in-depth exploration of the case study data in order to align the research evidence with the theoretical propositions of the study. A multiple case study approach is analogous to multiple experiments that follow replication logic and require a theoretical framework (Yin, 2003). In pursuit of this, the 14 case studies

were anonymously reviewed by outlining the case settings, locations and some of the highlights of the data. Within-case analysis of the data enabled the presentation of attributes of perception of traceability systems in line with the theoretical framework. The approach was replicated for all 14 cases and is presented in tabular form in this chapter.

5.2 Within-Case Analysis Protocol

The within-case analysis in this chapter allowed for the exploration of each case as a standalone entity. This enabled an intimate familiarity with each case in order to discern the profile and pattern of evidence to support or expand the various attributes of perception of traceability systems. A central component of the analysis process of this research is the application of analytical protocol to enable an in-depth understanding of the uniqueness of each case. The process also enabled the researcher to immerse in the data so as to foster the emergence of unique attributes and patterns of the case. The analytical pathway proposed by Miles and Huberman (1994) was adapted to guide the within-case analysis process. The framework is shown in Figure 5.1.
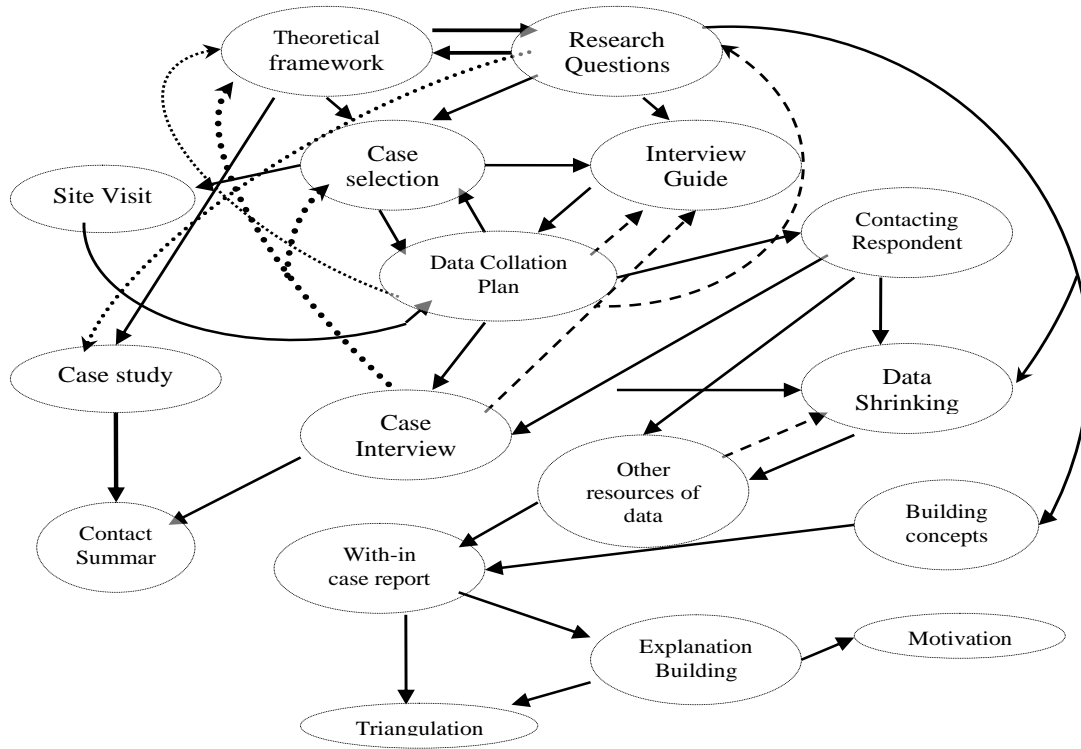
Figure 5.1: Data Analysis Process (Adapted from Miles and Huberman, 1994)

In studying the perception of respondents, the researcher applied constructs which enabled logical connections between the respondents' different perspectives. The analytical process considered the research questions and the theoretical framework used in the case study. These were aligned with the responses from the interviews and the subsequent shrinking of the data. The evidence was isolated into parent node and sub-nodes and was matched with each pertinent attribute of perception of traceability systems. The different motivations and network relationships were further distilled with the view of answering additional research questions. The within-case findings were used as a basis for cross-case analysis in Chapter 6 of this study.

5.3   Overview of Within-Case Analysis

Even though the researcher set out to conduct 15 case study interviews, 14 interviews were conducted because of the reluctance of one respondent. A carefully organised interview guide was used to interview farm owners, senior executives, directors and decision-makers who have implemented traceability and related systems in the cocoa supply chain in Ghana. Interviewing this level of executives was considered important to facilitate further insights, access and cooperation. Gatekeeper support in gaining access to information helped to increase the validity of the study (Cresswell, 2012). The researcher derived the meanings and insights about traceability attributes during within-case analysis.

However, there were difficulties in obtaining some aspects of the data and also in reaching respondents to clarify some assertions. In these cases the researcher resorted to alternative sources such as the Ghana Cocoa Board, and acknowledged these changes so as to preserve the validity of the study (Ellram, 1996). The field interviews were carried out over a period of six months in the four major cocoa growing regions in Ghana. Figure 5.2 is a map of showing the major cocoa growing regions of Eastern, Western, Ashanti and Brong Ahafo regions.

Figure 5.2: Map of Ghana showing the regions where data we collected: Source: Ghana Maps)

The respondents of the case study were chosen from the four cocoa growing regions, which supplies more than 90% of Ghana's cocoa (Cocobod, 2011). The farmers were selected from the Fanteakwa and Suhum Kraboa Coaltar districts of the Eastern region; Sefwi-Wiaoso and Aowin-Suaman districts of the Western region; Adansi West district of Ashanti region and Asonafo district of Brong Ahafo region. Taking a cue from Eisenhardt and Graebner (2007), the evidence of this case study is presented by the use of case study summary tables to complement the selective descriptive texts. This strategy emphasises the rigor in creating a bridge between the qualitative case evidence and the theoretical construct of this research. The overview of the case studies is summarised in the subsequent sections of this chapter.

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5.3.1 Case 1

The first case study falls within the farmer category and was taken from Begoro in the Fanteakwa district of the Eastern Region of Ghana. Begoro is 150 km north of Accra, the capital city of Ghana. The interview took place at the farming site following a prior telephone conversation with the farmer. The area has a population of 29,040, mostly cocoa farmers. The Fanteakwa district ranks among the leading cocoa producing hubs in the Eastern region of Ghana, supplying 7,676 metric tonnes of cocoa in 2012 (COCOBOD, 2012). The trend for the district's supply of cocoa in metric tonnes from 2005 is presented in the table below

2005/06	2006/07	2007/08	2008/09	2009/10	2010/11	2011/12
6,195	5,061	5,295	5,600	5,031	8,468	7,676

Table 5.1: Cocoa Supply in Fanteakwa District (Source: COCOBOD, 2012)

The respondent is a 45-year-old with a secondary school level education, and has 15 years experience as a farmer. The respondent held an executive position at the Eastern Regional Chapter of the Ghana Cocoa Coffee and Sheanut Farmers Association at the time of the interview. The farmer employs 3 additional labourers during the peak cocoa seasons and works in a network of LBCs, Cocoa Research, CODAPEC, Cadbury Partnership and Sustainability NGOs. A summary of the within-case analysis of attributes of perception of traceability systems is presented in Table 5.2.

Attributes of perception of traceability	Summary of findings
Knowledge of Traceability	Knowledge of traceability as a quality improvement system came from buyers, who desire special product attributes.
Market Drivers	LBCs and buyers need the quality of cocoa for their markets. This is driving traceability.
Industry Norm	Traceability is considered desirable by foreign cocoa buyers.
Economic Drivers	Traceability is indicated as desirable by foreign cocoa buyers.
Relationship Factors	Increased likelihood of meeting partners along the cocoa supply chain.
Relative Advantage of Traceability	Traceability provides additional remuneration and training.
Compatibility of Traceability	Traceability brings more to traditional cocoa farming methods, but is not complicated.
Complexity of Traceability	Traceability is not considered to be particularly complex except for record keeping.
Costs and Risks	The premium was insufficient to meet farmer expectations.
Willingness to Implement	No mention of willingness to implement besides meeting expectations of NGOs and LBCs.
Self-Belief/Self-Efficacy	Confident in ability to undertake traceability standard.
Support and Advisory Services	Relies on the support from traceability scheme partners such as NGOs and LBCs.

Table 5.2: Summary of the Attributes of Perception of Traceability Systems for Case Study 1

Traceability in his view relates to quality improvement and is compatible with existing farm tasks. However, difficulties lie with data, information requirements and insufficient remuneration and he relies on LBCs and NGOs for help. The traceability premium, which is the source of 'extra money', is the main motivation to implement the scheme.

5.3.2 Case 2

The second case study also belongs to the farmer category and was chosen from the Sefwi Wiawso district of Ghana. The area falls within the tropical rainforest climatic zone, and has warm temperatures throughout the year and moderate to heavy rainfall. Sefwi Wiawso is located in the Western Region of Ghana and covers an area of 2,634 sq. Km with a population of 148,298.

The interview was carried out at the farm site in Sefwi Wiaoso in the Western Region of Ghana. Prior arrangements were made through the regional chief farmer who selected an executive of a cooperative as the respondent. The respondent is a 57-year-old farmer and a union secretary of the Cocoa Private Partnership Cooperative and Marketing Union of the Sefwi Wiawso district. The respondent is a farm owner and has been growing cocoa as a major occupation for the past 20 year. The respondent had middle school education and is a member of a local group responsible for the dissemination of information to farmers. The farmer works within a network of purchasing clerks of LBCs which records produce movement in the supply chain. The Ghana Cocoa Board and NGOs are also present at society level and form part of the farmers' network. The summary of findings of the within-case analysis of attributes of perception of traceability is shown in Table 5.3.

Attributes of perception of traceability	Summary of findings
Knowledge of Traceability	There is limited knowledge about the details of traceability.
Market Factors	Farmer related the quality of cocoa needed as market driver for traceability.
Industry Norm	Not sufficient knowledge of norms dictating traceability and indifferent.
Economic Drivers	The promise of extra premium revenue remains the farmer's priority as members of traceability scheme.
Relationship Factors	Partnership with buyers and other members of traceability scheme was considered attractive.
Relative Advantage of Traceability	Quality of cocoa improves and improved price system.
Compatibility of Traceability	Traceability was considered as a normal farming operation.
Complexity of Traceability	Not particularly perceived as complex because of regular LBC and NGO support.
Costs and Risks	Places responsibility on farmers and require a lot of changes in the way of doing things.
Willingness to Implement	Farmer's participation in the scheme was a result of LBC and NGO requirement.
Self-Belief/Self Efficacy	The farmer indicated the need for support from other partners to be successful.
Support and Advisory Services	Receives support from NGO and LBCs.

Table 5.3: Summary of the Attributes of Perception of Traceability Systems for Case Study 2

The farmer demonstrated an awareness of the concept of traceability from the farmer field school sessions. He understood it as a system to achieve quality, certification and fair trade. Even though the farmer expected extra income from implementing traceability systems, he acknowledged the responsibilities that come with it.

5.3.3 Case 3

The third case study in the farmers' category was carried out in the village of Fawoho Yeden near Goaso, the capital of the Asunafo District of the Brong Ahafo region of Ghana. The farmer was selected with the help of a local extension officer of the Cocoa Swollen Shoot Virus Disease Control Unit of the Ghana Cocoa Board. The farmer was selected for his experience and knowledge. Telephone confirmation was made prior to the interview at the farm site. The Asonafo district covers an area of 171,709 sq. km and has a population of 171,709. Asunafo shares share common boundaries with Ghana's main cocoa producing areas of Asutifi, Juaboso and Sefwi-Wiaoso districts.

The 65-year-old cocoa farmer switched from the cultivation of food crops to cocoa farming eight years ago. He relies on family labour and a community shared labour system to carry out cocoa farming activities. He also relies on a network of extension officers of the Ghana Cocoa Board and LBCs in his farming operations.

Attributes of the perception of traceability	Summary of findings
Knowledge of Traceability	Traceability as record keeping systems of cocoa quality. No knowledge of any prescribed form of data capturing and data transmission.
Market drivers	LBCs and cooperatives capture farmers to supply traceable cocoa.
Industry Norm	Farmer not aware of industry norms.
Economic Drivers	Expectation of extra money as incentive.
Relationship Factors	Brings together farmers and other players in the chain.
Attributes of the perception of traceability	**Summary of findings**
Relative Advantage of Traceability	Additional income and good quality cocoa.
Compatibility of Traceability	No new skill required. Conforms to cocoa farming practices.
Complexity of Traceability	Not complicated, farmers already practice standards.
Costs and Risks	The premium was insufficient to meet farmer expectations.
Willingness to Implement	Traceability was implemented by farmer to meet LBC and NGO required standards.
Self-Belief/Self-Efficacy	Belief in own experience but required support of LBC.
Support and Advisory Services	Benefits from network relationship.

Table 5.4: Summary of Attributes of the Perception of Traceability Systems for Case Study 3

Traceability in the view of the respondent includes record keeping and quality improvement and has nuances that require the support of LBCs to achieve. He explained traceability as a one-sided command from buyers without reciprocal feedback unless problems arise. His major motivation is the relationship that is enjoyed between farmers, LBCs and foreign

buyers. The summary of findings of within-case analysis of attributes of the perception of traceability systems is shown in Table 5.4 above.

5.3.4   Case 4

The fourth case study in the farmers' category was taken from the village of Agona Kokrokookobi in the Suhum/Kraboa/Coaltar District of the Eastern Region of Ghana. The district is made up of a collection of rural areas, except for the district capital of Suhum. The district covers an area of 971 sq. km, with a population of 166,376 people.   The area is mainly a settler community made up of migrant farmers. The trend for cocoa supply from the Suhum/Kraboa/Coaltar district in metric tonnes is shown in Table 5.5.

2005/06	2006/07	2007/08	2008/09	2009/10	2010/11	2011/12
5,195	5,755	6,250	5,850	5,081	9,468	6,676

Table 5.5: Cocoa supply in Suhum/Kraboa/Coaltar District (Source: COCOBOD, 2012)

The respondent was contacted through the Cocoa Research Institute where the farmer had previously worked. The 62-year-old Chief Cocoa Farmer inherited a family and employed four farmhands to assist on the farm. The interview took place at his farmhouse where he showed the researcher his farm operations. The summary of findings of attributes of the perception of traceability systems is presented in Table 5.6.

Attributes of the perception of traceability	Summary of findings
Knowledge of Traceability	Traceability as a marketing tool coming from buyers. It is expected to produce high quality cocoa.
Market Factors	Traceability is a marketing concept and has LBCs in the centre of it.
Industry Norm	Traceability was considered a new marketing requirement.
Economic Drivers	Traceability is accepted for its reward for extra money.
Relationship Factors	Provides platform for interaction with LBCs, NGOs and foreign buyers.
Relative Advantage of Traceability	Traceability provides support and extra income.
Compatibility of Traceability	Considered compatible and allows for higher quality cocoa.
Complexity of Traceability	Record keeping and complex expectations from market makes it complex.
Costs and Risks	The premium was insufficient to meet farmer expectations.
Willingness to Implement	No mention of voluntary willingness to implement, but indicated desire to meet market standards.
Self-Belief/Self-Efficacy	Required assistance from LBC and NGOs to meet new standards.
Support and Advisory Services	Required support from traceability scheme partners such as NGOs and LBCs.

Table 5.6: Summary of Attributes of the Perception of Traceability Systems for Case Study 4

The farmer viewed traceability as a marketing instrument of LBCs with the promise to bring economic returns to farmers and farmers' communities. The farmer further stated the need for support in order to implement good agricultural practices that accompany traceability standards. Although traceability has created inconveniences in the ways that things were

done, joining the scheme gave farmers some advantages in terms of relationships and support. The expectation of high quality cocoa places risks and additional responsibility on farmers, neither of which have been fully compensated by traceability schemes.

5.3.5 Case 5

Case study 5 is in the farmers' category and applies to Obuasi in the Adansi West district of the Ashanti Region of Ghana. The district covers 828 sq. km, with a population of 235,680 people mostly involved in cocoa farming and mining activities. Figure 5.5 is a map of the cocoa producing districts of Adansi West. The Adansi West district is predominantly a cocoa growing area with smallholder farmers. In 2012, a total volume of 7,031 metric tonnes of cocoa was produced and sold to LBCs from the district. The total amount of cocoa supplied from Adansi West district since 2005 is shown in Table 5.7.

2005/06	2006/07	2007/08	2008/09	2009/10	2010/11	2011/12
8,286	6,085	7,798	5,348	4,677	8,410	7,031

Table 5.7: Cocoa Supplies from Adansi West (Source: COCOBOD, 2012)

The case study respondent was a 65-year-old with 40 years' experience as a cocoa farmer. He previously worked on his family cocoa farm which has been expanded over time. The farmer was an opinion leader among his peers at the Obuasi area farming community and often benefitted from the advice of the extension services of COCOBOD. His key network includes LBCs, COCOBOD and NGOs which provide various support services ranging from produce purchase to mass spraying of cocoa farms. The summary of findings from within-case analysis of attributes of the perception of traceability systems is presented in Table 5.8.

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Attributes of the perception of traceability	Summary of findings
Knowledge of Traceability	Traceability as a new scheme propagated by LBC and NGOs. Not much knowledge about its details.

Attributes of the perception of traceability	Summary of findings
Market Factors	LBCs require member to purchase cocoa and to support farmers.
Industry Norm	Considered as desirable by LBC; not sure about industry norms.
Economic Drivers	Farmers expect economic benefit and community projects.
Relationship Factors	Allows farmers, LBCs and NGOs to come together.
Relative Advantage of Traceability	There is expectation of extra money and support by joining traceability scheme.
Compatibility of Traceability	Traceability brings extra burden as farmer needs adjustments to meet standards.
Complexity of Traceability	Was not considered complicated notwithstanding extra burden on farmer.
Costs and Risks	High cost not rewarded, and little consultation with farmers can lead to scheme failure.
Willingness to Implement	No direct expression of willingness to implement scheme, however considered as scheme which farmers join in expectation of reward.
Self-Belief/Self-Efficacy	Confident in ability to meet farming standard required under traceability scheme.
Support and Advisory Services	Required support from traceability scheme partners.

Table 5.8: Summary of Attributes of the Perception of Traceability Systems for Case Study 5

Traceability, in the view of the farmer, was one of the new things being propagated by some LBCs and NGOs, and the farmer was not sure if it had to do with a new regulation in the industry. Traceability was perceived as a new way by which high quality cocoa has to be produced. Similar to previous schemes, the farmer expressed fear about the future of a traceability scheme. The farmer's concerns included the extra burden of work and withdrawal of support for farmers. The processes were not considered complicated but LBCs acted as proprietary owners of traceability schemes and needed to be consulted for advice at all times. The farmer's expectation of a cash reward from a traceability scheme had not been met so far.

5.3.6 Case 6

The sixth case study in the farmers' category was taken from Enchi in the Aowin-Suaman district of the Western Region of Ghana. The area has a population of 119,128 and covers 2,638 sq. km. The district is bordered by the Ivory Coast in the west, Wasa Amenfi and Sefwi Wiawso. Figure 5.6 is a map of the Aowin–Suaman district of the Western Region of Ghana where the interview took place. The farmer was recommended for the interview by the regional president of the Cocoa Coffee and Sheanut Farmers Association.

Enchi is a dominant cocoa producing community that supplied 54,724 metric tonnes, which ranks among the highest community outputs in the country (COCOBOD, 2012). Table 5.9 shows the cocoa production in metric tonnes in the district.

2005	2006	2007	2008	2009	2010	2011
48,832	41,653	39,654	46,992	42,988	55,112	54,724

Table 5.9: Cocoa Supply from Aowin-Suaman, (Source: COCOBOD, 2012)

The respondent was a 67-year-old settler farmer who has been involved in cocoa farming for more than 25 years. He owns 55 hectares of cocoa plantation in addition to food crops. The farmer employs up to five migrant labourers and operates in a network of chemical dealers, COCOBOD and LBCs. The summary of within-case analysis of attributes of the perception of traceability systems is shown in Table 5.10

Attributes of the perception of traceability	Summary of findings
Knowledge of Traceability	Traceability is being forced from abroad, with the objective of obtaining high quality cocoa.
Market Drivers	Traceability only achieves market standard of foreign buyers.
Industry Norm	Traceability was not considered a market norm, but an initiative that is being forced by foreign buyers.
Economic Drivers	Traceability is expected to provide extra money that is why farmers have joined the scheme.
Relationship Factors	It allows for meetings, training and interactions with LBCs, NGOs and foreign buyers.
Relative Advantage of Traceability	Traceability helps to achieve high quality and extra money.
Compatibility of Traceability	Fits into regular cocoa farming practices.
Complexity of Traceability	Not complex but has requirement that needs LBC support.
Costs and Risks	The fear of farmers being left out if scheme fizzles out. Insufficient remuneration.
Willingness to Implement	Not willing to implement voluntarily.
Self-Belief/Self-Efficacy	Confident in ability to achieve high quality without help. Needs LBC for additional paperwork.
Support and Advisory Services	Does not require much support because of farmer's own experience.

Table 5.10: Summary of Attributes of the Perception of Traceability Systems for Case Study 6

The farmer perceived traceability as one of the new initiatives that were being forced on farmers. In his view, farmers were aware of the issues of traceability and how it can help improve quality. The farmer expressed confidence in his ability to keep mental records of farm activities. He believed that traceability was not complicated but the risk rested with LBCs which may refuse to buy produce. The farmer had no special reason to pursue traceability except for the extra income that has been promised by LBCs.

5.3.7 Case 7

The seventh case study belongs to the middlemen category. The respondent was a 56-year-old director of operations in charge of traceability at a leading cocoa buying company (LBC) in Ghana. He has been a part of the decision-making process of the organisation for more than ten years. The cocoa-purchasing trend in metric tonnes by the respondent's firm in the last ten years is shown in Table 5.11.

2005/06	2006/07	2007/08	2008/09	2009/10	2010/2011
36,765	31,465	46,712	49,907	47,221	78,905

Table 5.11: Cocoa Purchases of Middleman Case 7 (Source: COCOBOD, 2011)

The traceability and certification of cocoa were considered by the respondent as a global strategy, and the respondent predicted it will dominate the future of cocoa commerce. The respondent has invested in information-sharing and technology systems in Ghana. The summary of within-case analysis of attributes of the perception of traceability systems is presented in Table 5.12.

Attributes of the perception of traceability	Summary of findings
Knowledge of Traceability	Traceability is being forced from abroad, with the objective of obtaining high quality cocoa.
Market Drivers	Serving the needs of growing markets and customers.
Industry Norm	New industry trend and norm to be fulfilled.
Economic Drivers	Economic return used to strengthen market position.
Relationship Factors	It allows for control of farmers and relationship with community.
Relative Advantage of Traceability	Builds customer loyalty and eases management of cocoa movement operations.
Compatibility of Traceability	Requires changes and investments to fit into business.
Complexity of Traceability	Tedious and involving. High level of monitoring and paperwork involve.
Costs and Risks	Expensive to manage, especially when no buyers were found.
Willingness to Implement	Willing to continue traceability based on market demand.
Self-Belief/Self-Efficacy	Confident in ability to implement and meet market standards.
Support and Advisory Services	Cooperation with external partners and closely monitoring market trend.

Table 5.12: Summary of Attributes of the Perception of Traceability Systems for Case Study 7

In the view of the respondent, traceability was considered to come from the word 'trace' so as to enable consumers to know where cocoa originates. Thus, traceability allows for geographical mapping and allows the middleman to have control of custody over the supply chain. His motivation to implement traceability systems was to foster relationships that had been developed in the supply chain. Income from traceability did not make a significant

difference, but gave him a stronger market position among farmers. The additional feedback from traceability systems helped to bring end-users of cocoa and farmers closer.

5.3.8   Case 8

The eighth case study belongs to the category of middlemen. The respondent is a 62-year-old managing director of a leading middleman cocoa-buying firm in Ghana. The purchasing trend in metric tonnes by the firm is shown in Table 5.13.

2005/06	2006/07	2007/08	2008/09	2009/10	2010/11
242,472	186,0551	208,482	247,881	238,968	374,858

Table 5.13: Cocoa Purchases of Middleman Case 8 (Source: COCOBOD, 2012)

The operations of the respondent were spread among 5300 purchasing points within a network of quality control personnel, transporters, banks and other divisions of COCOBOD. Traceability was not of high priority to the respondent since it was considered to be a marketing demand by foreign buyers. The summary of within-case analysis of attributes of the perception of traceability systems is shown in Table 5.14.

Attributes of the perception of traceability	Summary of findings
Knowledge of Traceability	Traceability is a marketing tool of foreign traders to market unique characteristics of cocoa. Reliance on foreign partners for knowledge.
Market Drivers	Marketing tool for intermediate traders. It is the partnership that is driving programme in Ghana.
Industry Norm	New industry trend and norm to be fulfilled.
Attributes of the perception of traceability	**Summary of findings**
Economic Drivers	There is an expectation of a premium to support the business.
Relationship Factors	Already have network of relationships outside traceability.
Relative Advantage of Traceability	Gives visibility in the international market and in advancing sustainability.
Compatibility of Traceability	Relatively compatible but require regular audit visits by partners.
Complexity of Traceability	Not sure of details of complexity since he relies on support from partners.
Costs and Risks	Expensive to implement because of farmer organisations and monitoring system.
Willingness to Implement	No expressed willingness to continue in the programme voluntarily without partners and expected incentives.
Self-Belief/Self-Efficacy	Believe traceability can be implemented through experience he has gathered over the years.
Support and Advisory Services	Reliance on foreign partners for support and advice, in order to continue with traceability.

Table 5.14: Summary of Attributes of the Perception of Traceability Systems for Case Study 8

In the view of the respondent, traceability involved the identification of the unique characteristics of cocoa from specific districts for marketing purposes. The middlemen partners thus communicate the attributes to end-users who pay a premium in return. Traceability was not considered complicated and could be implemented with the support of foreign partners.

The motivation to implement traceability was due to the marketing advantage that the programme offered. The premium received from traceability was reinvested in community projects and programmes to strengthen market position. Traceability systems also enhanced the respondent's image in meeting sustainability standards in the cocoa trade

5.3.9   Case 9

The ninth case study is a middleman and cocoa executive of a leading cocoa-buying agency (LBC) in Ghana. He is a 49-year-old executive officer of a multinational cocoa buying firm. The total volume of cocoa purchased from farmers by the respondent's LBC in metric tonnes is presented in Table 5.15.

2005/06	2006/07	2007/08	2008/09	2009/10	2010/11
102,667	70,483	54,072	50,111	43,512	80,770

Table 5.15: Cocoa Purchases of Middleman Case 9 (Source: COCOBOD, 2012)

In the respondent's view, the liberal internal cocoa marketing environment in Ghana has led to different market initiatives including traceability. Traceability involves knowing in specific terms where cocoa comes from and the nature of that cocoa. This allows the respondent's firm to deal with a recognised group of farmers or associations within a specific area.

However, the respondent was not sure if traceability was being driven by a specific market rule and could not indicate if it was a general norm in the cocoa sector. Implementing traceability has allowed LBCs to work in a network of many actors including NGOs, farmer groups and divisions of COCOBOD. The summary of attributes of the perception of traceability systems is presented in Table 5.16.

Attributes of the perception of traceability	Summary of findings
Knowledge of Traceability	Traceability is an outcome of liberal market environment where consumers want to know the source of cocoa. Detailed knowledge depends on customer needs.
Market Drivers	Market trend and customer desire driving traceability.
Industry Norm	Considers traceability a new market norm driving the future of the cocoa trade.
Economic Drivers	There is an expectation of a premium to fund sustainable business units.
Relationship Factors	Traceability supports working relationship with farmers, COCOBOD and NGOs.
Relative Advantage of Traceability	Ability to move with the new market norm in liberal environment.
Compatibility of Traceability	Not completely compatible because some changes and investment were required.
Complexity of Traceability	Complicated as changing customer needs required adjustments.
Costs and Risks	Expensive to implement and monitor, Cocoa may not be bought.
Willingness to Implement	Expressed willingness to continue traceability to capture new markets.

Attributes of the perception of traceability	Summary of findings
Self-Belief/Self-Efficacy	Need for cooperation in implementing traceability.
Support and Advisory Services	Reliant on external connections for advise and support in implementing traceability.

Table 5.16: Summary of Attributes of the Perception of Traceability Systems for Case Study 9

By a conscious strategy to differentiate its sources of cocoa, the traceability programme was implemented near historic sites such as Kakum rainforest which has the world-famous canopy walkway. The two most important motivations for the implementation of traceability in the view of the respondent were consumer need and market need. Satisfying consumer need helps to keep pace with growing niche requirements. The market need for information-sharing through traceability helps with knowledge-sharing and trust among stakeholders.

5.3.10 Case 10

The tenth case study is a middleman and a 50-year-old chief executive officer of a specialised sustainable cocoa-sourcing firm. The respondent's activities as a middleman involve capacity-building programmes for farmers in the production of certified and traceable organic cocoa. The respondent has operated as a middleman for three years and has purchased cocoa from organised farmers' cooperatives. The respondent's cocoa purchasing trend in metric tonnes is shown in Table 5.17.

2005/06	2006/07	2007/08	2008/09	2009/10	2010/11
-	-	-	325	286	293

Table 5.17: Cocoa Purchases of Middleman Case 10 (Source: COCOBOD, 2012)

The respondent works with farming communities to produce organic cocoa. The field officers who live in the farming community assist him with the project. He also works in a network of agencies, including COCOBOD and farmer groups, and with support from the government of Switzerland. The summary of within-case analysis of attributes of the perception of traceability systems is presented in Table 5.18.

Attributes of the perception of traceability	Summary of findings
Knowledge of Traceability	Traceability is a social programme to know the source of cocoa and is aimed at consumer protection. Deeper insight because traceability forms integral part of respondent's projects.
Market Drivers	Considers consumer health and safety as a big driver.
Industry Norm	Traceability is a global norm in the food industry and growing.
Economic Drivers	The premium can help sustain the project and programmes.
Relationship Factors	Cooperative formation, and works as long as chocolate consumers work together to achieve the desired attributes.
Relative Advantage of Traceability	Safety of future generations of consumers and provides opportunity. Ability to anticipate this is an advantage.
Compatibility of Traceability	Compatible with programmes and projects respondents already involved in.
Complexity of Traceability	Complicated depending on the depth of traceability.
Costs and Risks	Expensive in terms of the cost of technology and dealing with contamination. Risk of contamination still exists.
Willingness to Implement	Expressed willingness to continue traceability programme voluntarily as part of ongoing projects.
Self-Belief/Self-Efficacy	Confident in ability to implement traceability systems because of previous experience.

Attributes of the perception of traceability	Summary of findings
Support and Advisory Services	Expressed need for cooperation with buyers and programme sponsors.

Table 5.18: Summary of Attributes of the Perception of Traceability Systems for Case Study 10

Traceability, in the view of the respondent, was a social protection programme that was concerned with the health of chocolate consumers. Traceability meant being able to know, and have control over, the supply processes of cocoa from farmer to consumers. Important attributes such as the condition of production, the treatment of farmers and the type of input that was used remain important in traceability programmes. The deeper one intended to trace, the more complicated it becomes. The respondent's motivation was to meet the sustainability standards of the market and those of the Swiss government. The premiums are reinvested in the community to enable farmers to continue with sustainable practices.

5.3.11 Case 11

The eleventh case study is in the category of cocoa processor. The respondent was a 50-year-old CEO and owner of a cocoa-processing facility in the Western Region of Ghana. The respondent's activities involve sourcing raw cocoa beans from CMC and processing the cocoa into semi-finished products. The intermediary products are sold and exported abroad. Traceability forms part of a strategy to create a trusted product brand. Traceability, in the respondent's view, is a new phenomenon that serves the purpose of identifying the origin of product quality. The summary of attributes of the perception of traceability systems from the respondent is presented in Table 5.19.

Attributes of the perception of traceability	Summary of findings
Knowledge of Traceability	Traceability is a quality assurance system in a processing factory. Open to meeting customer requirements, but not tied to specific approach.
Market Drivers	Market concerns, and safe and quality food. Need to satisfy consumers.
Industry Norm	Traceability not considered industry norm but specific market need for food safety.
Economic Drivers	Food safety and avoiding contamination is a better driver than premium.
Relationship Factors	Traceability leads to greater collaboration of supply chain and can help deal with contamination and product batch recall.
Relative Advantage of Traceability	Safety of future generations of consumers and provides opportunity. Ability to anticipate this is an advantage.
Compatibility of Traceability	Fully compatible and integral part of cocoa processing business.
Complexity of Traceability	Complicated only if additional requirement is made to existing system.
Costs and Risks	Market uncertainty about premium and risk of investment into additional traceability systems.
Willingness to Implement	Willing to implement existing systems but not considering additional investment.
Self-Belief/Self-Efficacy	Confident in ability to implement existing system.
Support and Advisory Services	Enjoys limited support because of the proprietary technology.

Table 5.19: Summary of Attributes of the Perception of Traceability Systems for Case Study 11

The main motivation to implement traceability was to enhance quality assurance in order to avoid food scandals. In the respondent's view, the opportunity cost of dealing with

contamination could be prohibitive, hence investment in traceability systems for product batches were justifiable. However, the respondent reaffirmed that the existing product tracking and troubleshooting system in the factory has sufficiently addressed the broader need for traceability.

5.3.12 Case 12

The twelfth case study is a cocoa processor and the Head of Marketing of one of Ghana's cocoa processing facilities. The respondent has been Head of Marketing for eight years and explained cocoa processing as the art of converting cocoa beans into intermediate and finished cocoa products. The respondent operates in a network of COCOBOD, suppliers of ingredients, cocoa product traders, shipping companies and private transporters.

Traceability, in the view of the respondent, implies the association of cocoa product batches to the sources of the raw cocoa beans. This provides an idea about the quality of the products in relation to the cocoa beans' characteristics. The summary of attributes of the perception of traceability systems in the view of the respondent is summarised in Table 5.20.

Attributes of the perception of traceability	Summary of findings
Knowledge of Traceability	Traceability is a system of production batch identification. Knowledge of how the quality assurance and traceability systems operate in the processing facility.
Market Drivers	Market demand driving specialised products; quality to be traced to source. New EU rules also influencing markets.
Industry Norm	Not sure about position of international cocoa industry about traceability systems. However, new standards in EU and US markets require levels of traceability.
Economic Drivers	Expectation of premium from final product, buyers, and special quality requirements driving traceability.
Relationship Factors	No indication that tracing product batches would improve relationships in the supply chain.
Relative Advantage of Traceability	Provide cocoa factory with unique brand identity which can be verified through traceability. Quality product gives market advantage.
Compatibility of Traceability	Compatible with cocoa processing and built into the system.
Complexity of Traceability	Traceability could be complicated depending on what consumers want.
Costs and Risks	Investment into the system is expensive but premium not guaranteed.
Willingness to Implement	Willing to continue existing system.
Self-Belief/Self-Efficacy	Not sure if help is needed to implement, but depends on requirement of customers and engineering.
Support and Advisory Services	Relationship with buyers can help improve traceability.

Table 5.20: Summary of Attributes of the Perception of Traceability Systems for Case Study 12

Traceability has facilitated the management of the product chain as well as the supply chain of the cocoa. In the respondent's view, the need to expand the scope of traceability into a more elaborate system has not been felt yet in Ghana's cocoa processing sector. However, with the changing market rules in Europe and America, different approaches could be expected in the future.

5.3.13 Case 13

The thirteenth case study is a regulator and technical advisor to the Minister of Finance of Ghana. The Ministry of Finance is responsible for developing Ghana's cocoa sector policy. The respondent is a 48-year-old public servant who has previous experience in inter-governmental cocoa organisations. In his role as technical advisor to the minister, the respondent coordinates the policies of the Ghana Cocoa Board and monitors their implementation alongside government objectives. The development of a framework for the implementation of traceability systems has been one of his objectives. However, he indicated that the lack of international consensus on the technical and commercial dimensions of traceability systems is affecting Ghana's position. Table 5.21 shows a summary of the respondent's attributes of the perception of traceability systems.

Attributes of the perception of traceability	Summary of findings
Knowledge of Traceability	Traceability is a system of following cocoa through the supply chain and knowing its characteristics. The system already exists in Ghana and not sure what new traceability entails.
Market Drivers	New and growing markets require different attributes. Need different product attribute traceability systems.
Industry Norm	Traceability was being pushed by outside forces. Efforts being made to make it industry norm.
Economic Drivers	Traceability provides a premium, which is invested in the community. Good for development projects.
Relationship Factors	Traceability regulations would rather force collaboration. Traceability on its own could not lead to relationships.
Relative Advantage of Traceability	Premium received by farmers and investment into community make scheme advantageous.
Compatibility of Traceability	Traceability already exists in Ghana's quality control systems and does not require any foreign influences or changes.
Complexity of Traceability	Different market standards require different adjustments. This makes it difficult to comply.
Costs and Risks	Premium payment could be stopped once every cocoa becomes traceable. This leaves the cost on the farmer alone to bear.
Willingness to Implement	Not willing to recommend implementation of any system other than Ghana's existing quality control system.
Self-Belief/Self-Efficacy	Confident in already existing system over the years. There is a need to collaborate with the market to know new developments.
Support and Advisory Services	Expert publications and international organisations.

Table 5.21: Summary of Attributes of the Perception of Traceability Systems for Case Study 13

The respondent explained other initiatives and programmes such as certification of sustainable and fair trade cocoa, which aims at improving transparency in the cocoa supply chain. Traceability in the respondent's view involves following cocoa to the source where it comes from and understanding the characteristics that surround the products before they are purchased. The structure for deploying traceability in Ghana is in place and could be capitalised upon in marketing. Cocoa farming is a business, and people engaged in it expect to make profits. If traceable attributes of Ghanaian cocoa give a competitive edge in the marketplace, then it is right to capitalise on traceability. As a regulator, his motivation is to establish the appropriate framework to ensure that the premium is used to develop the farming community on the principle of create-and-share.

5.3.14 Case14

The fourteenth case study is of a regulator who has worked in Ghana's cocoa industry for over 12 years as Director of Research, Monitoring and Evaluation. He is a 56-year-old public servant who has worked with the regulatory arm of the Ghana Cocoa Board since 1992. Elaborating on the network relationships in the cocoa industry, it was found that COCOBOD operated at the highest hierarchical order in the cocoa supply chain and has been described differently in the literature. Such descriptions include COCOBOD being called an 'instrument for exploiting farmers'. COCOBOD regulates the activities of farmers, LBCs, hauliers, cocoa processing firms, transporters, cocoa buyers and other categories of input suppliers. This ensures a smooth network relationship among all actors so as to achieve the government's objectives in the cocoa sector. On the subject of traceability, the respondent believes the directives of the European Union take a central place in the industry and interfere with

national systems of traceability. The summary of attributes of the perception of traceability systems from the perspective of the respondent is shown in Table 5.22

Attributes of the perception of traceability	Summary of findings
Knowledge of Traceability	Existing system traces cocoa from farmers' sources through the supply chain to final destination. Any new system revolves around the same principle.
Market Drivers	A new market issue created by outside forces. It is implemented so as not to lose out.
Industry Norm	Traceability could become industry norm if there is agreement about its pros and cons.
Economic Drivers	Traceability premium helps farmers and farmers' communities. Avenue for additional income for farmers.
Relationship Factors	Traceability as it exists has not promoted relationships in the supply chain.
Relative Advantage of Traceability	Provide for the requirements of niche markets which require speciality cocoa. This and premium are not available in bulk cocoa trade.
Compatibility of Traceability	Traceability is compatible with Ghana's system and can be compatible with many other cocoa systems in West Africa.
Complexity of Traceability	The manual bagging and sealing system is less complicated. New computerised systems could pose challenges.
Costs and Risks	Possibility of legal liability far into the chain and expenses.
Willingness to Implement	Not willing to implement any system outside the existing quality control system in Ghana.
Self-Belief/Self-Efficacy	There is the need to understand what is going on in order not to lose out. But confident in Ghana's tried and tested system.

Attributes of the perception of traceability	Summary of findings
Support and Advisory Services	Rely on historical antecedence and international relationships.

Table 5.22: Summary of Attributes of the Perception of Traceability Systems for Case Study 14

The motivations for implementing traceability are the premium and the opportunity to move with the new market trend. Failure in this regard by the Ghana Cocoa Board risks the country losing out in the EU market. However, it is believed that the new traceability system may have other motives, including passing liability of contamination to cocoa producers. In order to avoid traceability certification becoming a technical barrier to trade, it was considered necessary to understand the positions of the WTO and ICCO.

5.4   Summary

This chapter explored in detail the results of each case study in respect of the proposition of this study. Miles and Huberman's case study analytical protocol was adapted to provide a guide to the within-case analysis process. A total of 14 cases were reviewed to outline the case settings, the respondents and their perception in respect of the different attributes of traceability systems. The data was distilled, summarised and aligned with the different theoretical propositions. The research proposition helped to address the research questions set out in Chapter 4 of this study. The perception towards different attributes for each respondent was summarised into internal attributes, external attributes and attributes of perception. The within-case analysis was built upon to develop the cross-case analysis.

Chapter 6: Cross-Case Analysis

6.1   Introduction

In this chapter, data was analysed across all of the cases in order to identify the differences in perception of traceability systems. By further analysis of within-case findings, the study sought to generalise the perception of traceability systems in the cocoa sector of Ghana. In Chapter 4 it was argued that a theoretical framework was needed to make meaningful sense of data in this case study. In this regard, the theoretical framework was explored along the three areas of: internal factors including demography; external factors; and the perceived usefulness of traceability systems. The different variables were explored and analysed in order to understand the differences in perception among the different players in the cocoa supply chain. Mind maps were used to present the analysis, which were developed by the researcher to make a pictorial representation of the cross-case analysis. The justification of the use of mind maps as a new technique in qualitative research has been provided in Chapter 4. Illustrative quotes of respondents were purposefully used to enrich the analysis and to emphasise assertions. In qualitative case study research, illustrative quotes were found useful in enriching responses and observations (Kvale, 2010).

To explore the motivation for implementing traceability systems, a qualitative counting technique was used. A frequency table, which captured the consistency of themes for each category of respondent, was presented. Finally this chapter presents a network of relationships among the different actors in the cocoa supply chain in Ghana. The network of respondents were pooled into categories and connected together in a network map of relationships among stakeholders. Miles and Huberman (1994) considered data from multiple

respondents in cross-case analysis as the best way to find common meanings, perceptions and themes of social phenomena where a single scientific explanation does not exist.

6.2   The Demography of Respondents

The principal reason for collecting demographic information about the respondents in this case study is to build a sound picture of the case informants. Rogers (1995) and Jackson (2008) also used demographic information to build a good understanding of the social structure of respondents. In building a good picture of the respondents in this study, the demographic information relating to age, gender, education and experience were collected. Figure 6.1 is the mind map of the demographic profile of the respondents.

PROCESSOR
Female

MIDDLEMAN
Male

FARMER
Male

REGULATOR
Male

GENDER

FARMER
60 Years

MIDDLEMAN
54 Years

PROCESSOR
50 Years

AGE

REGULATOR
52 YEARS

DEMOGRAPHIC PROFILE

MIDDLEMAN
7 Years

PROCESSOR
5 years

EXPERIENCE

REGULATOR
7 years

FARMER
20 years

EDUCATION

FARMER
Basic / Low Education

MIDDLEMAN
University / High Education

PROCESSOR
University /High Education

REGULATOR
University /High Education

Figure 6.1: Mind Map of the Demographic Profile of the Case Study

As presented in the mind map in Figure 6.1, the majority of the case respondents for this study were males, constituting more than 85% of the total case study. The two female respondents were drawn from the cocoa-processing sector. Even though the respondents were selected purposely with the guidance of the Director of Research of the Ghana Cocoa Board, a balance in the demographic composition was ensured. The respondents' ages ranged from 45 to 67 years, with the farmers constituting the oldest age group while the cocoa processors formed the youngest age group. The age distribution is consistent with the total population in the cocoa sector (Ghana Cocoa Board, 2010).

In Chapter 4, the criteria for the classification of educational levels were outlined. The farmers' group represented the least educated but with the highest average experience of 20 years. Two quotes were randomly selected to support the differences in experience;

> *'I have been working in the cocoa-processing sector since we established this plant in 2010, that is, two years ago. Even though I have had previous experience in cocoa as a middleman in the Ivory Coast, it is only recently that I entered the processing business.' (Cocoa processor, 50, Chief Executive Officer, Case 11)*

> *'I started working in cocoa when I was young and helping my parents. Later on, I was given a portion of the family farm, which I have expanded. It is now my own farm and I can say I have been a cocoa farmer for more than 40 years now.' (Farmer, 65, Ashanti Region, Case 5)*

6.3   External Factors of Perception

Research has shown that factors external to the environment of the supply chain have an impact on behaviour and perception (Fisher, 2000). The study explored the perception of respondents in respect of external variables of perception of traceability systems. These attributes were earlier identified in the theoretical framework in Chapter 4 of this study. Respondents' perspectives were solicited by asking how they viewed traceability as economic or market instruments. Similarly, the interview guide was used to explore the perspectives of respondents regarding traceability as a means to achieve supply chain relationships or as a general norm in the cocoa industry. As discussed in Chapter 4, previous behavioural studies (Jackson, 2008) used similar external variables to understand behaviour. The differences in the perception of external attributes are mapped in Figure 6.2. The use of mapping and diagrams as a qualitative research technique is useful in presenting abstract perspectives (Morse and Richards, 2002).

MIDDLEMAN

It is to serve particular customer needs. There is a growing market opportunities for traceability

PROCESSOR

Food safety and dealing with contamination is important. It is important to meet customer expectation in the market

REGULATOR

It is a new market issue, which does not add a lot to what already exist in Ghana's system.

FARMER

There is premium that is used for projects in the community and considered as a good thing. But not enough to go round all farmers.

MIDDLEMAN

The portion of premium goes to develop community and welfare of farmers. It also strengthen market position

PROCESSOR

Not sure if the premium is enough as a motivation. Processors are more concerned about food safety and contamination in factories

FARMER

Our LBC buyers need traceability so we think the need is coming from the market.

MARKET FACTORS

EXTERNAL FACTORS OF PERCEPTION OF TRACEABILITY

ECONOMIC FACTORS

REGULATOR

The premium is a good support to government's objective to provide famers with social amenities

PROCESSOR

No new rules requiring traceability in any special way. But it is evolving especially in the EU

INDUSTRY NORM

RELATIONSHIP FACTORS

FARMER

There is good relationship with LBCs, NGOs etc which help explain issues to farmers

REGULATOR/FARMER

Farmers pointed to LBCs / NGOs as behind it. The Regulator consider is coming from outside forces since there is no international agreement on it

MIDDLEMAN

New issue emerging from customer concerns. It is a market issue that supplier must comply with.

PROCESSOR

There is the need for the entire chain to work together so as to collaborate in case of contamination or safety issues

REGULATOR

Stronger regulations are rather needed to control stakeholders in the supply chain. It can bring stakeholders in line with objectives

MIDDLEMAN

Relationship support efforts to control supply chain and to bring stakeholders together

Figure 6.2: Mind Map of the External Factors of Perception of Traceability

Figure 6.2 sets out the differences in the perception of traceability in relation to external factors. This approach is discussed for each variable and supported by illustrative quotes from respondents.

In examining traceability as a norm in the cocoa industry, the respondents in the case study generally regarded traceability systems as a new development in the cocoa industry. While the middlemen and the processors perceived traceability as the creation of consumers, farmers were not aware of where it was coming from but identified the middleman and other third parties as supporting it. The regulator in Ghana's cocoa sector, however, considered that traceability is being forced on cocoa suppliers by external interest groups. In support of the differences in the perspective of traceability as an industry norm, some selected statements were as follows.

> *'There are no clear rules on traceability in the cocoa industry. It is a new phenomenon, which has different uses in the cocoa business. As of now, there are no rules requiring us to do it, but gradually we expect legislation.' (Processor, 50, Chief Executive Officer, Case 11)*

> *'Ghana has its own system that can actually do the same thing as traceability. But what we are asked to be doing is nothing new, but being forced on us. I think everybody is doing it, so for us not to do so risks losing out; we have to join.' (Regulator, 56, Director, Case 14)*

> *'We don't know much about it. But we work with LBCs, the Cadbury Partnership and the rest. They are supporting us …' (Farmer, 57, Western Region, Case 2)*

Relationships in the cocoa supply chain are among the external influences of the perception of traceability systems. There were no clear differences in responses to traceability as a relationship instrument because most respondents agreed that traceability is good for relationships. This follows a trend in the literature which highlights the role of relationships and interdependence in improving traceability (Golan *et al.*, 2005). Regulators, however, favour strong regulation over relationships as useful for traceability. One quotation, taken from a farmer, supports relationships and interdependence in the traceability schemes in Ghana:

> *'Even though I am the chief farmer and I tell farmers to join traceability, I don't know too much detail but I expect the marketing people and the LBCs to help with all the paperwork. We are in the group to perform in a certain way and we rely on our partners to help us.' (Farmer, 62, Eastern Region, Case 4)*

The middlemen also expressed the importance of relationships to the integration of their operations. This is supported by a representative quotation to illustrate the middlemen's point of view:

> *'The relationships that we build with farmers and end-users help give us better control of activities and traceability. They bring all stakeholders together.' (Middleman, 56, Director, Case 7)*

With regard to economic influences within the supply chain, the farmers understood traceability as something that provides additional premiums and other incentives. The processors and the middlemen, for their part, did not emphasise financial and economic rewards as central to traceability. A cocoa processor indicated that traceability helps in

managing the risk of contamination and recall, while the middlemen indicated that efficient supply chains represented the economic gain from traceability. Even though a regulator acknowledged the premium as an economic gain, the regulator cautioned that premiums may not be sustained over time if the volume of traceable cocoa in the market increases. Bullut and Lawrence (2007) and Checketts (2006) identified the price premium as an integral aspect of traceability systems. Davies (2004), however, described processor reluctance to engage in traceability systems because of a lack of sufficient economic incentive. To illustrate the differences in the perception of economic variables of traceability, some selected responses are used as examples:

> *'There is a premium that goes to develop the cocoa community, which is a good thing for the cocoa sector as a whole. So the premium is a communal concept that creates and shares these kinds of things. But whether it would be sustainable is another thing.' (Regulator, 48, Advisor to Minister of Finance, Case 13)*

> *'Part of the premium comes to us, but we give it back to the community through our numerous activities. However, it is recognised as income for the strategic unit, which we are using to strengthen our position on the field as social partners. At the moment, it is not much but in the long run the picture can be different.' (Middleman, 49, Cocoa Executive Officer, Case 9)*

Market consideration as an external variable of behaviour is supported in the literature (Jackson, 2008). In this study, market factors were adopted as an external variable to explain the perception of traceability of cocoa in Ghana. Dessureault (2006) indicated that market considerations were important driving components of traceability systems. There were

differences in the perception of market variables in relation to traceability systems. These are shown in the mind map of Figure 6.2. Three quotations were selected to illustrate the differences in the perception of market factors in driving traceability systems:

'We are in this cocoa business to meet the needs of buyers. If there is a market opportunity, we cannot wait for COCOBOD to institutionalise it first. That is why we took the initiative to act as pioneers of traceability in Ghana because the market needs it.' (Middleman, 56, Director, Case 7)

. *'It is the LBCs which tell us what is happening around us. They organise us and train us to join the cooperative. I don't know if my cooperative qualifies in what you are referring to, but whatever it is, we leave it to people who buy our cocoa.' (Farmer, 67, Western Region, Case 6)*

'We process cocoa and sell to the market, so we don't have a choice. The customer is the key, so what the market wants is what we have to deliver. It is not up to us to say it is good or not, but it is what the customer wants.' (Processor, 48, Head of Marketing, Case 12)

The discussion of external variables in this section suggests differences in the perception of traceability systems as marketing instruments, economic instruments, relationship instruments or as a general norm in the international cocoa market. Case study quotes were used to support the cross-case analysis.

6.4 Internal Factors

It is suggested that attributes and events, which are internal and within the immediate control of respondents, can influence behaviour towards traceability systems (Heyder *et al.,* 2010). The perception of traceability systems in Ghana's cocoa supply chain is influenced by internal factors such as the level of knowledge about traceability systems, the level of income dependence, and the location and size of operations. Figure 6.3 is a mind map of the differences in the perception of traceability in terms of internal variables.

MIDDLEMAN

Locations in Accra and Kumasi but have network throughout the country. Purchases range between 1500 – 280,000 metric tones a years

PROCESSOR

Located at the port cities of Tema and Takoradi. Production capacity of 25.000 – 65, 000 metric tonnes

REGULATOR

Location in Accra but with offices across all regions of Ghana. Regulate all activities revolving around 1 million tonnes cocoa output

FARMER

Limited knowledge of traceability systems and rely on network at community level to

MIDDLEMAN

Good knowledge and knowhow of traceability systems. Actively engage farmers in education and training

PROCESSOR

Not sure about the depth of traceability sought by the research. But have knowledge of system in factories

FARMER

Farmer locations are Easter, Western, Brong Ahafo and Ashanti regions of Ghana. Farm sizes between 5 – 40 hectares

REGULATOR

Mixed response to knowledge about new systems of traceability. Confident in existing Ghana system

LOCATION AND SIZE OF OPERATION

KNOWLEDGE OF TRACEABILITY SYSTEM

INTERNAL FACTORS OF PERCEPTION OF TRACEABILITY

INCOME DEPENDENCE

FARMER

There is premium, which is used for the community but not enough to go round farmers.

MIDDLEMAN

The premium is good for the community but not as high as farmers would expect. Middleman reinvest its share in community

REGULATOR

The premium when shared fairly is good for the community but it is not high enough and feared that it cannot be sustained.

PROCESSOR

Premium from the market is not high enough to make a significant change. The important aspect is about meeting safety concerns

Figure 6.3: Mind Map of the Internal Factors of Perception of Traceability

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To understand the influence of location and size of operations on perceptions, farmers were selected from the Eastern, Western, Brong Ahafo and Ashanti regions of Ghana. More than 90% of Ghana's cocoa is produced in these areas (Ghana Cocoa Board, 2010) and represents the core base of cocoa farming activities. Farm sizes vary from 5–40 hectares. The middlemen, processors and regulators operate from the urban areas of Accra, Kumasi and Takoradi. Even though these areas serve as headquarters, the middlemen and regulators operate across the cocoa growing regions. The mind map in Figure 6.3 was used to show the perception of variables of traceability systems which are internal to the operations of respondents. There were differences in the knowledge of traceability systems among respondents. The farmer category expressed limited knowledge of how traceability systems work. An example is provided as an illustrative quote:

> *'We do not know a lot about traceability but we are in it. There are many systems around at the moment. We are also members of cooperatives and we also do other things. Maybe the LBCs can come in to organise us to operate the system so we must rely on them.' (Farmer, 57, Western Region, Case 2)*

The middleman category acknowledged that it understood traceability systems. As supply chain intermediaries, middlemen associate with foreign partners who commercialise cocoa in the international market. This association with international partners helps to expose the middlemen to internal market requirements, standards and the practice of traceability.

The regulator category, however, expressed mixed knowledge of the issues relating to traceability systems. They related traceability systems to the internal quality control systems of the Ghana Cocoa Board. As a result, a traceability system was perceived as a foreign

instrument in opposition to national systems. An example of the perspective in this regard is provided in the quotation below:

> *'The cocoa system was established in 1947 and it has an element of traceability built into it. Now we see new standards being forced from outside. I don't know what it is all about, but whatever it is, we have it already.' (Regulator, 56, Director, Case 14)*

The perception of how respondents depend on income related to traceability was also examined. On this subject, there were no clear differences in the perception of respondents. Income in the form of traceability premiums was perceived as insufficient to make a meaningful impact on finances. The middlemen, however, expressed satisfaction with the amount of premium paid, but do not depend on traceability income. Instead, they reinvest the premium back into the farming community. Some case quotations to support the analysis are as follows:

> *'The premium from traceability is used to develop the community. As a middleman, we have our share just as COCOBOD and the farmer but we have to reuse our portion in the community as additional support for the farmer. This premium does not make any difference to my finances, but this way we build a bond of loyalty with farmers.' (Middleman, 62, Managing Director, Case 8)*

> *'We go to various workshops and training in addition to receiving the premium for traceability. What comes to our cooperative is used for the whole community, so we cannot say there is enough for us as individuals.' (Farmer, 45, Eastern Region, Case 1)*

There were differences in the nature and operations of respondents as discussed in this section. However, respondents did not depend on the traceability premium as a part of their income. With the exception of middlemen, other respondents described the traceability premium as insufficient. In terms of the knowledge of traceability systems, there were differences in the level of knowledge about how traceability systems work, as shown in Figure 6.3.

6.5 Perception of Usefulness of Traceability

The perceived usefulness of a system is the degree to which the individual believes in the efficacy of the system to enhance operations and welfare (Davis, 1989). In behavioural studies, the perceived usefulness of a phenomenon or behaviour is examined by variables such as relative advantage, compatibility, complexity, and the risks involved in performing the behaviour (Rogers, 1995; Tan and Teo, 2000; Jackson, 2008). In the context of this research, direct questions were asked and follow-up questions relating to the variables of the perceived usefulness of traceability systems were proposed. The differences in perception of the different actors in the supply chain in respect of the perceived usefulness of traceability systems are presented in Figure 6.4.

MIDDLEMAN

Better supply chain management and help deliver obligation to community. It helps in building loyal customer base

PROCESSOR

It helps to solve food safety problems and gives product a better brand. Also build loyal customer base

REGULATOR

Premium is useful to develop communities and also provide a niche market opportunity for cocoa producers

FARMER

Not sure if traceability is complex because of the assistance of LBCs and other NGOs. There is help with the paper work.

PROCESSOR

The existing system in processing is integrated and forms part of cocoa processing. However additional requirements would be complex

REGULATOR

Difficulty in meeting different market standards. This makes it difficult to be familiar with what is being forced on Ghana

FARMER

Premium is used to provide social amenities. There is opportunity for training and recognition.

RELATIVE ADVANTAGE OF TRACEABILITY SYSTEMS

COMPLEXITY OF TRACEABILITY

MIDDLEMAN

Traceability is tedious and involves a lot of paper work and monitoring difficulty. It is difficult if you go deeper into the scheme

PERCEIVED USEFULNESS

PROCESSOR

Processing cannot be complete without a system of tracing product to bean sources. In that respect, it is compatible uncertainty about the concept.

COMPATIBLE OF TRACEABILITY TO OPERATIONS

FARMER

It is not different from the way things are done. It only comes with doing things well and taking records uncertainty about the concept.

COSTS AND RISKS OF TRACEABILITY

FARMER

There is fear that the cocoa may be rejected due to problems. Also the premium is not high to compensate farmers

REGULATOR

The system already exist and there is no need to change the approach to monitoring and regulation the concept.

MIDDLEMAN

It requires a whole change in organization to cope with data management and monitoring of the chain processes. This gets difficult at times uncertainty about the concept.

PROCESSOR

Uncertainty about who pays premium and if it is sustainable. There is still market uncertainty about the concept.

REGULATOR

Buyers can stop paying premium is traceable cocoa abounds. There is fear of legal liability and uncertainty.

MIDDLEMAN

There are no buyers at times and it can be expensive to run. There is the fear of loosing farmers is the economic benefit is not enough

Figure 6.4: Mind Map of the Perceived Usefulness of Traceability of Cocoa in Ghana

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The costs and risks associated with traceability were also used as variables to explain the perceived usefulness of traceability systems in the cocoa sector of Ghana. The respondents in the case study acknowledged the prevalence of costs and risks in implementing traceability systems. The cost of traceability was seen as direct and indirect expenses incurred during operations. It was also explained by the opportunity cost of engaging in traceability systems as against other schemes in the cocoa sector. The risks of traceability relate to the measure of adverse exposure to the market resulting from the implementation of traceability systems. It was found in the course of the interviews that the respondents were not able to clearly distinguish the costs of traceability systems from the risks. This reflected a weakness in the use of an open-ended interview guide because the respondents were not restricted to addressing the specific information that was being sought. It therefore decided to merge risk and cost in the development of the mind map in Figure 6.4. The elements of risk and cost were expected to have a negative effect on the perception of the usefulness of traceability systems because when costs and risks are found to be higher in behaviour, the inclination to perform is lower (Rogers, 1995). With regard to the perception of the risks of traceability, a regulator pointed out that the risks of potential legal liability and uncertainty about the continuous payment of premiums are important:

> *'We are not sure if the new system being sought in addition to what already exists in COCOBOD is aimed at placing liability directly on our farmers in the case of food contamination.' (Regulator, 56, Director, Case 14)*

The middlemen, on the other hand, linked the risks of traceability to economic challenges. The uncertainty of markets for cocoa produced by traceability schemes was considered a risk

because of the expense involved. The perception of risk by the middlemen also involved farmers deserting the scheme or switching from one programme to another. From the perspective of the cocoa processors, risks related to market availability, the recall of products and the cost premium to be paid. Processors were uncertain about the liability of traceability premiums. Insufficient premiums to compensate for the economic costs and risks of traceability were the major risks of traceability from the farmers' perspectives. The farmers also perceived risks and costs to include the rejection of cocoa by middlemen or final buyers in the international market. This point was made in the following quote:

> *'Our fear is that the cocoa can be rejected and the farmer who produced the cocoa can be penalised. This is what we fear and want to avoid.' (Farmer, 65, Ashanti Region, Case 5)*

The perception of the complexity of traceability systems can also be expected to adversely affect the inclination to implement traceability. Rogers (1995) established a negative relationship between the complexity of behaviour and the inclination to perform the behaviour. With the exception of record keeping, the farmers did not perceive traceability systems as complex.

> *'I am not sure what the whole thing is about but we are able to do things right because we happen to follow the LBC and take instructions from our cooperative. As a farmer, putting everything down as a record is difficult. A farm is not the best place to keep papers.' (Farmer, 45, Eastern Region, Case 1)*

Cocoa processors consider traceability as part of the general internal record keeping and product batch numbering system. However, the response of the processors limited traceability to product identification systems in factories. The middlemen perceived traceability systems in cocoa as complex undertakings in terms of the different market standards that must be met.

> *'We are now working with the "geo-traceability people" to develop software to assist in differentiation. We have different stocks of cocoa for different buyers in the same warehouse facility. Differentiation is becoming more and more complex as our operations grow.' (Middleman, 56, Director, Case 7)*

Compatibility and the relative advantage of a system or behaviour have a positive influence on perceived usefulness (Jackson, 2008). In the area of traceability, research indicates that some established advantages have contributed positively to the perception of traceability (Buhr, 2003; Hobbs *et al.,* 2007; Golan *et al.,* 2004). As indicated in the mind map in Figure 6.4, the farmers perceive traceability systems as integral to the farming process and therefore compatible with operations. The cocoa processors also perceive traceability as integral to cocoa processing depending on the depth of traceability sought.

> *'I want to be recognised and identified as the farmer who produces a particular cocoa that is used for making chocolate. It is part of what I have been doing already and I want to be known for it.' (Farmer, 65, Brong Ahafo Region, Case 3)*

The regulators and the middlemen perceived traceability systems as compatible with the cocoa supply chain. They considered traceability as a way of improving transparency and controlling events in the supply chain. Some of the perspectives were as follows:

'We are engaged in different sustainable projects, including organic certification, for which traceability is required. It is compatible with our philosophy; that is why I believe traceability of non-sustainable cocoa is a waste of time and does not achieve anything. Traceability fits perfectly for us.' (Middleman, 50, Chief Executive Officer, Case 10)

'It is important to know the source of cocoa for many reasons. That is why Ghana originally had traceability built into its operations.' (Regulator, 48, Advisor to the Minister of Finance, Case 13)

The relative advantage of traceability systems in the cocoa sector was attributed to a number of factors ranging from financial benefits, the better management of the supply chain, quality assurance, market share and supply chain relationships. Some of these factors have also been highlighted in the literature as advantages of traceability systems (Buhr, 2003; Hobbs *et al.,* 2007; Golan *et al.,* 2004).

'Because of traceability we have been benefiting from training on how to improve our farming practices. Our community also benefits from boreholes and other things and we feel united.' (Farmer, 57, Western Region, Case 3)

'It is a new trend in the market that is bringing in extra benefits to farmers and communities. We need to be in there in order not to lose out.' (Regulator, 56, Director, Case 14)

'We are able to hold on to our market share and have better control of our supply chain. We build relationships as we go along.' (Middleman, 62, Managing Director, Case 8)

In this section, cross-case analysis of the perceived usefulness of traceability systems was carried out across different respondents. In examining this, reference was made to behavioural literature, which provided a theoretical guide to the selection variables. Pursuant to Rogers' theory of the Diffusion of Innovations (Rogers, 1995), relative advantage, compatibility, complexity, risk and costs were examined. The differences in perception of these variables across respondents were presented in this section. Further to perceived usefulness, the intention to implement traceability across the different cases was examined. The qualitative exploration of the intention to implement traceability systems was useful in examining contradictions and consistencies of response compared to express intentions.

6.6   Intention to Implement Traceability in Ghana's Cocoa Sector

In this section, the differences in the intention to implement traceability systems across cases are examined. In the discussion of behavioural theories in Chapter 3, perceived usefulness, or the positive evaluation of a system or behaviour, does not necessarily lead to performance (Ajzen, 1991). Perceived behavioural controls such as self-efficacy and confidence, as well as the evaluation of experts or advisors about behaviour or systems, determine actual performance. Understanding the differences in the perception of traceability systems in the context of this study also includes the evaluation of differences in the intention to implement traceability. In Chapter 4, the theoretical variables of intention as justification for the choices

made in this study were presented. Direct questions and follow-ups were asked in respect of self-confidence and the influences on decisions to implement traceability systems. Also, the willingness of respondents to continue using traceability systems was explored. Differences in intention were analysed across cases and the results presented in Figure 6.5.

REGULATOR

Not willing to accept systems being forced from outside. Ghana has its own system and has to be recognized by the international market

PROCESSOR

Happy to implement existing system but not ready for additional investments. Wants to guarantee quality and deal with food safety

FARMER

Limited knowledge and rely on training from facilitating LBC or NGO. Not sure if it can do it all alone with the support

MIDDLEMAN

Confident in the ability to deliver what the partners in the market wants. Have local and international network.

REGULATOR

The need to understand underlying reasons for the new system. Cocobod already has a working traceability system

MIDDLEMAN

Willing to continue implementing traceability albeit difficulties. Import for the market and supply chain

WILLINNESS TO IMPLEMENT

INTENTION TO IMPLEMENT TRACEABILITY

SELF-EFFICACY

PROCESSOR

Have experience and knowhow in processing industry traceability. Only sure about the batch traceability in factory

FARMER

Not sure about traceability in the long run. But will continue as long as premium is good and LBC / NGO wants it.

REGULATOR

Read from expert publications; Attend meetings and organized conferences

SUPPORT AND ADVISORY SERVICE

FARMER

Needs regular support of LBC and NGOs. Attend field school training and other sessions to know more

PROCESSOR

Has limited relationship in terms of finding knowhow of traceability. Take a cue from the market

MIDDLEMAN

Cooperation with external buyers to meet their expectation. Has a duty to train farmers

Figure 6.5: Mind Map of the Intention to Implement Traceability

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In examining self-efficacy, respondents were asked about the trust and confidence they have in their ability to implement traceability systems. There were differences in self-efficacy because farmers expressed doubts about their ability to implement traceability alone. For example:

' received training but the Cadbury Partnership and LBC lead us on what to do. So we rely on them but I don't think some of the things required in traceability are necessary.' (Farmer, 57, Western Region, Case 2)

'I represent farmers and we speak about the issues of sustainability. We know what to do to get the best out of our cocoa and we do this with the support of the LBC, so if traceability is what would get us there, I think we should continue to be in the scheme.' (Farmer, 45, Eastern Region, Case 1)

In analysing the responses of the processors and middlemen, it was found that they were confident in their ability to implement traceability without the help of third parties. However, they indicated a reliance on the market and consumer preference when designing traceability systems. The regulators, on the other hand, were not sure about whether or not a new traceability system adds anything to the existing quality control systems in Ghana. The following quotation illustrates a regulator's point of view:

'We already have traceability in our system, but we need to know what the new standard is about.' (Regulator, 48, Advisor to Minister, Case 13)

Also, the regulators were concerned about changing situations in the international cocoa markets, specifically in the European Union, which could influence the implementation of 'Western' traceability systems.

In terms of advisory and support services, the regulators rely on trade publications and support materials from the International Cocoa Organisation. Information from publications by cocoa experts influenced the intention to implement traceability in Ghana. The processors and middlemen indicated that market information and relationships with buyers influenced their intention to implement traceability systems. In particular, the middlemen have developed relationships with international merchants with whom they implement traceability systems. Support and advice from these international sources influence perception, and the intention to implement traceability.

The analysis also found that the cocoa farmers relied on the support and advisory services of LBCs, NGOs and extension officers. The level of cocoa production per farmer in Ghana is relatively low. For this reason, farmers are grouped together into a traceability scheme where the produce is pooled together on a cooperative basis. The cooperatives thus rely on LBCs and NGOs to implement traceability.

In terms of the willingness to implement traceability systems, a question was posed as to whether or not respondents were willing to implement traceability systems voluntarily. The middlemen in Ghana's cocoa sector generally expressed willingness to implement traceability. The processors expressed willingness to continue with product quality traceability systems but were not willing to voluntarily implement additional systems to capture downstream and upstream information. The regulators did not express willingness to

implement any additional systems besides those that already exist in Ghana. The farmers were indifferent to implementing traceability systems. A quotation to illustrate the farmers' view is as follows:

> *'Implementing traceability depends on who is behind it. If we trust the LBC or the NGO we are willing to go through the training and implement as required.' (Farmer, 45, Eastern Region, Case 1)*

It was also deduced from the data that the farmers' indifference to traceability systems could be the result of reliance on other supply chain partners for decision-making.

In this section, the differences in intentions to implement traceability systems across the case studies were analysed. As discussed earlier in this section, the study relied on literature to select the three variables, which influenced the intention to implement traceability systems. The variables were self-efficacy, the availability of advisory and support services, and willingness to implement traceability systems. The differences and similarities across the cases were identified and discussed. The outcome of this cross-case analysis helped the researcher to align the different aspects of perception with the intentions of the respondents. Furthermore, the motivations for implementing traceability systems were examined across cases. This issue is discussed in detail in Section 6.7.

6.7   Motivations for the Implementation of Traceability Systems

As discussed in the methodology in Chapter 4, a counting technique was used to identify the factors of motivation for the implementation of traceability systems in Ghana's cocoa supply chain. Miles and Huberman (1994) recommended this technique as providing analytical

honesty in making judgements about qualitative study. To find the motivations for the implementation of traceability systems, respondents were asked about factors of motivation for implementing or continuing to remain in traceability programmes. From the contents of the data, themes were identified and the consistency of the responses was isolated. Table 6.1 presents the results of the cross-case analysis of the motivation factors for implementing traceability systems.

Factors of Motivation for Implementing Traceability	Farmers	Middlemen	Processors	Regulators	Total	%
Extra Money	4	2	-	2	8	23%
Training	2	-	-	-	2	6%
Market Share	-	3	-	1	4	11%
Knowledge	-	3	-	-	3	9%
Quality Assurance	-	-	2	-	2	6%
Relationship	3	2	-	-	6	17%
Regulatory Expectations		-	1	1	2	6%
New Trends	-	-	1	1	2	6%
Supply Chain Management	-	3	-	-	2	6%
Sustainability	2	2	-	-	4	11%

Table 6.1: Motivations for Implementing Traceability Systems in the Ghana Cocoa Sector

From the results of the analysis, the most important factor of motivation for the farmers to implement traceability systems was the extra money in the form of a premium paid for traceability. The other factors were the opportunity for training and for relationship-building. A quotation to illustrate the perspective of the farmer is as follows:

'We get a premium that comes to develop our community. As you can see, we are benefiting from training by our partners and this makes us know all the people that we are dealing with.' (Farmer, 45, Eastern Region, Case 1)

The middlemen identified market share, supply chain integrity and greater knowledge of the supply chain as the key motivating factors for implementing traceability. An example of such a view is expressed in the following quotation:

'The market is the most important reason that we are in the business. We also get to have geographical control of our activities.' (Middleman, 56, Director, Case 7)

According to the cross-case data analysis, the cocoa processors identified quality assurance as the most important factor of motivation. The regulators, however, identified extra money in the form of premiums as the motivation for accepting traceability systems. In the analysis across all cases, the extra money in the form of premiums was found to be the most important factor of motivation for implementing traceability. This was followed by the improvements in relationships and market shares that traceability brings to supply chain participants. Respondents, particularly the farmers and middlemen, identified traceability as a tool for promoting sustainability. This has also influenced their motivation to implement traceability systems. Finally, the supply chain linkages in the cocoa sector of Ghana were mapped.

6.8   Supply Chain Networks in the Cocoa Sector of Ghana

In the discussion of case study methodology in Chapter 4, the use of a common sense approach to show collaboration and cooperation among different actors in supply chains (Hammer, 2002) was adopted. In this section, the linkages among the actors in the cocoa

supply chain were examined with the view to produce the supply chain map. Respondents were asked to provide details of their relationships, and operational and transactional networks in the cocoa sector of Ghana. The data gathered were analysed across the different cases and the linkages presented in a supply chain mind map in Figure 6.6.
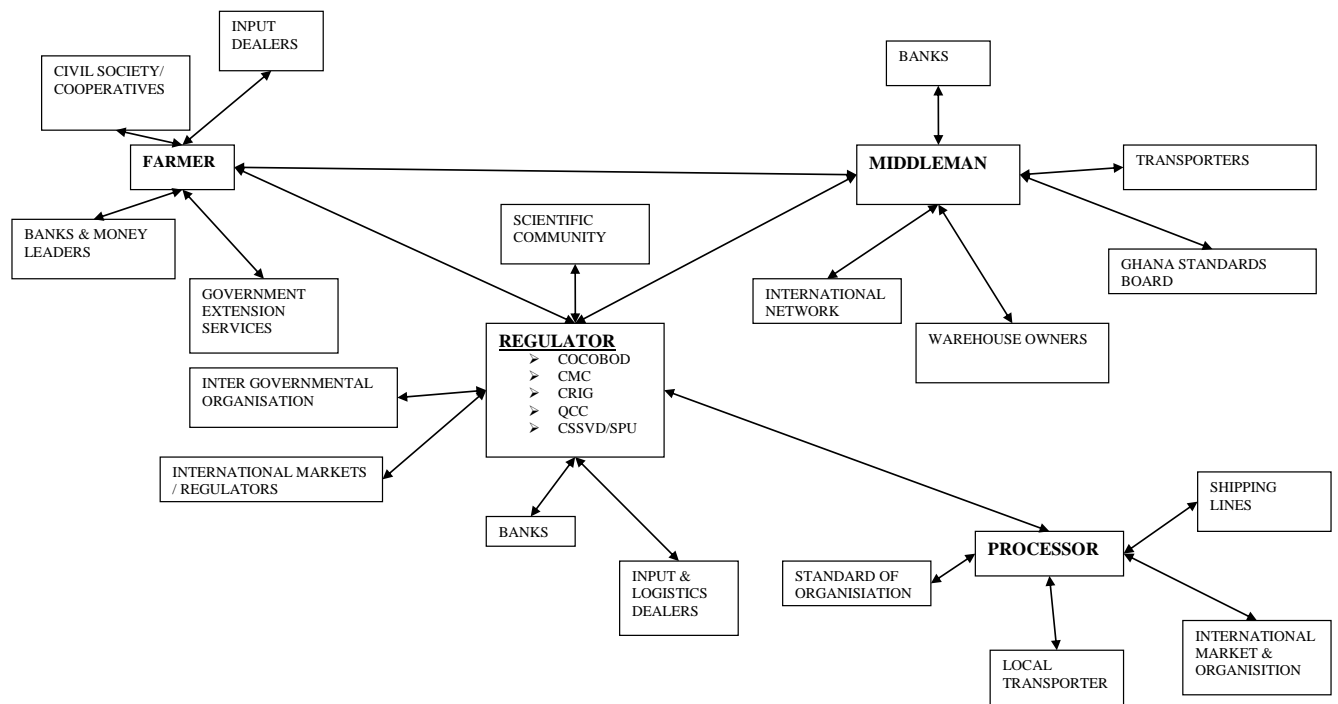
Figure 6.6: Supply Chain Mind Map of Relationships, Operational and Transactional Networks

The supply chain map in Figure 6.6 is a representation of the linkages of the cocoa sector and an indication of how the actors relate to one another. It focuses on how goods, information, regulations and transactions flow in both upstream and downstream directions within the cocoa system in Ghana. In constructing the supply chain map, the entire cocoa system in Ghana, including the secondary players such as banks, shipping companies, trade houses and international cocoa organisations were considered. The data gathered from the field

interviews of the key players were analysed across the cases, and the various linkages and networks were constructed. The linkages were connected together to show the relationships in the cocoa sector. The map reveals the interdependence among the farmers, middlemen, processors and regulators. As can be seen in Figure 6.6, the regulators play a central role in the cocoa system and interact with other participants in the supply chain. The map also shows different levels of relationship and interaction, which could influence behaviour and perception. The details of the findings are presented in Chapter 7.

6.9   Summary

In discussing the methodology in Chapter 4, it was argued that the perception of traceability systems is best explained by different behavioural variables. On the basis of theoretical insight, we developed the parameters for examining the differences in the perception of traceability systems. Also, this research sets out to determine the factors of motivation for the implementation of traceability systems, and the mapping of the cocoa supply chain network in Ghana. In the cross-case analysis of this chapter, data across all the cases was analyses in order to answer the research questions. The themes used to examine the perception of traceability systems were classified into demographic factors, internal factors, external factors, perceived usefulness and the intention to implement traceability systems. The differences in perception among the different stakeholders were presented in mind maps. Selected quotes from the data were used to illustrate aspects of the analysis. In examining the factors of motivation for the implementation of traceability systems in this cross-case analysis, a counting technique (Miles and Huberman, 1994) was applied by tabulating the frequency of factors in Table 6.1. In mapping the supply chain network, a common sense approach (Hammer, 2002) was used to construct a mind map of relationships and networks in

the cocoa sector of Ghana. Cross-case analysis provided the basis for answering the research

questions in the discussion of findings of this study.

Chapter 7: Discussion of Findings

7.1   Introduction

In this chapter, the findings of the study and alternative explanations are presented. In answering the key research question as to how and why traceability systems are perceived differently, the five research propositions, which were set out in Chapter 4 are taken into consideration. The cross-case analysis discusses in Section 6.1 is used to answer the key research questions. The outcome of the cross-case analysis was used to answer the second research question with regards to the motivation for implementing traceability systems. A mind map of the cocoa supply chain network is discussed in this chapter along with alternative explanations of the findings. In Chapter 4 the importance of situating the findings of qualitative case studies in the literature was discussed. The findings in this chapter were therefore compared with the literature in a bid to improve the reliability of the study.

7.2   The Differences in the Perception of the Meaning of Traceability

In this section, the findings about the different perspectives of the meaning of traceability systems are discussed. This was achieved by distilling the meanings assigned to traceability systems in the within-case and cross-case analyses of the data. The results were compared with other meanings suggested in the relevant literature of traceability systems.

From the farmers' perspective, traceability is a farm-based initiative aimed at improving product quality and the production processes of cocoa. Similarities can be drawn between the farmers' view of traceability and the literature. *Folinas et al.,* (2006) classified traceability into two types: logistics traceability, which follows physical movement, and quality

traceability, which is associated with quality and other attributes. Golan *et al.,* (2004) also indicated that traceability alone is not beneficial unless it is linked with quality attributes. The farmers' view of traceability is related to farm activity and is supported by the literature.

The processors' explained traceability systems as problem-solving tools associated with identifying batches of finished products to the raw materials. In the related literature, Bracken and Mathews (2005) proposed a similar meaning of traceability as the ability to identify a unique batch and the raw materials used. This proposal appeared in a study to demonstrate how the use of EAN/UCC traceability standards satisfies European Union regulations regarding business operations. Bollen *et al.,* (2007) also viewed traceability from a similar perspective as the ability to track a product batch and its history. The processors' perspective limited traceability to factory production activity, a perspective which is also grounded in the literature.

The middlemen in Ghana's cocoa chain control and coordinate the movement of cocoa between the farm gate to the point of export. From the middlemen's perspective, traceability systems are instruments that provide geographical control and enable the mapping of farmers who supply cocoa. Mapping farmers in a specific geographical area helps to establish the breadth, depth and precision of information (Golan *et al.,* 2005). The middlemen regard traceability as a logistics activity; this is also acknowledged in the literature (Trautman *et al.,* 2008).

The regulators make rules and regulations, and monitor the implementation of cocoa sector policy in Ghana. The regulators' perspective of traceability refers to a system of knowing the origin of cocoa so as to ascertain its characteristics. The choice of the word 'origin' to

describe traceability has been widely used to define traceability (Hobbs, 2004; ISO, 2007; Smith, 2005; Pouliot and Summers, 2007). However, such authors have not limited the definition to origin alone, but have also included other stages and processes by which complete tracking of products is achieved. The regulators' perspective closely relates to internal quality control in Ghana's cocoa system where seals are attached to bags of cocoa to trace their origin. However, such control fails to track movement and flow from point to point. Hobbs (2004) indicated that tracing the flow of products underpins the concept of traceability.

7.3 Differences in the Perceived Usefulness of Traceability Systems

The perceived usefulness of traceability systems in this study is the extent to which respondents believe that traceability could enhance their activities in the cocoa supply chain. In this section, the differences in perceived usefulness of traceability systems are discussed in relation to the literature. Alternative explanations for the findings are also discussed.

In the literature of behavioural studies, there is a negative relationship between perceived risks and the complexity of a system, and the perceived usefulness of that system (Tan and Teo, 2000, Jackson, 2008). Rogers (1995) and Bradford and Florin (2003) also suggested a negative relationship between risks and the complexity of a system and its perceived usefulness. In the cross-case analysis of the perceived usefulness of traceability systems in Section 6.5, the perception of factors such as complexity, risk, relative advantage and the compatibility of traceability systems were examined. It was found from the analysis of data that the middlemen considered traceability systems as risky and complicated. Contrary to

theoretical expectations discussed in the literature, the middlemen perceived traceability systems as useful.

In comparison to the middlemen, the farmers and regulators perceived traceability systems as less complicated and less risky. In contrast to the literature, the farmers and the regulators perceived traceability systems as less useful to their activities in the cocoa supply chain. The cocoa processors, on the other hand, perceived traceability systems as useful, and perceived them as less risky and less complicated.

With the exception of the findings from the cocoa processors, the results of the case study were opposite to the expectations from the literature. Alternative explanations to the findings of the differences in the perceived usefulness of traceability systems were proposed. Yin (2003) suggested that the narrative nature of qualitative case studies makes it difficult to find causal links to reflect the theoretical proposition of a phenomenon. It is plausible that the narrative approach to this case study methodology could have affected the content of the findings.

The second rival explanation for the findings could be gaps in the understanding of traceability systems. Fritz and Schiefer (2010) found that there were gaps in the understanding of the complexities of implementing traceability systems. They identified that the gaps included information interest, information content, processing needs, and technological and intellectual requirements. It is plausible that the respondents exposed these gaps in their answers to the question regarding their knowledge of the complexity and risks of implementing traceability systems. This is because the qualitative case study methodology used in this study did not test construct variables, as would be the case with quantitative

modelling, but relied on narratives from the respondents. The third explanation is the interviewer effect. As an official of the Ghana Cocoa Board, it was plausible for respondents to tailor aspects of their answers to impress the interviewer. The middlemen, for example, may have highlighted the difficulties and risks involved in traceability so as to attract the support and sympathy of officials of the regulatory institution, the Ghana Cocoa Board. The regulators and the farmers may have expressed a 'political' view in terms of rejecting systems perceived as being imposed by foreign interests. The forth explanation is derived from Rogers' theory of the Diffusion of Innovation systems. The theory describes the existence of intervening factors; this explains the deviation from expected behaviour. There could also be other strategic considerations in the decision process for adopting technology systems. In this case study, it is plausible for the perceived usefulness of traceability systems to be influenced by considerations other than theoretical antecedents discussed in the literature.

Traceability is perceived by the respondents to provide relative advantage. The farmers and the regulators identified additional money in the form of premiums as an added advantage of traceability systems. The processors identified the quality assurance system, and the middlemen identified supply chain control systems, as relative advantages of traceability systems. Similarly, the respondents identified traceability as compatible with supply chain operations. The middlemen and the farmers, however, identified changes to operations in order to accommodate the data-capturing requirements of traceability systems.

7.4 Differences in the Intention to Implement Traceability Systems

The intention to implement traceability systems was examined in the context of factors such as self-efficacy, the availability of support services, and willingness. It was found that the middlemen and the cocoa processors trusted their ability to implement traceability systems without the assistance of third parties. The middlemen and processors also expressed willingness, and their intention, to implement traceability systems. The farmers did not have the confidence to implement traceability systems and were unwilling to do so voluntarily. The regulators did not require external assistance to implement traceability systems and were not willing to implement them beyond existing national quality control systems. The farmers and the regulators did not have an intention to implement traceability systems voluntarily.

The Theory of Planned Behaviour (Ajzen, 1991) explains the influence of self-efficacy, and the expectations of significant players, on behavioural performance. According to the theory, high self-efficacy, and affirmations of behaviour by significant players, tend to have a positive influence on actions. The findings for the farmers, middlemen and processors conformed to the theory. The regulators presented a mixed situation whereby high self-efficacy did not result in a greater intention to implement traceability. One plausible reason could be attributed to the tendency of a regulator to reject a system perceived to be imposed by foreign forces.

7.5   Differences in the Perception of the Internal Variables of Traceability

In this section, the findings about the differences in the understanding of traceability systems and the contribution of traceability premiums to income are discussed. These variables form part of the internal factor of perception of traceability systems. It was found that the

middlemen and the processors understood traceability systems and the information requirements of the cocoa system. However, the processors' understanding of traceability systems was limited to processing-based product batch identification and product movement. In respect of premiums, the middlemen and processors did not perceive traceability premiums as making a significant contribution to income.

The farmers and regulators in Ghana's cocoa sector perceived traceability premiums as insufficient and not significant to income. The farmers did not fully understand traceability systems and their requirements. This is because they rely on LBCs and middlemen to lead cooperatives in implementing traceability systems. The regulators did not discuss the additional requirements and standards of traceability outside the existing national quality control systems. The regulators perceived the international market requirements of traceability systems as a threat to local authorities.

7.6   Differences in the Perception of External Variables of Traceability

In this section, differences in the perception of traceability systems as an industry norm, a relationship tool, and an economic tool in the cocoa sector are discussed. The respondents perceived traceability as a new development in the global cocoa industry. However, there were differences about where traceability was perceived to be coming from. The middlemen perceived traceability systems as a creation of consumers in the international market. The farmers did not know about the sources driving traceability in the cocoa sector. The processors perceived traceability systems as an integral part of the supply chain process that had existed over the years. The regulators perceived traceability systems as being forced on cocoa producers by external forces and interests.

The study also found that traceability systems were perceived as improving relationships among stakeholders in the cocoa supply chain. Supply chain participants recognised the relationships that developed in the traceability process. Golan *et al.,* (2005) found that the relationships, which result from traceability schemes are interdependent in nature. The findings in this case study support this view except in the case of the regulators who perceived relationships to represent mistrust and to control activities along the supply channel.

There were differences in the perception of traceability systems as an economic tool. The farmers perceived additional money in the form of premiums as a major economic component associated with traceability systems. This view was supported by Bullut and Lawrence (2007) and Checketts, (2006), who isolated price premiums as an integral aspect of traceability systems. The processors identified the risk management function of traceability systems as providing economic importance. The cost of managing recalls, and the risk of contamination, has adverse economic effects on the cocoa processors. Traceability systems were perceived as providing solutions to such exposure. The middlemen did not perceive economic rewards for themselves. Instead, they saw rewards going to the farmers who produce cocoa. The middlemen perceive the premiums as incentives in developing farmer loyalty. The regulators perceive traceability premiums as an incentive system for cocoa producers. They perceived the present premium regime as insufficient and failing to reward the farmers' efforts.

7.7   Motivations for the Implementation of Traceability Systems

From the frequency table in Section 6.7, the following factors were found as motivating the implementation of traceability systems.

The farmers perceived extra money in the form of traceability premiums as the most important factor of motivation for the implementation of traceability systems. The farmers also identified the relationships that result from the implementation of traceability systems as motivating implementation. Hobbs (2004) affirmed that traceability facilitates relationships in supply chains. However, the evidence supporting price premiums as a benefit of traceability remains uncertain (Loureiro and Umberger, 2007). Golan *et al.,* (2004) identified the economic benefit of traceability to include the lower cost of distribution and higher margins.

The cocoa processors identified traceability systems as an important element in cocoa processing but did not consider that there is a need to implement additional systems to capture extra upstream and downstream information. This finding is similar to the food processing industry's perception of traceability. Heyder *et al.,* (2010) found that food manufacturers perceived traceability as a useful means of ensuring food safety, but lacked the motivation to invest further to meet the intrinsic purpose of traceability. In terms of motivation, the cocoa processors identified quality assurance as a key motivation for implementing traceability systems in Ghana's cocoa sector. The quality assurance reason, as a motivation for the implementation of traceability systems, is supported by the literature (Heyder *et al.,* 2011; Trautman *et al.,* 2008; Bullu, 2007; Dessureault, 2006; Golan *et al.,* 2004).

The middlemen identified market share and supply chain management as the main motivations for implementing traceability systems. Supply chain considerations and market factors as motivators for the adoption of traceability systems have been identified in the literature (Golan *et al.,* 2004; Dessureault, 2006). However, the middlemen considered that the cost of investment in traceability systems affects the implementation of traceability. The cost of traceability has been estimated to range between $10-$12 million in Europe for a single supply chain (Buhr, 2003). Brester *et al.,* (2004) also estimated a $1.643 billion annual increase in the operational costs of the beef industry in the United States as a result of the implementation of an origin labelling traceability programme.

The regulators perceived traceability systems as promoting Western standards of food chain management and imposing unnecessary costs and potential liability. Hobbs (2003) also shared the view that traceability could impose costs that can lead to international trade tensions without a guarantee of direct benefits. The literature further indicated that liability-based incentive systems could be incorporated in traceability systems to address the impact of food safety issues (Hobbs, 2004). This confirms the fear of the regulators that liability-based traceability systems could result in trade embargoes and penalties in the international cocoa trade. The regulators of Ghana's cocoa sector, however, identified 'extra money' in the form of premiums as a motivating factor so long as the premiums outstrip the costs of implementing traceability. This means that the regulators expect the economic benefits (Golan *et al.,* 2004) to be higher than the costs of implementing traceability systems.

From the discussion of the results of the research into the factors of motivation for implementing traceability systems, 'extra money' in the form of traceability premiums was

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identified as the most important factor. However, six factors of motivation of traceability were discussed in the literature review (Theuvsen *et al.,* 2005; Dessureault, 2006). These are:

1. Market differentiation strategies

2. Business process improvements

3. Risk management strategies

4. Stakeholder demands

5. Certification system requirements

6. Legislative requirements

The traceability premium as a factor of motivation was not included in the above drivers of traceability systems. This finding is specific to the case of Ghana's cocoa sector, where extra income is expected as a reward for implementing traceability systems.

7.8   The Supply Chain Network in the Cocoa Supply Chain in Ghana

The result of the supply chain mapping in this study shows a network of the core processes, relationships and interactions involved in the operations of the cocoa sector. The mapping shows a vertical approach to chain integration and horizontal cooperative integration. The networks of the farmers, middlemen, cocoa processors and regulators also show cooperation and interdependence. Each actor makes decisions and manages costs without considering the reaction of other players in the network. However, the regulators interconnect the decisions of the different actors and play a central role. Cooperation in the cocoa sector is based on the delivery of goods and services. Hammer (2002) suggested two main cooperation systems in supply channel integration: product-based and customer-based integration.

It was found in this case study that the alignments in the cocoa sector were based on the functional objectives of participants. These include the provision of services, the distribution of inputs, the processing of cocoa, marketing, transportation and international cooperation. In some cases, the operational alignments are governed by contractual arrangements. Contracts are important tools to influence quality and specifications (Gorton *et al.,* 2006). However, in the event where public enforcement of these business contracts breaks down, the ability to enforce and maintain private self-enforcing contracts prevails in the cocoa supply chain. Private self-enforcing contracts in the cocoa sector network arrangements are a set of regulations, which moderate the activities of players in the supply chain. In this regard, COCOBOD, as the cocoa industry regulator, plays a central role in managing the network of activities in the cocoa sector of Ghana. Kumar (1992) identified alignments in supply chain networks as often controlled by contractual arrangements. Gardner and Cooper (2003) found the most compelling reason to construct a supply chain map is the ability to visualise the link between cooperation and supply chain strategy. In this case study, the supply chain network can be viewed as the interconnections within the entire cocoa system in order to provide a visual link between policy, strategy and supply chain activities. The supply chain map can facilitate a quick scanning of the cocoa sector and provide a strategic direction for commercial interest groups and policymakers.

7.9   Applying the Findings of Demography to Theory

In Section 6.2, it was argued that an examination of demography helps to build a sound picture of respondents. This section applies theories to find relationships between the demography of respondents and the perception of traceability systems in the cocoa supply chain in Ghana. The theories applied in this case study include the behavioural theories of

Reasoned Action and Planned Behaviour, the Diffusion of Innovations Theory, and decision-making theories. In Chapter 3, it was argued that Rogers' Diffusion of Innovations Theory (Rogers, 1995) found a relationship between demography and behaviour towards technology systems. Some researchers have used demographic features to profile behaviour towards traceability systems (Heyder *et al.,* 2010). Traceability is a contemporary phenomenon in supply chains (Trautman *et al.,* 2008) and relies on technology systems (Bourlakis, Vlachos and Zeimpekis, 2011). In this respect, the demographics of respondents in the context of Rogers' theory of Diffusion of Innovations are discussed.

The findings of this study show that the middlemen and cocoa processors constitute the highly educated category in the context of the classification proposed in Chapter 4. The results also indicated the leadership roles that the middlemen and the cocoa processors play in the cocoa supply network. In the context of Rogers' theory, the demographic profiles of the middlemen and the cocoa processors can be associated with the general characteristics of 'early adopters'. In the findings of this case study, the middlemen and the cocoa processors perceived traceability as useful, and indicated their intention to implement the system. A similarity can be drawn between the findings in this case study and the behaviour pattern of 'early adopters'.

The farmers constitute the low education and low economic status category in the demography of respondents. According to Rogers' theory, this demographic category is described as 'laggards'. 'Laggards' are often sceptical in their perception and adoption of new technology systems. The result of this study shows that the cocoa farmers did not perceive traceability as a useful system and were indifferent about its implementation. A parallel exist between this perception of the farmers and the behavioural pattern and demographic profile

of 'laggards'. The demographic profile of the regulators is similar to that of 'early adopters' according to Rogers' theory. However, the behaviour pattern of the regulators in this case study research can be compared to that of 'laggards'. The confusing nature of the finding in the case of the regulators can be explained by the regulators' willingness to reject a system which is perceived to be imposed from outside.

7.10   Summary

In this chapter, the findings of the study in order to address the research proposition and research questions were discussed. The perception of traceability systems in the cocoa sector of Ghana was discussed by highlighting the differences in the perception of different actors. The findings were discussed in terms of the meanings assigned to traceability and the perceived usefulness of traceability systems. The differences in the intention to implement traceability systems and the differences in the perception of variables of traceability systems were also discussed. It was considered that relationships exist between demography and perception in this case study. The findings were discussed in the context of Rogers' category of demography and behaviour towards innovation systems (Rogers, 1995). With reference to Rogers' theory, the demographic profile and perception of the middlemen and the cocoa processors conformed to 'early adopters' while the farmers exhibited 'laggard' characteristics. The findings for the regulators were, however, inconclusive and a plausible explanation was discussed. The major factors of motivation for the implementation of traceability systems were considered. There were differences in motivation among the different actors in the cocoa supply chain. Finally, the relationships among the different actors were revealed through mapping of the cocoa supply chain in Ghana. The interdependence of relationships,

and the centrality of control between the Ghana Cocoa Board and other actors in the cocoa sector of Ghana, were found and reviewed.

Chapter 8: General Conclusion and Recommendations

8.1   Introduction

The conclusion of this thesis provides a summary of all aspects of the research conducted to complete the study. The perception of traceability systems in the cocoa supply chains was studied by way of a case study of Ghana. Traceability has been recognised as a means of achieving transparency in the global cocoa supply chain (ICCO, 2010). The theoretical basis of studying the perception of traceability systems was derived from a combination of theories which provided guidance to data collection and analysis. The findings of the study were triangulated with literature in order to situate the case study in a general context. The summary of the research and the contribution that the current research has made to the literature, agribusiness policy and strategy are discussed. The acknowledged limitations and recommendations for future studies are also outlined in this chapter.

8.2   Summary of Research

In order to understand the perception of traceability systems in the cocoa supply chain, a case study of the perception of traceability systems in Ghana's cocoa supply chain was conducted. After a thorough review of the literature on research methodologies, a qualitative case study method was found to be the most suitable approach to gaining first-hand insight into the genuine experience of respondents with respect to their perception of traceability systems. A multiple case study approach was chosen to enable us to understand the perception of traceability systems among different actors in the cocoa supply chain in Ghana. Using a set of research propositions, the research questions were examined in the context of understanding

the perception of traceability systems in the cocoa supply chain. An outline of the literature was developed to address the theoretical aspects of the research questions. The literature review covered issues pertaining to transparency and supply chains; the international cocoa value chain and traceability systems; and the theoretical literature of behavioural theories, technology and innovation diffusion theories, and decision-making theories. A theoretical framework, based on a combination of theories and previously tested behaviour was used as a theoretical guide to the research process. The specific theories were Rogers' Diffusion of Innovations Theory (Rogers, 1995), the Theory of Reasoned Action (Ajzen and Fishbein, 1980) and the Theory of Planned Behaviour (Ajzen, 1991). Furthermore, empirical construct variables in agribusiness research (Jackson, 2008) and in traceability studies (Heyder *et al.,* 2010; Shulz and Tonsor, 2010) were adapted for the theoretical framework.

A multiple case study strategy of four categories of actors in the cocoa supply chain in Ghana was used. These categories were the farmers, the middlemen, the processors and the regulators. Empirical data was collected from 14 respondents, made up of six farmers, four middlemen, two cocoa processors and two regulators. A carefully designed interview guide was used to collect the case data by means of face-to-face interviews over a period of six months. Additional sources of evidence from documents and casual observations were made during the field interviews. Taking a cue from Miles and Huberman (1994), the data was rigorously analysed and complimented evidence from the literature. Rival explanations were also provided. Mind maps were used in the presentation of the cross-case data analysis in order to provide a pictorial representation of the results. The factors of motivation for implementing traceability systems were derived from the case study data of the different respondents. These factors were presented in a tabular form and ranked using a qualitative

counting technique (Miles and Huberman, 1994). One of the objectives of this research is to produce a map of the supply chain network in the cocoa sector of Ghana. Pursuant to this, the networks and relationships of individual actors in the case study were extracted. A cross-case analysis strategy was used to aggregate and distil the common theme, and patterns of relationships, in the network map. The supply chain map was developed to show the multiple transaction pathways and information network systems based on the system-wide control structures of COCOBOD. The study made some key findings, which were discussed.

It was found that different actors in the cocoa supply chain perceived traceability differently and assigned different meanings to traceability systems. The farmers perceived traceability as a system for improving cocoa quality; the middlemen perceived traceability as providing control over the farmers and the supply chain; the processors perceived traceability systems to mean a quality assurance system; and the regulators perceived traceability as the instrument which associated cocoa to its source of origin. These differences in the perceived meaning of traceability systems from different actors in the supply chains were also found in the literature (Trautman *et al*., 2008). It was also found that there were differences in the perceived usefulness of traceability systems, and the intention to voluntarily implement traceability systems by actors in Ghana's cocoa supply chain. The expected utility of traceability systems underpinned the perception of usefulness of traceability systems. The middlemen and the processors perceived traceability systems as useful, while the farmers and the regulators did not perceive traceability systems to be useful in the cocoa supply chain in Ghana. In relating the demographic profile of respondents in this case study, and the expected behaviour towards technology systems (Rogers, 2005), the middlemen and the processors were found to show the characteristics of 'early adopters' while the farmers were found to be

'laggards'. There was no theoretical consistency for the regulators' demographic profile and for the regulators' perception of traceability systems in accordance with Rogers' classifications.

The study also found differences in the factors of motivation for the implementation of traceability systems among the different cases. The findings showed goal-directed decision-making behaviour in the sense that the factors of motivation followed respondents' activities in the supply chain. By applying a qualitative counting technique, this study found the most important factor of motivation for the implementation of traceability in Ghana's cocoa sector to be 'extra money' in the form of traceability premiums. The other factors were also discussed as part of the results of this study.

In the mapping of the cocoa supply chain it was found that cooperation and interdependence exist among stakeholders, even though each actor makes independent decisions. However, the different actors align their decisions and information processes to the policy objectives and directives of the regulator, who plays a central role not only as a regulator but also as an actor. The central place of COCOBOD within the cocoa supply chain network, as discussed in the findings, signifies the strategic importance of cocoa to the government of Ghana.

Following the recommendation of Patton (2002), this study applied multiple theories at the onset of the research because of the contemporary nature of the subject of perception of traceability in the academic literature. The findings of the study suggest that the pattern of the perception of traceability systems follows Rogers' Diffusion of Innovations Theory (Rogers, 1995). This could be attributed to the fact that traceability systems are technology-based, and respondents' perception towards them followed a technology and innovation diffusion theory.

Secondly, the findings confirmed the proposition of this study that there are differences in how traceability systems are perceived among the different actors in the cocoa supply chain in Ghana.

8.3   Contributions of Study

It is considered that this study can positively contribute to agribusiness policy and to the academic literature. The findings of the study in terms of the perceived meanings of traceability systems from the suppliers' point of view can contribute to policy and scholarly knowledge. The meanings assigned to traceability to reflect produce quality, identification, geographical control and origin credence, otherwise known as "geographical indicators" (Bramley *et al.,* (2009). This brings to bear a new dimension to the debate on the practical approach to the implementation of traceability systems in cocoa producing countries. A geographical indicator approach can enable large quantities of cocoa to be traced by using a geographical credence rather than a one-step-up and one-step-down approach to a mass commodity product such as cocoa. The second contribution of this study is the identification of price premium and relationship as factors of motivation for the implementation of traceability systems. Leading literature in the area of traceability systems (Theuvsen and Hollmann-Hespos, 2005; Heyder *et al.,* 2010) focused on consumer markets, established different factors of motivation for the implementation of traceability systems. These findings bridge a gap in literature between consumers-focused and raw material supplier-focused research and provides insight for businesses and policy makers on different incentive systems, needed to drive traceability. This serves as an extension of consumer side research on traceability systems (Theuvsen and Hollmann-Hespos, 2005; Heyder *et al.,* 2010) thus

bridging the gap in literature. With specific reference to cocoa, the Council of International Cocoa Organisation (ICCO, 2012) and the General Assembly of the Alliance of Cocoa Producing Countries (COPAL, 2013) have considered ways of driving the implementation of traceability and sustainability systems. The findings on motivations for implementing traceability systems can guide these organisations in the development of traceability and sustainability policies.

The study also has commercial implications for the global chocolate manufacturers. The world's leading chocolate manufacturers, namely Mars, Ferrero, Hershey, Nestlé and Mondelez, which represent about 50% of global cocoa usage (ICCO, 2012), have committed to sourcing sustainable and traceable cocoa by the year 2025. In the realisation of this objective, these multinational firms have committed to projects in cocoa producing countries, especially Ghana, with a view to influencing the behaviour of supply chain participants to implement traceability and sustainability systems (ICCO, 2012). The results of this study provide strategic insights, which can be used by these firms to achieve their objectives. Incentive systems and social programmes by the firms can be tailored to address the specific motivations of key supply chain participants in Ghana.

Due to globalization and internationalization of agri-food supply chain, competition and competitive advantage is moving from individual firm activity towards supply chain networks (Ondersteijn *et al.,* 2005). Therefore, coordination between supply chain participants has become important in agri-food business. The results of the supply chain mapping provide a useful insight about the levels of coordination, commercial interactions and network of relationships, which can be exploited to influence behaviour in the cocoa supply chain. Gardner and Cooper (2003) found supply chain mapping to enhance the

environmental scanning process for strategic planning. In this case study, the mapping of the cocoa supply chain interdependence and linkages can help the policy makers and commercial interests to identify the points of interactions and power distribution in the supply chain. In the network mapping, the farmers are closely linked to the middlemen and can be influenced by the middlemen. Similarly, the regulators play a central role in the network and can influence the supply chain in Ghana. The levels of influence found in this study can enhance the implementation of risk management systems as well. Implementing risk management in supply chains require a sound knowledge of the network of commercial functions and infrastructure (Singhal *et al.,* 2011). The construction of the map of supply chain relationships and interactions can contribute to Ghana's cocoa supply chain risk management.

Finally, traceability systems are contemporary technology, and are innovative systems in international food commodity supply chains. The study of the perception of traceability systems in the cocoa supply chain therefore situates the current research in the context of technology and innovation, with implications for international business and policy. The study therefore meets the overarching objective of this doctoral research programme regarding technology and innovation systems in business and policy.

8.4   Limitations of Research

The limitations of the current study are in respect of the research methodology used, resource constraints and the researcher's effect. In answering the key research question of how traceability systems are perceived in Ghana's cocoa supply chain, the result of a qualitative case study of 14 respondents cannot be generalised across the entire cocoa supply chain. Instead the result can provide useful insight for future studies and can help to develop

hypothesis for a broader quantitative research. was used. Secondly, a model of the perception of traceability systems could be developed and tested by way of Structural Equation Modelling. To achieve this, a quantitative methodology would be required to provide accurate measurements and to test the model of the perception of traceability systems. However, in this qualitative case study was needed to provide detailed and richer foundation for the development of perception of traceability modelling.

The official position of the researcher as an employee of COCOBOD appears to have affected the data collection process. Despite the explicit explanation of the objective of the research and the assurances of confidentiality, some respondents viewed the occasion as an opportunity to give narrations with a view to impress the interviewer or to drive home a point to COCOBOD. Upon reflection, this dilemma should have been managed by providing additional assurances of the neutrality of the researcher and the study, or to make use of a neutral party for the purpose of data collection. Also, the coherence of this study would have been improved if the researcher had been proactive in directing respondents away from superfluous details offered during the interviews. The application of computer software in addition to word processing would have improved the displays, the appearance of networks and the general outlook of diagrams contained in the report of this study.

8.5   Recommendations for Future Research

In this case study of the perceptions of traceability systems in Ghana's cocoa supply chain, a number of issues were raised as limiting the scope of the research. One such issue relates to the development of a theoretical model in order to predict the perception and behaviour of supply chain actors towards traceability systems. A future study to investigate the

determinants of the perception of traceability systems in Ghana's cocoa sector is recommended.

Another limitation relates to sample coverage. A case study of 14 respondents may not adequate to capture the general perception towards traceability systems in the cocoa supply chain. It would be interesting to undertake further investigation by using a large sample size in a survey to find out the perception towards traceability systems. Particularly, the perceptions of farmers are important in the cocoa supply chain, as market failures are attributed to the inadequate supply of information to farmers (Golan, 2003). On the basis of this a more extensive and rigorous survey requiring more financial, human and logistics resources can be carried out to understand the perception of farmers.

The questions and uncertainties about the cost of traceability and the distribution of price premiums remain unanswered. From the results of this study, the perceived usefulness of traceability is influenced by the cost of implementing traceability systems. However, there is no study in the cocoa sector to estimate the cost of traceability. Similarly, it is unclear which sections of a supply chain should pay the price premiums (Becker, 2007). To this end, a future study to estimate the cost of traceability systems and their distribution in the cocoa supply chain is recommended. Furthermore, a willingness-to-pay experiment for the cost of traceability needs to be conducted in the consumer markets for chocolate products. Buhr (2003) found that providing clarity for the source of traceability premiums and cost of traceability is useful to a firm's strategy.

The results of this study provide insights regarding perception, motivations and network relationships which can be used by the Ghana Cocoa Board, international cocoa institutions

and businesses to develop policies and programmes to improve the perception of the usefulness of traceability systems in Ghana's cocoa supply chain.

8.6   Summary

In this section, a summary is provided of the case study research and outlined the key findings of the study. The multiple case study methodology and the range of theories applied to answer the research questions were discussed. The contributions made by this research to policy discussions at the International Cocoa Organisation and the Alliance of Cocoa Producing Countries towards improving the acceptance of traceability systems in the international cocoa trade were outlined. Also, the application of this study to the programmes and projects in cocoa producing countries, including Ghana, that are designed to improve the acceptance of traceability and sustainability systems were discussed. It is argued that there was no specific study of the perception of traceability systems in the cocoa supply chain in Ghana, and therefore consider this study can be considered as a contribution to scholarly knowledge in this area. The limitations of this study, such as the choice of a qualitative case study approach compared to a quantitative survey or modelling approach using structural modelling methods were acknowledged. Also, the effect of the researcher, as an official of the Ghana Cocoa Board, on the interviews, and the time and resource limitations, were outlined. Finally, recommendations were made for future studies into modelling the perception of traceability systems, and a large-scale survey of farmers' perception in Ghana's cocoa sector, were made. It was also recommended that the Ghana Cocoa Board, international cocoa institutions, and firms take into consideration the differences in perception, the motivations and the network of relationships in the cocoa sector of Ghana

when developing policies regarding the implementation of traceability systems. The findings of this study can also provide insights into traceability systems to guide the work of the European Union and the International Standards Organisation's committee work in developing traceability and sustainability standards.

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APPENDICES

Appendix 1: Summary of Traceability Definitions

Definition	Source
A tool that may be applied within a broader food inspection and certification system as part of a risk management option for meeting specific food safety or fair trading practice objectives.	Codex Alimentarius Commission 2004 with FAO and WHO
Traceability (sometimes called identity preservation): the ability to track the inputs used to make food products backward and forward to/from their source at different levels of the marketing chain.	Dickinson, Hobbs and Bailey, 2003
Traceability of beef requires a verifiable method to identify bovine animals, carcasses and cuts in all their packaging and transport/storage configurations at any point in the supply chain.	EAN International, 2002
The ability to trace and follow a food, feed, food-producing animal or substance intended to be, or expected to be incorporated into a food or feed, through all stages of production, processing and distribution.	European Parliament and the Council of the EU, 2002.
The efficient and rapid tracking of physical products and traits from and to critical points of origin or destination in the food chain necessary to achieve specific food safety and/or assurance goals.	Farm Foundation, 2004
A record-keeping system designed to track the flow of products or product attributes through the production process or supply chain.	Golan *et al.,* 2004
A broad term that refers to systems that allow tracking. (transparent) quality verification	Hobbs, 2006
The ability to trace the history, application or location of that which is under consideration. May refer to the origin of the materials and parts, the processing history, and the distribution and location of the product after delivery.	International Standards Organization, 2000
The ability to maintain credible custody of identification for animals or animal products through various steps within the food chain from the farm to the retailer.	McKean, 2001
A system that provides a set of data about the location of food and food ingredients along the supply chain. Data relate to both the 'where' and the 'when' issues.	Meuwissen *et al.,* 2003
The ability to track a product batch and its history through the whole, or part, of a production chain from harvest through transport, storage, processing, distribution and sales (chain traceability); or internally in one of the steps in the chain, for example the production step (internal traceability).	Moe, 1998
The ability to locate an animal, commodity, food product or ingredient and follow its history in the supply chain forward (from source to consumer) or backward (from consumer to source).	OnTrace, 2007

Definition	Source
Individual companies are able to identify both suppliers and customers.	Peterson, 2004
The history of a product in terms of the direct properties of that product and/or properties that are associated with that product once these products have been subject to particular value-adding processes using associated production means and in associated environmental conditions.	Regattieri *et al.,* 2007
The ability to identify the origin of animals or meat as far back in the production sequence as necessary to ascertain ownership, identify parentage, improve palatability, assure safety and determine compliance in branded or source-verified beef programmes.	Smith *et al.,* 2000
A system that allows for retailers and the supply chain to identify the source of contamination and thereby initiate procedures to remedy the situation and ensure food safety.	Smyth and Phillips, 2002
The ability to follow the movement of a food through specified stage(s) of processing, production, and distribution.	Souza-Monteiro and Caswell, 2004
The property of the result of a measurement or the value of a standard whereby it can be related to stated references, usually national or international standards, through an unbroken chain of comparisons all having stated uncertainties.	Standards Council of Canada 2001 CAN-P-43
The ability to document all relevant elements needed to determine the life movement history of an animal.	USDA, 2007
The information necessary to describe the production history of a food crop, and any subsequent transformations or processes that the crop might be subject to on its journey from the grower to the consumer's plate.	Wilson and Clarke, 1998

Appendix 2: Case Study Interview Guide

> ➢ Start off the interview by introducing myself and thanking the participant for taking part in the research.
>
> ➢ Explain ethical issues: everything discussed in this interview is confidential and any evidence published from the interview will not make any connection to the participant's name.
> ➢ The interview can be paused or terminated at any time without prejudice.
> ➢ Any statements that the participant does not want to be recorded can be omitted from the tape.

1. Can you tell me a bit about yourself, your age and level of education if possible, and your area of operations in the cocoa supply chain?

2. How long have you been engaged in this kind of role in this location?

3. What is the nature of the operations that you carry out on a daily basis?

4. In the performance of your duties, which organisations, institutions or persons do you deal with?

5. Which kinds of associations or relationships do you have with people or firms which influence your work? And how do you relate with them?

6. As a farmer/middleman/processor/regulator engaged in traceability or sustainability initiatives, can you explain how easy or difficult it is to implement?

7. So what do you think traceability is all about? And what do you think is meaning of traceability?

8. From your perspective, what are the processes involved in implementing a traceability system, and what kind of help do you need to implement and run it? Are you confident in your ability to implement the system by yourself or what kind of help do you need?

9. In your view, what kinds of things are traceability systems addressing in the cocoa chain? – follow up questions on factors such as Market, industry

direction, economic matters, stronger relationships?

10. How important is traceability of cocoa to your operations as a farmer, and do you depend on the extra income that it generates?

11. How does traceability fit into your work, and how do you regard the advantages it brings?

12. Do you have specific motivations for implementing traceability systems? What factors can you enumerate and explain why they motivate you to remain in the traceability systems?

13. How does traceability affect relationships and trust in the cocoa supply chain?

14. What in your view are the adverse effects such as costs, risks and complexities in implementing traceability systems?

15. Can you give me your final views on the usefulness of traceability systems if you intend to continue with the programme? And what final things can you say about the support that you receive implementing and the self-confidence in going it aone in your work or in the cocoa sector of Ghana?

Appendix 3: Contact Summary Form

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Contact Summary Form
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Contact Type : LBC   **Site :** Head Office - Accra
   Visit   Personal interview   **Contact date:** 28 November 2011

   Phone _____   **Today's date:** 8 / 02 / 2012

1. **Main Issues**

The respondent is the main decision-maker with experience as an international civil
servant.
Entered traceability agreement with French company and implementing
traceability as new marketing concept to give LBC control over farmers from whom
respondent purchases cocoa.
To satisfy the chocolate consumer where cocoa is coming from, and to provide
information about cocoa.
Information presented through intermediary to final consumer.
Document accompanying parcel showing origin of cocoa.
Information system needed to implement.
Motivations include market, supply chain control, sustainability.
Important for LBC because of the control it gives in managing chain risks.

Summary of information

Key Question Guide	Information
Can you tell me about yourself and your operations?	Managing Director with previous experience in FAO. Operates 100 depots, 5300 buying agents and located in all cocoa buying districts in Ghana. Pays farmer producer price, takes cocoa for grading and sealing by Quality Control, transport to CMC at warehouse, process documents for payment.
What is traceability from your point of view?	Traceability is a new marketing concept to give LBC control over the sources from it obtains cocoa. Same is passed on to final consumers who want to know where cocoa is coming from. It is about knowing the source of cocoa and tracing.
What motivated you to implement traceability systems?	Market share, control over supply chain, promote sustainability, premium to implement development projects.

How important is traceability to your work or effects?	Traceability plays a central role because of ability to know source of cocoa. Does not add much except for additional information that informs consumer in return for premium.

2. Other Observations & Outstanding Issues

Documents and official communications indicating 'pros' and 'cons' of traceability projects. Newsletter publications on traceability issues. Respondent still exploring other aspects of traceability.

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Contact Summary Form

</div>

Contact Type :   **FARMER**   **Site :** Asunafo District
     Visit   <u>Personal interview</u>   **Contact date:** 24 January, 2012

     Phone <u>   </u>   **Today's date:** 22 February, 2012

Main Issues

The respondent switched from food crops to cocoa cultivation but worked with family on cocoa farm at young age.

Relates to extension officers, Cocoa Board, LBCs, input suppliers, NGOs and part of traceability farmers' cooperatives.

Traceability is a system to improve quality of cocoa that is sold to LBC in the traceability programme.

It involves keeping accurate records about the farm, and the selling of cocoa.

Major motivations include premium and training programmes that farmers involved in.

Traceability is good, but not sure if it would last for long time.

Information exchange in the supply chain allows for interaction among participants.

Traceability imposes restrictions on how things are done and it is sometimes difficult to keep records.

Document accompanying parcel showing origin of cocoa.

Summary of information

<u>Key Question Guide</u>	<u>Information</u>
Can you tell me about yourself and your operations?	The farmer is member of traceability cooperative, and switched to cocoa farming from food crop farming. He receives support from his family and the community in farming activities. He receives support from extension officers, and also interacts with LBCs, Cocoa Board, input suppliers. Cocoa is supplied to one key LBC that leads the traceability cooperative.
What is traceability from your point of view?	Traceability is a system to improve quality of cocoa that is sold to LBC in the traceability programme. It involves keeping accurate records about the farm, and the selling of

	cocoa. It is good in his view as it provides an additional premium for community projects.
What motivated you to implement traceability systems?	Motivations include premium and training programmes for farmers involved in traceability.
How important is traceability to your work or effects?	Traceability is good because it encourages knowledge and information-sharing and trust. But difficult to comply with records and practices that improve quality.

Other Observations & Outstanding Issues

Sheets of paper and dusty notebooks were observed at farmer's place. The farmer, though, indicated the usefulness of traceability, and also placed emphasis on difficulties to comply with standards.

Contact Summary Form

Contact Type :   **COCOA PROCESSOR**   **Site :** Factory - Takoradi

   Visit   Personal interview   **Contact date:** 28 November 2011

   Phone   **Today's date:** 8 / 02 / 2012

3. Main Issues

The respondent is main decision-maker, majority shareholder and CEO of cocoa processing facility. Relatively new in processing, developing network, branding products and obtaining international certification.
Interested in traceability as long as it is beneficial to business but not ready to invest more.
Traceability is a tool for detecting the origin of batches of cocoa used in particular batch of processing.
Traceability also involves knowing the producers of cocoa.
Information exchange through emails and enquiries can result in trust and relationships but these take time to develop.
Traceability is important for processors in detecting problems and dealing with them.

Summary of information

Key Question Guide	Information
Can you tell me about yourself and your operations?	Owner and CEO of a cocoa processing facility in Ghana with years of experience in the cocoa supply chain in the Ivory Coast and Ghana. Operations involve the purchase of cocoa from CMC, transport, storage, processing, selling and shipping. Deals with agencies in the chain including international market network.

What is traceability from your point of view?	Traceability is about knowing which lots of cocoa used in the processing of particular product batches and possible tracing to farmer. It is new in the market because of consumer awareness and enquiries for partnerships are growing. It allows information flow from suppliers to customers.
What motivated you to implement traceability systems?	Quality management in processing, detecting and dealing with contamination.
How important is traceability to your work or effects?	Traceability is important in the sense of knowing what goes where because contamination can be expensive. It is good in that respect, bur not sure if any more investment is needed beyond what already exists.

Other Observations & Outstanding Issues

Modern decent factory environment using IT systems. Ready to try new things that meets customer expectations. Issues of who pays for the premium to be explored in next interview.

Contact Summary Form

Contact Type :   **REGULATOR**   **Site :** Head Office - Accra

   Visit   Personal interview   **Contact date:** 26 November 2011

   Phone _____   **Today's date:** 8 / 02 / 2012

4. Main Issues

The respondent is apublic servant, director and a decision-maker.

Experience comes from civil service and more than ten years in the Ghana Cocoa Board. Performs regulatory functions defining rules and policy, and monitors implementation in respect of cocoa research, production, transportation, storage, marketing and quality control.
Traceability is a new marketing concept replicating Ghana's system of tracing the origin of cocoa through seals.
No particular relevance besides knowing the source where cocoa was produced from.
What motivates traceability includes extra money (premium) to farmers, new markets, international standards and fear of losing out.
Traceability comes from outside and has not significant use. It is also not clear who takes legal liability should things go wrong.

Summary of information

Key Question Guide	**Information**
Can you tell me about yourself and your operations?	Director of Ghana Cocoa Board, previously Advisor to Minister of Finance, also civil servant at Ministry of Finance. Regulate cocoa production and input supplies to farmers. Cocoa purchased by LBC, transported and taken over by CMC, which markets and exports.
What is traceability from your point of view?	Traceability is new concept replicating Ghana's system of tracing the origin of cocoa through seals. Not too sure about the exact expectations of the international standards, but traceability is about knowing where cocoa comes from. In return, premium is paid to farmers.
What motivated you to implement traceability systems?	Factors that motivate traceability include extra money (premium) to farmer, new markets, international standards and fear of losing out. As long as traceability comes with benefits, farmers and middlemen will entertain it.
How important is traceability to your work or effects?	Traceability comes from outside and respondent does not think it has any significant use that is different from what exists. It is also not clear who takes legal liability should things go wrong.

5. **Other Observations & Outstanding Issues:** Respondent expressed doubt about the motivation behind external standards driving traceability. Has entered MOU on pilot basis.

Appendix 4: Cases of Traceability Systems

A. ENGLAND

PROGRAMME:

(A) Producer Club

(B) Assurance Schemes: Farm Assured British Beef and Lamb (FABBL), Scottish Quality Beef and Lamb Association (SQBLA), and Farm Quality Assurance Scheme (FQAS) (Northern Ireland)

REGULATORY SYSTEMS

I. Retailer Codes of Practice, e.g., Tesco

II. Tesco's Livestock Codes of Practice

III. Fair Trading Act: Supermarkets' Code of Practice (2002)

TYPES OF TRACEABILITY SYSTEM

I. Mandatory: Retail driven; Tesco Club Members must follow Codes of Practice

II. Mandatory: Retail driven; all meat suppliers must be members of the Livestock Codes of Practice

III. Mandatory: Initiated by industry; governs Tesco's relations with suppliers

(A) Voluntary: Led by Tesco with producer committees; producers who are club members are not under contract but must commit at least 50% of their stock

(B) Mandatory: Producer led schemes are voluntary, but Tesco (and all other major supermarkets) require that beef suppliers must be members of a recognised assurance scheme

APPLICABLE DEFINITIONS

I. Mandatory: Retail driven; Tesco Club Members must follow Codes of Practice

II. Mandatory: Retail driven; all meat suppliers must be members of the Livestock Codes of Practice

III. Mandatory: Initiated by industry; governs Tesco's relations with suppliers

(A) Voluntary: Led by Tesco with producer committees; producers who are club members are not under contract but must commit at least 50% of their stock

(B) Mandatory: Producer led schemes are voluntary, but Tesco (and all other major supermarkets) require that beef suppliers must be members of a recognised assurance scheme

STAGES OF TRACEABILITY

I. The EU regulations are baselines for Tesco Codes of Practice, including traceability requirements

II. Used to ensure animal welfare and whole-life traceability where possible; may include feed and breeder stock

III. Outlines the regulations for trading between the four largest UK supermarkets (Tesco, Asda and Sainsbury) and their suppliers

(A) Ensures that all the meat Tesco sells comes from animals which can be traced back to the farm where they were born and where they have been reared

(B) Assurance Schemes provide origin/traceability information from farm through to retail store

B. SCOTLAND

PROGRAMME

(A) Scottish Borders Tag (Traceability and Assurance Group)

(B) Scotch Quality Beef and Lamb Association (SQBLA)

(C) Scotbeef's BeefTrack□□ (a member of SQBLA)

(D) The Guild of Scotch Quality Meat Suppliers

(E) Scotch Beef Club

RGULATORY SYSTEM

I. The Cattle Identification (Scotland) Regulations 2007

II. The British Cattle Movement Service (BCMS) of the Rural Payments Agency (RPA): The Cattle Tracing System (Great Britain, since 28 September 1998)

III. Scottish Food Quality Certification Ltd. (SFQC) accredited by EN4501

TYPES OF TRACEABILITY SYSTEMS

I. Mandatory: Government regulated

II. Voluntary: Formed in 1995 to give credibility to the quality and farm assurance schemes already formed (i.e., SQBLA)

(A) Voluntary: Producer-led initiative

(B) Voluntary: Consumer-driven

(C) Voluntary: Retail-driven

APPLICABLE DEFINITION

Traceability is the ability to trace and follow food, feed, food-producing animals or substances intended to be, or expected to be incorporated into a food or feed, through all stages of production, processing and distribution (EC Regulation No.178/2002).

STAGES OF TRCEABILITY

I. Regulations on cattle identification in Scotland; came into force on 06 April 2007

II. Provides traceability of cattle from birth to death

(A) Full traceability and assurance programme; individual animal identification, information on cattle movements, and official government department inspections on farm (UK Ministry of Agriculture, Fisheries, and Food)

(B) With the use of Cattle Control Documents (CCD), all movements are recorded since July 1996; quality assurance from farmers to retailers

(C) Since 1992: Identification of individual animals, producers, producer's farm, welfare, environment and animal health management, identification of raw material, and food safety management through to the final consumer

(D) Full traceability from the live animal to the batches of meat

(E) Group of restaurants that are able to trace Scotch Lamb and Beef to their suppliers

C. AUSTRALIA

PROGRAMME

(A) National Vendor Declaration (NVD) and Waybill

(B) National Feedlot Accreditation Scheme (NFAS)

(C) EAN numbering/DNA sampling

REGULATORY SYSTEMS

I. National Livestock Identification System (NLIS)

II. Property Identification Code (PIC) and Tail Tag System

TYPE OF TRACEABILITY SYSTEMS:

I. Mandatory (since 1 July 2005; voluntary from 1999 to 2005): Government legislated for international market competitiveness

II. Mandatory (since the 1960s): Government legislated and based on a unique identification number assigned to each farm or parcel of land

(A) Mandatory for export: Producer led, underpinned by state legislation; the NVD is independently audited under the Livestock Production Assurance (LPA) scheme (which is a voluntary programme)

(B) Mandatory for export: Industry self-regulating quality assurance scheme; mandatory for feedlots producing grain-fed beef for export markets

(C) Voluntary: Producer-led; collection of DNA samples on farms so that animals can be traced from meat samples

APPLICABLE DEFINITION

Traceability/product tracing: *the ability to follow the movement of a food through specified stage(s) of production, processing, and distribution* (Codex Alimentarius Commission, 2004).

STAGES OF TRACEABILITY

I. Under NLIS all cattle at birth are issued a lifetime identification number that is embedded in a radio-frequency chip; traceability is to property of birth

II. PIC tail tags are applied at the time of future and subsequent sales and are an additional source for traceback, but are unique only to a lot or pen of cattle

(A) NVD is a mechanism for the transfer of information on the history of livestock consigned for sale or slaughter

(B) All grain-fed cattle in Australia destined for export must be individually identified with a unique identification number when they enter a feedlot and movements on and off the feedlot must be recorded.

(C) Producers using EAN technology assign each animal with a unique EAN compliant number based on the PIC and sequence number, and linked to the NLIS number; DNA hair samples are collected and can be matched to DNA from meat

D. JAPAN

PROGRAMME

(A) Jusco Supermarkets (Aeon Company Ltd): National Feedlot Accreditation Scheme

(B) Jusco Supermarkets: Wagyu beef consumer assurance

(C) Ito Yokado Supermarket

REGULATORY SYSTEMS

I. The Law Relating to Special BSE Countermeasures (July 2002)

II. The Beef Traceability Law (2003)

TYPE OF TRACEABILITY SYSTEM

I. Mandatory: Government regulated

II. Mandatory: Government regulated; Ministry of Agriculture Forestry and Fisheries

(B) Voluntary: Retail-driven; BSE testing certificate, production record certificate, photograph of the producer (TruValue Brand)

(C) Voluntary: Retail-driven; point of sale information is posted, including photographs of producers and information on the type of animal

APPLICABLE DEFINITION

Traceability/product tracing: *the ability to ensure, at any stage(s) of the food chain, the path of a food and the relevant information of the food are known, including product identification and where and when it came from and where and when it was sent and the other product information if appropriate* (Codex Alimentarius Commission, 2004).

STAGES OF TRACEABILITY

I. Traceback of all cattle from the feedlot to the packing plant; unique identification number on the ear tag of each animal

II. Traceability from production through distribution to consumption; an internet-based system

(A) Ensures that beef is free of growth promotants, therapeutic antibiotics, bone meal feed materials, and any genetically modified feed materials

(B) Meat is traceable from the supermarket to the producer's farm where the calf was born, feedlot, slaughter plant, processing plant and meat inspector; information on the animal's diet is also provided

(C) The location of where the animal is produced is provided on the label