

**PROCESSORS' WILLINGNESS-TO-PAY FOR PRODUCT QUALITY
CERTIFICATION: THE CASE OF INFANT CEREAL FOOD SECTOR IN
GREATER ACCRA REGION**

BY

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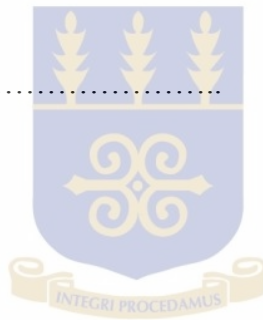
**DEPARTMENT OF AGRICULTURAL ECONOMICS AND AGRIBUSINESS
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DECLARATION

I, Perpetual Biamah Decker, author of this Thesis, “PROCESSORS’ WILLINGNESS- TO- PAY FOR PRODUCT QUALITY CERTIFICATION: THE CASE OF INFANT CEREAL FOOD SECTOR IN GREATER ACCRA REGION”, do hereby declare that the work presented, with the exception of various forms of literature consulted and which have been duly acknowledged, was entirely done by me in the Department of Agricultural Economics and Agribusiness, University of Ghana, Legon from August 2011 to March 2013. This work has never been presented either in whole or in part for any other degree in this university or elsewhere.

.....
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This dissertation has been presented for examination with our approval as supervisors

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DEDICATION

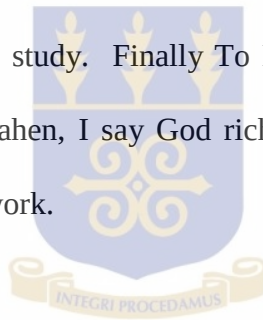
This work is dedicated to my parents, my beloved husband and to my children Emmanuel, Dinah and Peter for their support and understanding throughout the entire duration of the programme.



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ABSTRACT

There have been investments in the infant food sector in Ghana in recent times. This is as a result of the introduction of cereal foods fortified appropriately for children aged five and below aimed at eradicating or reducing malnutrition. However, competition from transnational and multinational companies with branded and certified products is hindering progress of local companies in the sector. This study seeks to assess local processors' willingness to pay (WTP) for product quality certification as a quality assurance strategy to enhance their competitiveness. Certification operating as a quality assurance system is less expensive than brand strategy in terms of investment spending for SMEs. The factors that may influence processors' WTP for product quality certification are also determined. Thirty five (35) infant cereal processors were interviewed in Accra and Tema. A logit analysis used on data collected via a structured questionnaire, show that local infant cereal food processors are willing to pay for certification but at lower cost than the stipulated amount of GhC530. They are willing to pay on the average 51.62% of this amount, that is, GhC273.57. Also 5.7% of sampled firms had zero willingness to pay amount. A tobit analysis also indicate education, annual income of the firm, firm age, access to loan, and scale of operation as significant factors influencing the amounts processors are willing to pay for product certification. The scale of operation, however, has a negative effect on WTP contrary to expectation. The study recommends that GSA, NBSSI, FDB and MOTI should consider other payment forms of product certification like installment payment so as to make it more convenient for processors to pay and entice even the smallest micro firm in this sector to ensure consistently high quality among these products, as this may go a long way to reducing malnutrition in children.

TABLE OF CONTENTS

DECLARATION	i
DEDICATION	ii
ACKNOWLEDGEMENT	iii
TABLE OF CONTENTS.....	v
LIST OF TABLES	viii
LIST OF FIGURES	ix
LIST OF ABBREVIATIONS.....	x
 CHAPTER ONE: INTRODUCTION.....	 1
1.1 Background	1
1.2 Problem Statement	5
1.3 Objectives of the Study	7
1.4 Relevance of Study	8
1.5 Organization of the study.....	9
 CHAPTER TWO: LITERATURE REVIEW	 10
2.1 Introduction.....	10
2.2 Importance of SMES (Food Industry) to Ghanaian Economy.....	10
2.3 The Infant Food Subsector	13
2.4 Regulations, Legislations and WHO Recommendations.....	14
2.5 Globalization, Trade Liberalization and Certification	15
2.5.1 Global Markets, Demand Driven Supply Chains and Changes in the Agri- food Sector.....	15
2.5.2 Grades and Standards in Trade	17
2.6 Branding.....	18
2.6.1 Benefits of Branding.....	19

2.7 Certification	20
2.7.1 Types of Certification	23
2.7.2 Certification and Quality Assurance in Ghana	25
2.7.3 Certified Products and certifying institutions in Ghana	26
2.7.4 Importance or benefits of Certification	27
2.8 Processors' Willingness-to-Pay for product quality certification	28
2.9 Factors Affecting Processors' Willingness to Pay for Certification	29
2.10 Techniques for Eliciting Willingness to Pay	32
2.10.1 Auctions	33
2.10.2 Conjoint analysis (CA)	33
2.10.3 Contingent Valuations	34
2.11 Empirical Studies on WTP	35
2.11.1 Models for Adoption Behaviour	35
2.11.2 The Logit Model	36
2.11.3 The Probit Model	37
2.11.4 Tobit Model	38
2.12 Summary of chapter	42
 CHAPTER THREE: METHODOLOGY	 43
3.1 Introduction	43
3.2 Conceptual Framework	43
3.3 Method of Analysis of Specific Objectives	45
3.3.1 Describing the characteristics of LICFPS	45
3.3.2 Study design and Contingent Valuation procedure	46
3.3.3 Estimating the magnitudes and the effects in the factors on WTP	47
3.3.4 Estimating processors' mean Willingness-To-Pay (WTP)	56
3.3.5 Factors influencing the maximum amount processors are willing to pay ...	56

3.4 Assumptions and Limitations	57
3.5 Study Area	59
3.6 Sampling Procedure and Sample Size	60
3.7 Scope of Study	61
 CHAPTER FOUR: RESULTS AND DISCUSSIONS.....	64
4.1 Introduction.....	64
4.2 Characteristics of LICFPs	64
4.3 Estimating processors' willingness to pay for certification at "bid price	69
4.4 Estimate of Mean Willingness to pay amount	76
4.5 Factors influencing the maximum amount to be paid.....	78
 CHAPTER FIVE:SUMMARY, CONCLUSIONS AND RECOMMENDATIONS ..	80
5.1 Summary	80
5.2 Conclusions.....	81
5.3 Recommendations.....	82
REFERENCES	84
 APPENDICES	97
Appendix 1- Sample Questionnaire	97
Appendix 2- List of Processors Identified	104
Appendix 3- Logit Regression Results	107
Appendix 4: Tobit Regression Results	108

LIST OF TABLES

Table 2.1 Some Quality Assurance Schemes and Their Logos	25
Table 2.2 Status of Certification for Various Sub-Sectors	26
Table 3.1 Summary of Hypotheses	55
Table 4.1 Education Level of Respondents	65
Table 4.2 Number of Years of Establishment of Firm	65
Table 4.3 Management Model of firms	66
Table 4.4 Firms' annual income from infant cereals	66
Table 4.5 Access to Formal Credit	67
Table 4.6 Source of raw materials in Infant Cereal Processing	68
Table 4.7 Plant Capacity Utilization	68
Table 4.8 Processors' willingness to pay for Certification	69
Table 4.9 Perception of Profits Improvements after Certification	69
Table 4.10 WTP responses and Categorical Variables of respondents	71
Table 4.11 Logit results for WTP for Product Quality Certification	72
Table 4.12 Summary of maximum willingness to pay for certification	77
Table 4.13 Respondents maximum willingness to pay	77
Table 4.14 Tobit results for WTP amount for Product Quality Certification	80

LIST OF FIGURES

Figure 3.1 Conceptual Framework	44
Figure 3.2 Map of Greater Accra Showing Districts	59
Figure 4.1 Processors' Willingness to Pay for Product Quality Certification	70

LIST OF ABBREVIATIONS

AMA	Accra Metropolitan Area
CA	Conjoint Analysis
CSIR	Council for Scientific and Industrial Research
CV	Contingent Valuation
EGFL	European General Food Law
FDA	Food and Drugs Authority
FDB	Food and Drugs Board
G&S	Grades and Standards
GAR	Greater Accra Region
GDP	Gross Domestic Product
GI	Geographic Indications
GSA	Ghana Standards Authority
GSB	Ghana Standards Board
IFM	International Association of Infant Food Manufacturers
IPM	Integrated Pest Management
LICFPs	Local Infant Cereal Food Processors
MDGS	Millennium Development Goals
MoTI	Ministry of Trade and Industry
MSMES	Micro, Small and Medium Scale Enterprises
NBSSI	National Board for Small Scale Enterprises
OECD	Organization for Economic Co-operation and Development
PQC	Product Quality Certification
QAS	Quality Assurance Systems
SCNUN'S	Standing Committee on Nutrition
SMES	Small and Medium Scale Enterprises
TMA	Tema Metropolitan Area

TPC	Third Party Certification
TPCs	Third Party Certifiers
UN	United Nations Organization
UNICEF	United Nations Children's Fund
WFP	World Food Programme
WHO	World Health Organization
WTO	World Trade Organization
WTP	Willingness-To-Pay

CHAPTER ONE

INTRODUCTION

1.1 Background

The World Food Programme (WFP), the United Nations Children's Fund (UNICEF) and many non-governmental and government organisations have initiated projects targeted at eradicating malnutrition especially in children across the globe. Malnutrition at an early age leads to reduced physical and mental development during childhood. For example, according to the 5th World Nutrition Situation Report of UN's standing committee on nutrition, stunting in growth affects more than 147 million pre-school children in developing countries (SCN, 2004). Malnutrition has been defined by the WFP as a state in which the physical function of an individual is impaired to the point where he or she can no longer maintain natural bodily capacities such as growth, pregnancy, lactation, learning abilities, physical work and resisting and recovering from disease (WFP, 2011).

Some regions like Central and Eastern Europe and the Commonwealth of Independent States (CEE/CIS), Latin America and the Caribbean are making progress in this mission. However some of the developing nations have not seen much success, while in others the situation is deteriorating. Western and Central Africa is in this group which is making insufficient progress towards achieving the first millennium development goal (MDG 1) of eradicating poverty and hunger (UNICEF, 2011). According to Otoo (2008), the nutritional status of individuals is a component of three major related factors namely food intake, quantity and quality of the food as well as

the general physical health of the individual. Thus progress in achieving MDG1 can be attained by addressing these critical issues.

In Ghana, the nutritional status of children as measured by body mass index (BMI), height for age, weight for age and weight for height and compared with international reference standards are poor. According to GMHS (2008), indicators of poor nutritional status such as stunting (Low height for age), Low weight for age (underweight), Low weight for height (severe acute malnutrition/wasting) and High BMI for age (overweight/obese) in Ghanaian children are 28%, 14%, 9% and 5% respectively, indicating poor performance of children in terms of malnourishment in children under the age of five years.

Interventions by government and development partners in curbing child malnutrition have not been sustainable in Ghana. This result from weak targeting, mismatch between causes and actions, suboptimal delivery and low coverage of comprehensive health and nutrition services (GHS, 2011). There is a need therefore for all stakeholders to support efforts to meet the nutritional needs of children in terms of variability in the food intake available and the quantities and quality of the food provided.

Domestic entrepreneurs, realizing the opportunities in complementing the efforts of government and development partners whilst making money and creating jobs, have embarked on producing cereal foods fortified appropriately for children aged five and below. These products were basically recipes developed and heavily promoted through collaborations between the Ministry of Health and Centre for Scientific and Industrial Research's (CSIR) Food Research Institute (Masters et al., 2011). These

manufacturers are usually small and micro scale enterprises (SMEs) using home based technologies in their production. These SMEs use raw materials (grains and legumes) produced by Ghanaian farmers. The volume of production and sales of these firms have remained rather low, as these alternatives have been unable to displace established branded products like Cerelac, Blendina and BeechNut even though locally manufactured products are much cheaper (Masters et al., 2011).

A common practice in child care and feeding is to introduce children aged six months and above slowly to family foods; by mashing or extending cooking time, care givers ensure that the food is tender enough for consumption by un teethered infants. However the World Health Organization recommends the use of complementary foods as these are better able to supply the nutrients needed for proper growth of children especially between six to twenty four months old (GDHS, 2008; Pee and Bloem, 2009). The International Association of Infant Food Manufacturers (IAIFM), also emphasize that iron and high calorie content in diet is very important for infants around the age of six months onwards, thus iron enriched cereal based foods become very useful. Ruel et al., (2001) undertook a study to understand the nature of urban poverty and how urban poverty, food insecurity, and malnutrition in children are related. Their results revealed that childcare practices, maternal education, maternal early return to work after delivery is important in determining children's nutritional status. A survey by Levin et al., (1999) indicates that a third of households in Accra are headed by women and also about 75 % of households have at least one working woman. This is of great consequence on childcare and feeding practices in urban households. Evidently, the role of women as sole housekeepers is no longer the case. Thus urban mothers' increased demand for convenient and high quality infant food products is

understandable. This trend in consumption is the basis for investment in the infant food sector.

The global infant food sector is dominated by few actors like Gerber, Heinz, and Beechnut and Nestle, which are all transnational corporations with intensive branding activities for their products. These corporations compete with SMEs in domestic markets. The categories of products in the infant food sector are the cereal based products; meat based products and textured fruits and vegetables. In Ghana, the major product by SMEs in the infant food sector is the cereal based foods. The major cereals employed are maize, rice, millet, sorghum, cowpea, soybeans and groundnuts (peanuts). The decision of the government of Ghana to assent to the World Trade Organization exposes its SMEs to competition which is stiffer not only as a result of increased numbers of sellers and products, but also due to the fact that experience and credence attributes are numerous and important in food products such that asymmetric information and moral hazards can lead to market failure (Winfrey and McCluskey, 2005; Menapace and Moschini, 2010). To ensure profitability and sustainability, SMEs in the infant food sector must employ product differentiating strategies to be competitive. Certification is one of such strategies but introduces an extra cost to production (Thornsbury et al., 2006).

Certification enables a consumer to differentiate between products on the basis of their environmental, social (Blackman and Rivera, 2010), safety, labor standards, quality and many other attributes of food products. Menapace and Moschini, (2010) indicate that credible certification schemes reduce the cost of establishing reputation leading to welfare gains compared to a situation in which only trademarks are available. In that sense certification helps reputation to operate as a quality assurance

system. It is less expensive than brand strategy in terms of investment spending, making it a more attractive and cost effective strategy for SMEs than brand strategy (Chambolle and Giraud-Heraud, 2002).

1.2 Problem Statement

Over the past two decades, a number of private food standards have been instituted by the private sector especially retailers to assure quality and safety in a highly competitive market (Reardon and Farina, 2002). Several standards in use in the agrifood chain are public standards with common applications; but most of current agricultural trade standards are privately set by groups or firms to serve their particular needs (Giovannucci and Ponte, 2005). In the economic literature, infant foods are referred to as credence goods since their quality cannot be determined before and even after purchase (Darby and Karni, 1973; Langinier and Babcock, 2005; Menapace and Moschini, 2010) and consumers depend on brand names and quality signals from reputable certifying institution or third party certification (TPC) in decision to purchase (Deaton, 2004; Milgrom and Roberts, 1986; Sanogo and Masters, 2002).

Branding is non-existent among local infant cereal foods as branding is costly and often not within the means of SMEs. This could lead to low competitiveness and low market shares. Since their products are not branded and have virtually no form of certification, consumers have little information on the quality of these products, making purchase decisions price biased. Consequently, consumers tend to patronize the more expensive branded infant foods on the market, even when they cannot afford sufficient quantities to meet the needs of their children (Masters et al., 2011).

Verifiers or certifying institutions lend credibility for many quality claims of producers and processors ranging from organic food attributes, environmentally friendly production processes and adherence to labor standards. Verification often comes in a form of certificate or mark or symbol issued to the producers to indicate compliance to a system of grades and standards. Briz et al. (2005) indicate that the major benefit (from firm perspective) of certification was the possibility of gaining competitive advantage over competitors, followed by improved management and control of the firm, improved definition of responsibilities and duties of production staff, and improved quality of products and services. Generally, businesses have four kinds of motivation to adopt quality assurance systems and these are: to show a company's ability to produce products of high quality, to earn premium price for quality products, better customer and supplier relationships and ultimately increased sales and market shares (Karipidis et al., 2009).

Yiridoe and Maret (2004) and Thornsby et al., (2006) explain that whatever the reasons may be for adopting quality control in a firm, the action has risks and costs associated with it. Menapace and Moschini (2010) attest to costs associated with provision of quality information on food products and that certification schemes can be a means of reducing this cost. They further indicated that this can be achieved if certification schemes are credible and accessible by all or some of the firm population.

In spite of the benefits associated with certification, the issue of processors' WTP for product quality certification for Local Infant Cereal Food Processors in particular is relatively unexplored especially in Ghana. The research questions that arise are:

1. What are the characteristics of local infant cereal food processors' (LICFPs)?
2. What factors affect LICFPs' Willingness to pay for certification?
3. What are the magnitudes of these factors in their effects on processors' willingness to pay for product certification?
4. What is the maximum amount that LICFPs are willing to pay for product certification?
5. What factors influence the maximum amount LICFPs are willing to pay for for product certification?

These are the issues addressed in this study.

1.3 Objectives of the Study

The broad objective of this study is to assess local infant cereal food producers' willingness to pay for product quality certification and the factors that may affect it.

The specific objectives are:

1. To describe the characteristics of local infant cereal food processors
2. To identify the factors that may affect LICFPs WTP for product quality certification
3. To estimate the magnitudes of these factors and their effects on processors' willingness to pay for product certification?
4. To estimate the maximum amount that LICFPs are willing to pay for product quality certification
5. To determine the factors that influence the maximum amount processors are willing to pay for product quality certification.

1.4 Relevance of Study

The study is important for several reasons. The results of the study will inform policy makers on the course of action to be taken to reverse the slow rate of growth in SMEs in the infant food sector. An identification of factors influencing LICFPS willingness to pay for certification can direct policy makers on formulating strategies to address those issues commonly identified as a negative or more critically those barriers particularly faced by SMEs in adopting product quality certification (Briz et al., 2005).

Secondly results of this study will aid policy makers to formulate policies that will go a long way in ensuring survival and growth in SMEs which are a source of employment and for producers of agricultural raw materials. Thirdly the results of the study can help policy makers and trainers to address those attributes of SMEs with negative influence on WTP to ensure maximum participation in PQC as this could improve production efficiency, competitiveness and adaptation to food safety regulation and traceability standards for survival and growth of firms in the infant food sector.

Again, the acceptance and implementation of such a certification system is expected to improve the quality of local infant cereals and make them competitive. This will facilitate complete signaling of credence attributes in infant cereals and cause increases in demand for high quality products, all things being equal (Innes and Hobbs, 2011). Also all actors along the cereal marketing chain can obtain economic benefits from the adoption of PQC since the set standards and best practice guidelines are embodiments of infant food quality attributes and participation in PQC means that

a processor can get feedback on the quality of the finished products. Furthermore participation in PQC provides for processors standards that will ensure the achievement of improved and more consistent quality of local infant cereals for consumers in Ghana.

Finally, aiming to improve business performance of SMEs for products including those developed by CSIR's Food Research Institute will serve as motivation for continued effort to develop more recipes in the fight against child malnutrition. This is important to achieve the first millennium development goal (MDG 1) of eradicating hunger and extreme poverty, the second millennium development goal (MDG 2) of achieving universal primary education and MDG 4 of reducing child mortality. The results of this study will have policy implications for interventions to prevent rather than treat malnutrition in Ghanaian children on a larger scale than food aids could ever attain.

1.5 Organization of the study

The study is structured into five chapters. The next section is a review of literature relevant to the subject matter of this study. Chapter three explains the methodology of this research. Chapter four discusses the results and findings. The final chapter is the summary, conclusions, policy recommendations and suggestions for future research.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This chapter reviews past and relevant studies undertaken by other researchers. The reviews are on certification in agri-food sector, factors influencing processors' participation and adoption of quality assurance systems and also on methods of analysis frequently used in adoption studies.

2.2 Importance of SMES (Food Industry) to Ghanaian Economy

SMEs are a source of employment to their immediate communities and currently the number of SMEs keeps rising. Data collected from the Registrar General's Department in Ghana, shows an increase in registration from 7347 firms in 2005 to 12718 in 2010 representing a 73.1 % increase. According to the OECD, (2004) SMEs contribute over 55 per cent of GDP and over 65 per cent of total employment in high income countries. However, in low income countries SMEs and informal enterprises account for over 60 per cent of GDP and over 70 per cent of total employment, while they contribute over 95 per cent of total employment and about 70 per cent of GDP in middle income countries. In Ghana, data is not readily available to easily compute the contribution of SMEs to employment and GDP (Agyapong, 2010). However, information available from the Registrar General indicates that 90% of firms registered are SMEs (Mensah, 2004).

As Ghana nation attains middle income status and strives to achieve the Millennium Development Goals, it needs to shift focus on agricultural gross domestic product (GDP) and concentrate on developing other sectors of the economy (Zaney, 2011). The industry and services sectors' contribution to GDP has been increasing steadily.

Generally the service sector contributed more to GDP than the industry sector between 2006 and 2010 (GSS, 2011). In Ghana's quest to become an industrialized nation, it is important to focus on value addition to its primary agricultural products. Also, exporting value added products instead of primary products would be a form of diversification and would go a long way to improve foreign exchange earnings. Thus there has been much discussion and programmes to promote more activities in industry which comprises the mining and quarrying, the manufacturing, electricity, water and sewage and the construction sectors.

Specifically, the manufacturing sector has received attention from government which is evident in the passage of an industrial policy document in 2010. Generally, the industrial policy is aimed at ensuring that industrialists are able to offer high quality and competitive products to enable them gain access to the global market. It also represents a critical component of Ghana's strategic effort to alter the industrial structure by developing a competitive manufacturing sector (Zaney, 2011). Furthermore, the Ministry of Trade and Industry is soon to institute a law on industrial competitiveness. In other words, the Ministry is championing the cause of an Industrial Competitiveness Act which seeks to provide incentives for promoting the use of local raw materials and increasing domestic content in local industry (Ibid).

Small businesses have been said to be important in job creation (especially female employment) and contribute to tax, export and import revenues and human resource development. They also facilitate the distribution of goods and are the cradle of innovations and entrepreneurship. In Ghana, SMEs are usually found to engage in

such activities as farming, fishing, small scale mining, restaurants, food processing and other services (Agyapong, 2010).

Local infant cereal food processors (LICFPs) are invariably micro, small and medium scale enterprises. These are often perceived and described as flexible in that they can more easily switch between operations (Aryeetey and Ahene, 2005). This results from the use of simpler equipment as well as multipurpose or non-specialized machinery in their production processes. This allows them to change from the production of one product to the other. These SMEs are also considered a cheaper alternative for creating jobs (Schmitz, 1995; Aryeetey and Ahene, 2005). This lower cost could be explained in terms of the relatively lower capital investments made by micro, small and medium sized enterprises. For example it is entirely possible for a cottage (micro) industry to operate from the owners' residential facilities or premises saving the new business the cost of rents for at least the early years of operation. The advantage of being flexible is to allow SMEs to adapt to customers' requirements much more easily than their counterparts who are large scale. LICFPs are local raw material users and in consequence save the nation some foreign exchange as would be required if they were to import raw materials (Aryeetey and Ahene, 2005).

The manufacturing sector is dominated by small and medium scale enterprises. Most of these enterprises are agro industrial establishments in the food and drinks sector. Among these are infant cereal foods. The number of firms in this subsector increased from single digits in 1980s and 1990s when they were first introduced to double digits in this current year. Their contribution to the economy of Ghana include, but not limited to, a source of employment, a means of reducing post harvest losses of grains

and legumes, a source of convenient complementary foods for infants especially in the urban areas of Ghana and thus a means of fighting under nutrition in children on a larger scale than food aid interventions have achieved.

2.3 The Infant Food Subsector

The worldwide markets for baby foods and infant formula can be grouped by the following product segments: infant formula (baby milks/baby formulas), baby meals, baby cereals, baby juices/drinks, and baby biscuits/cookies produced by different manufacturers in countries or regions like the USA, Canada, Japan, Europe, Asia-Pacific, Latin America, Middle East, and Africa (Reportlinker,2010).

A global strategic business report on baby food and infant formula industry lists some key and niche players such as Abbott Laboratories, Abbott Nutrition, Earth's Best, GroupeDanone SA, Danone Baby and Medical Nutrition B.V., HJ Heinz Company of Canada LP, Hero AG, Beech-Nut Nutrition Corporation, Organix Brands Ltd., Mead Johnson Nutrition, Morinaga Milk Industry Co., Ltd., Nestle S.A., Gerber Products Company, Nestle USA, Pfizer Inc., SMA Nutrition, Synutra International Inc., and Wakodo Co. Ltd.(Report linker, 2010).

There has been an increase of commitment to reducing child malnutrition recently. Also an increased understanding of what nutrients and foods are required has stimulated a lot of interest as well as research and development efforts on the part of food manufacturers to process foods and to produce active ingredients for inclusion in special foods or for use in food preparation (de Pee and Bloem, 2009). As a result many innovative and convenience products have been seen on the infant food market.

According to International Association of Infant Food Manufacturers (IFM, 2011), the infant food industry spends about 2.5% of its annual profits in research and development for better products through identification of nutritional needs of infants, development of products to meet those needs, ingredient sourcing, prototype production and clinical trials. This is evidenced in the launch of bifidus pro-biotic Cerelac early 2011 on the Ghanaian market.

2.4 Regulations, Legislations and WHO Recommendations

Globally, there are a number of public and private sources of regulations as well as legislations that govern the infant food sector, as both national governments and international organizations across the globe are very much interested in infant nutrition issues. The public sources include, Codex Standards, European Union Documents, US Government Documents and WHO International Digest of Health Legislation among others (IFM, 2009).

The World Health Organisation (WHO) recommends consumption of nutritious food, comprising exclusive breastfeeding for the first 6 months of life, followed by breastfeeding in combination with complementary foods thereafter until at least 24 months of age. Furthermore, a hygienic environment, access to preventive as well as curative health services and good prenatal care are important ingredients for the treatment and prevention of malnutrition among children who are 5 years and below (de Pee and Bloem, 2009). Hygienic environment refers to clean drinking water and clean sanitary facilities. Many children across the world have access to preventive health care services like free immunizations (polio), vitamin A supplementation, and yellow fever among others. These free immunizations are sustained in poor and developing countries by help from the international communities. It must be noted

that the immunizations are not on a daily basis as complementary feeding is or should be. Thus food aid programmes can only be used in emergencies and it is imperative that nation states and parents collaborate to develop appropriate strategies to enhance nutrition in infants and young children.

2.5 Globalization, Trade Liberalization and Certification

There are many documented evidence on the fact that the agri-food sector has been undergoing rapid transformation (Gawron and Theuvson, 2009; Barling, 2009; Vermeulen and Bienabe, 2007) in many parts of the world based on industrialization of agriculture and agro-food processing.

2.5.1 Global Markets, Demand Driven Supply Chains and Changes in the Agri-food Sector

Nations and businesses around the globe are becoming more and more dependent on one another with the formation of the World Trade Organisation. Any small or large firm finds itself in competition with many firms (in the industry) from different parts of the world as a result of trade liberalization. Furthermore, consumers have also become more sophisticated in their consumption of especially food products. Recurrent food crises have been claimed to be the major driver of changes in food demand and consumption. These food crises have triggered consumers' distrust and increased their food safety awareness (Vermeulen and Bienabe, 2007).

Furthermore, growing social and environmental concerns of consumers as well as some forms of local food activism that developed in reaction to globalization trends

are perpetuating the changes (Ponte and Gibbon, 2005). The quality turn is clearly related to the globalization of food networks and by the market saturation for ‘commodity’ type products (Allaire, 2003; Ponte and Gibbon, 2005). The market these days, especially in developed countries is leading the campaign for food control among firms as most consumers now demand environmental loyalty, quality and safety assurances before they purchase products.

Environmentally friendly goods are being sought and consumers are willing to pay more for that product (Gbedemah, 2004). Industries and manufacturers that fail to heed such a call become uncompetitive (Gbedemah, 2004), therefore prompting them to adopt new strategies towards quality assurance in the industry. For example, since 2005, the implementation of a traceability system is mandatory to all European food chain operators (Asioli et al., 2010). According to the European general food law (EGFL), traceability is “the ability to trace and follow a food, feed, food-producing animal or substance through all stages of production and distribution”. Tracing and tracking according to Meuwissen et al. (2003), deals with opposite directions of the supply chain and have become very important components of food chains. While tracing follows a food product or its ingredient backwards in the supply chain, tracking follows the product forwards in the supply chain. Tracking and tracing is the major function of traceability systems and they seek to establish the history of food products. These are important instruments that help firms and stakeholders clarify issues in events of food crises and scandals.

2.5.2 Grades and Standards in Trade

Standards are the means or criteria used to judge products, processes and producers (Hatanaka et al., 2005). Producers, especially in the food industry, use many processes in transforming primary agricultural produce to arrive at finished products for consumers. These processes often need to conform to standards depending on the product category and class. Grades and standards (G&S) used to function as technical instruments to reduce transaction costs (Hatanaka et al., 2005), in commodity markets that are homogeneous but in recent times, they are used strategically by businesses as strategic instruments of competition in differentiated product markets.

Carriquiry and Babcock (2004) indicate that there is a great disparity in existing QASs as regards the degree of stringency (and associated costs) of the systems employed. They explained that these differences were based on market structure, the nature of the reputation mechanisms, and the size of the demand for value-added products and whether the attributes sought-after by final consumers are credence, experience, or a mixture of both. They argue that QASs can be seen as efforts made by firms to position themselves strategically in a marketplace where consumers can differentiate between firms that deliver quality goods and those that deliver substandard quality. And generally, where there exists a lack of formal G&S (as occurs in developing and poor nations) transaction costs in national and international markets increase. The nature of G&S has shifted from performance standards when they are viewed in terms of realized characteristics and attributes of the products. They have become more of process standards. These changes, because of the implied investments, have tended to restrict small firms in developing countries from participating in market growth (Reardon et al., 2001). For example, small firms are

often unable to provide financial resources for the initial outlay necessary to implement quality assurance systems.

In recent years many quality assurance schemes have been instituted especially by the private sector (Albersmeier et al., 2010; European communities, 2006; Sodano, 2006; Jahn et al., 2005) with standards often higher than those of public regulations. These are classified according to target group, focus, goal, content, standard owner, areas of application and number of stages along the supply chain involved (Theuvsen and Spiller, 2007). Sometimes standard setters can be separated into private and public (Theuvsen and Plumeyer, 2008; Jahn et al., 2003).

According to Theuvsen and Plumeyer, (2008), public standards are laid down by national or regional governments like the EU regulations EC2092/91 and 510/2006. BQ and BQM standards are examples of regional regulations in Germany state of Saxony-Anhalt. On the other hand, private standards can be instituted by customers or suppliers or by norming institutions like ISO 9001, ISO22000; or sometimes by inspection and certification institutes. Examples of customer standards are BRC global standard and international food standard. Assured farm standard in the UK is an example of supplier instituted standard while TUEV-tested and Fresenius quality are both examples of inspection and certification institute's standard.

2.6 Branding

Branding is described as a marketing strategy or tool that has been used successfully for many years by producers and/or other supply chain members to increase consumer awareness, loyalty, and, ultimately, willingness to pay for their products. These

strategies aim to convince consumers that the brand name is a stand-in for quality (Ubilava et al., 2008).

For agricultural companies and for agribusinesses in general, there is increasing knowledge and acceptance that branding promotes future financial growth and prosperity. Research on retail purchase managers by Nijssen and van Trijp (1998) in the Netherlands to identify the variables that influence the level of consumer franchise of fresh foods brands for meat and poultry, cheese, fruits and vegetables found that both traditional success factors for building strong brands and characteristics closely linked to the nature of fresh food products are important. Examples of success factors in branding are order of market entry and level of promotional expenditure while physical possibility to brand and shelf-life are some of the fresh food product characteristics. Furthermore, brands with a higher consumer franchise have a higher financial pay-off for both the supplier and the retailer than brands with a lower consumer franchise (ibid). In other words, brands that are well accepted and patronized by consumers have a higher return on the investment of branding as a marketing tool.

2.6.1 Benefits of Branding

Menapace and Moschini (2010) indicate that producers use brands to differentiate their products from those of other producers. A brand can be a trademark, a mix of a trademark and a Geographical Indications (GI) label or a GI label. In other words, consumers can and do identify products of different firms through brands and base purchase decisions on the firms' reputations for quality as conveyed by the brands.

Branding is a marketing tool that has been found to be more beneficial to larger establishments than their counterparts who are small. It has been alleged that this happens mainly because branding is a costly activity and that in small firms the costs can outweigh the benefits (Nijssen and van Trijp, 1998). Small firms do not enjoy economies of scale to make branding cost effective. This is not to say that SMEs have no use for branding, but that they need to carefully weigh the costs and benefits before embarking on the branding activities. Generally, some of the benefits accruing to businesses from branding are outstanding growth opportunities since strong brands generate more sales at the retail level (Nijssen and van Trijp, 1998). This is an underlying reason for retailers' low stocking of unbranded products.

Ubilava et al., (2008) found that branding magnifies the effect of other informational attributes of pork chops by increasing the marginal utility of such information, and that its absence led to increased uncertainty for a significant group of consumers in the US market. In other words branding may increase premiums paid by consumers for certified credence attributes in pork chops. Other benefits of branding include economies of scale, lower marketing costs, increasing international business, laying grounds for future expansion, quicker identification and integration of innovations. Some branded infant cereals in Ghana are Cerelac from Nestle a multinational company, Cow and Gate, Nutrillac, Nutribom, Blendina, Beechnut s even though there are many infant cereals made by both domestic and foreign manufacturers.

2.7 Certification

Certification is the act of certifying or the state of being certified (Collins English Dictionary or a certified statement (Webster's College Dictionary). It has also been

defined as confirmation that some fact or statement is true by use of documentary evidence. According to the Oxford dictionary, the practice of giving information about oneself or one's company in a formal statement instead of asking a third party to do so is self-certification. In this breadth, third party certification is formal information given by a third party on account of another (the first party). It seeks to tell others that a claim by the first party is true. The Spore magazine indicates that certification is an effective marketing tool that allows consumers to make both social and environmental statements while shopping. In the agri-food sector certification basically is concerned with verification of compliance with set standards. These standards are either public or private and while they concern food safety, food quality, good agricultural and manufacturing practices, many other compliance is with systems, processes and products (Hatanaka et al., 2005). A producer may be willing and able to invest in the adoption of quality assurance systems to ensure the end product is of the quality required or set in the standard. However, as is common in food products, this investment may not be visible to consumers. It is often not sufficient to just adopt any quality assurance scheme (QAS) without the appropriate certification and labeling schemes in place. This is especially necessary, when the standard for the QAS is privately owned (Hatanaka et al., 2005). Thus certification tends to aid customers and other suppliers to identify those suppliers who have invested in production of high quality products.

Certification provides a means for informing ultimate consumers about products and offers a producer a certificate, a mark (Jahn et al., 2004; GSA, 2011; or some other signs as a guarantee that the information so given by the producer is well founded (Canavari et al., 2006; Heyder et al., 2010). The process of certification turns

credence attributes of food products into qualities that can be seen and used in purchase decisions (Albersmeier et al., 2009; Canavari et al., 2006; Deaton, 2004; Milgrom and Roberts, 1986; Sanogo and Masters, 2002) thus eliminating market failure resulting from information asymmetry (Giovannucci, 2003; Jahn et al., 2004).

Certification systems in the agri-food sector is varied and can be discussed in terms of the standard setter, addressees, foci, objectives, geographical coverage, number of participants and supply chain coverage (Theuvsen and Plumeyer, 2008; Gawron and Theuvsen, 2009). Often standard setters issue certificates of compliance to tell other businesses, consumers or both businesses and consumers that the products or services from a firm or farm is of the quality claimed, thereby reducing quality uncertainties in food supply chains (Gawron and Theuvsen, 2009). The food industry is particularly fraught with mistrust because food products contain many quality attributes (Winfree and McCluskey, 2005); therefore a certification scheme can only work if consumers trust that the auditing scheme is effective and can guarantee product quality and safety adequately.

The basic structure of certification is that it begins with a link between the producer and customer (Albersmeier et al., 2010; Jahn et al., 2004). A neutral certifier provides a certificate that serves as a quality signal for the customers or actors within the supply chain (Luning et al., 2002). By the certificate issued, the certifier tells customers and or actors within the supply chain that the product of this producer meets certain set standards. This implies that, the certifier's role is to audit the producer based on requirements instituted by the standard owner.

Menapace and Moschini (2010) wrote that the system of certification is in competition with that of branding when they are used to improve the quality of products. They explained that the certification system tends to use control of an offered product as a condition of having a level of certified quality.

2.7.1 Types of Certification

Various certification schemes have different objectives. In one breath, some guarantee minimum standards thus improving food safety: and in another breath, some provide a means for product differentiation. These schemes achieve this by systematically compiling legal rules, norms and industry guidelines like good hygiene, good manufacturing and good agricultural practices which are then enforced by large business to business schemes (Gawron and Theuvsen, 2009). Schemes used for product differentiation often address consumers who may pay higher prices and also have an increased tendency to remain loyal with the product.

Hatanaka et al., (2005) indicate that there are generally three (3) types of certification depending on who undertakes the verification. When the audit is performed by the producer, it is referred to as first party certification. An audit conducted by paid inspectors of the retailer or the producer makes this type of certification a second party certification. Finally, when an independent body or party (apart from buyers or consumers and sellers or producers) verifies compliance with the set standards, it is called third party certification. Put differently, an LICFP may adopt one or the other of QAS. If the firm employs or engages a quality control official to verify compliance to either public or private standards, this is referred to as first party certification since the verifier is a part of the firm- here the supplier or processor. However if the

LICFP'S retailer hires the services of an auditor or inspector to verify compliance, it is a second party certification since a second party who is in the supply chain is involved. If parties who are not actors in the supply chain conduct the auditing then it is described as third-party certification (Hatanaka et al., 2005). For example, an LICFP may invite GSB or any other accredited certifier to perform the assessment or verification in the case of third party certification. Since GSB or any other accredited certifier for that matter is not affected by the results or outcome of the audit it is perceived to be independent and objective. It is this perceived independence that is driving the proliferation of third party certifiers across the globe in the agri-food and commodity markets.

Again, Heyder et al., (2010), indicate that there is a wide range of quality certification schemes in operation in recent times and that even more are being instituted. They explained that globalization is a driver of this trend and that these schemes cover a wide array of areas including production and processing techniques, ingredients or inputs, origin of raw materials, animal welfare, environmental and labor standards as well as compliance with compulsory hygiene and food safety standards. Table 1 shows some schemes, where they operate in terms of geographic location and the products they apply to.

Table 2.1: Some Quality Assurance Schemes and Their Logos

FQAS	COUNTRY	PRODUCT	LOGO
Baena (PDO)	Spain	Olive oil	
Boerenkaas	The Netherlands	Cheese	
Comté (PDO)	France	Cheese	
Dehesa de Extremadura (PDO)	Spain	Cured ham	
EUREPGAP	EU	Fruits and vegetables	EUREPGAP
LABEL ROUGE	France	Chicken	
ParmigianoReggiano (PDO)	Italy	Cheese	
Red Tractor/ Assured Produce	UK	Potato	

Source: Gay et al., 2007

2.7.2 Certification and Quality Assurance in Ghana

Certification in Ghana is carried out by the national standards body known as Ghana Standards Board (GSB) now Ghana Standards Authority (GSA). Aryeetey and Ahene (2005) indicate that the GSB is the institution mandated to develop standards and offer testing and certification services as well as analysis of food and drugs among others when they researched on changing regulatory environment for SMEs and their performance in Ghana. According to GSB, product certification is an activity or procedure by which a third-party gives written assurance that a product, process or service conforms to specific requirements like those of ISO 9001:2000 among many others.

Product certification involves the issuance of a certificate or mark (or both) to demonstrate that a specific product meets a defined set of requirements for that

product, usually specified in a standard. The certification mark is normally found on the product packaging (label) and may also appear on the certificate issued by the certification body. The mark carries a reference number or name of the relevant product standard against which the product has been certified (GSB, 2011). The GSB in the case of Ghana is the standard setter. However there is a regulatory body mandated to regulate the manufacture, importation, exportation, distribution and use as well as the advertising of food products on the Ghanaian market (Food and Drugs Board, 2011) with respect to their safety, quality and efficacy(for drugs). The table below shows the status of product certification for the period 2009 to 2011 for various sectors of the food industry.

Table 2.2: Status of Certifications for Various Sub-sectors

Subsector	Number Of Certified Firms For Past 3 Years		
	JUNE 2009	JUNE 2010	JUNE 2011
Processed Cereals	1	0	0
Confectionary	3	2	0
Cooking Oils	1	1	1
Dried Fruits	0	0	0
Beverages	3	0	1
Dairy Products	0	0	1
Cosmetics	7	4	2
Water	12	11	13
Others	6	9	5

Source: Computations by author using data from GSA

2.7.3 Certified Products and certifying institutions in Ghana

In most countries traditional governmental regulators do exist; yet there have been many crises and scandals in the agribusiness sector. Thus consumers' confidence in these regulators has diminished. Certifying institutions can be classified as being private or public bodies just as the standard setter or owner. Public certifying institutions are important where quality of food products is considered a public good.

Furthermore, the certifier also needs to prove its capacity to carry out these audits through an accreditation process (Albersmeier et al., 2010).

2.7.4 Importance or benefits of Certification

In small food firms the benefits of adopting quality assurance systems depend on the type of enterprise, the products of the firm, the kind of market they operate in as well as the certifying body involved (Karipidis et al., 2009). Theuvsen and Plumeyer (2008) indicate that a benefit of certification is to reduce transaction cost resulting from reduced expense in advertisements and the need for rigorous marketing activities which are the traditional marketing channels. They also wrote that certification can be used to achieve differentiation in differentiated products market. This differentiation may be realized from compliance with above average process standards (Gawron and Theuvsen, 2009).

Generally benefits of adopting quality assurance systems (QAS) and the certification of such systems to SMEs in the food industry can be grouped broadly into two: internal and external benefits (Karipidis et al., 2009).

According to the national standards body, there are basically five (5) reasons why Product Certification is important. Its importance can be attributed to consumers, suppliers and regulators. First, this is important to the supplier because it is an affirmative action for quality and secondly acts as a catalyst to increased market share. Thirdly, it ensures the production of consistently high performing products and fourthly serves to fulfill Governmental requirements. Finally, certification helps to promote consumer confidence in products supplied (<http://gsb.gov.gh/site>, 2011).

Golan et al., (2000) as cited in Nilsson and Foster, (2004) gives an in-depth overview of current labeling schemes and claim that labeling may be one of the best tools for increasing the match between preferences and purchases. Moreover, they also note that one of the producer benefits of the program is market access for involved producers.

However, certification increases the poor's transaction costs in the national and international markets and thus reduces the scope and profitability of their market. That increases their poverty and by extension, political clout (Theuvsen and Plumeyer, 2008).

2.8 Processors' Willingness-to-Pay for product quality certification

Agribusinesses such as supermarkets, restaurants, and food processors are often interested in estimating consumer demand for a new product or new attribute of an already existing product. Furthermore, agribusinesses such as seed and chemical companies, technology and equipment dealers, and agricultural service providers might also be interested in producer (farmer) WTP for a new product or service (Jayson and Hudson, 2004). For example farmers may demand new technologies like an improved maize or soya bean variety. They may also demand a new approach to extension services. Willingness-to-pay (WTP) is the maximum amount of money (Kalish and Nelson, 1991; Sattler and Volckner, 2002) or consumer surplus (Kumar et al., 2011) or producer profits (Alberini et al., 2004) that can be exchanged or foregone in order to gain some form of utility from a market or non market good. In agriculture, WTP studies have been used to evaluate demand and cost curves for extension

services delivery through commercial agents and for improved water quality for irrigation and for veterinary services among others.

Alberini et al., (2004) defined Willingness-to-pay (WTP) as the amount of money that can be taken away from a person's income at the higher level of environmental quality to keep his utility constant. Again, willingness to pay (WTP) has been described as a strong research approach by many researchers (Mwaura et al., 2010): that it involves the engagement of targeted clients for potential services in order to establish their preferences for the proposed services and the value the clients are ready to pay. WTP for a service is the maximum amount of money an individual would be willing to pay for that service rather than do without it. WTP studies are widely used in assessment of markets, goods, services by planners, entrepreneurs and for environmental valuation.

2.9 Factors Affecting Processors' Willingness to Pay for Certification

LICF processors' WTP for certification may be described as the maximum amount of profit that producers are willing to forego in order to obtain certification for their products. This may be influenced by many factors from the socio- economic characteristics of the firm manager or owner(s) to the market and environmental or institutional characteristics. In determining the main reasons why firms seek ISO 9000 certification, Briz et al., (2005) asked respondents to indicate the importance of variables in two groups of factors namely firm driven and customer driven factors. Operational efficiency, reduction in rates of error and costs were included in the former group while legal requirements, customer demands and market share enlargement were in the latter.

In an analysis on the factors influencing firms' establishment of traceability systems, Xie et al., (2011) wrote that internal factors of firms like the number of years in existence(age), the management structure and prior quality attestation of the enterprise are important in explaining firms decision to establish a traceability system. These researchers used a logistic regression to analyze data collected on various agricultural products enterprises, and their results showed that frequency of sampling inspections, the action of competitors (peer pressure), media and customer demands coupled with expected improvements in competitiveness and economic benefits are among the external factors influencing managers' decisions to establish traceability systems. Mwaura et al., (2010) studied crop and livestock farmers' willingness to pay for extension services in Uganda. By using cross tabulations and probit analysis they found sex, educational level and age of the producer and access to extension services to be associated with respondents' willingness to pay for extension services. Kumar et al., (2011) also researched livestock farmers' willingness to pay for veterinary services in India. They used personal interviews and focused group discussions to collect data on livestock producers and specified two models for estimating WTP: one for in-centre service and another for at-home services. Asiabaka and Owens, (2002) while studying determinants of adoptive behaviors of rural farmers in Nigeria, found those farmers' socioeconomic characteristics such age and education influenced their adoption behavior while farm size was not significant even though it had a positive sign. This implies that the more educated a farmer is, the more likely he or she would seek new information regarding his farm business. However a farmer's decision to adopt a technology may or may not depend on the size of his farm.

As indicated by some researchers (Kathiravan et al., 2007; Kumar et al., 2011), older enterprise managers are less likely to adopt new technologies and for that matter to participate in certification schemes. Koundouri et al., (2006) studied the adoption of more efficient irrigation technology in Greece using observed behavior and not stated choice methods. They indicated that younger, more educated farm operators were more likely to make use of the new technology. It was also noted that farms with smaller operations but higher profit per unit of land than the average were more likely to adopt. They explained that this could be because the use of irrigation equipment is labor intensive and time consuming, so it is more appropriate for small, intensive operations. This suggests that the characteristics of the technology to be adopted may also influence the decision process. However, Jensen et al., (2007) found age not to be a significant factor in the adoption decision with respect to potential production of switch grass.

Many studies report a positive correlation between education and adoption of technology (see Nkonya et al., 1997; Jensen et al., 2007; Baidu-Forson, 1999). For example, in a study on the use of high yielding varieties by farmers in India, adoption and schooling were found to be positively correlated (Badal et al., 2007). Qualls et al., (2011) hypothesized farmers' perception on certain issues to be negatively associated with interest in growing switchgrass. They wrote that farmers who perceived a high potential for planting or harvesting time conflicts between switch grass and other crops, a lack of developed switch grass markets, a low level of knowledge of production practices for switch grass relative to other crops, and uncertainty about continuing eligibility of land for Conservation Reserve Program payments when producing switch grass can all influence adoption negatively.

2.10 Techniques for Eliciting Willingness to Pay

Researchers have increasingly been using the willingness-to-pay (WTP) technique as a means of evaluating the value of market (Colson and Huffman, 2009; Xie et al., 2011; Zheng et al., 2011) and non market goods including health care technologies (Whynes et al., 2005; Smith et al., 1999), environmental programmes (Alberini et al., 2004; Whitehead, 2006; Basarir et al., 2009), extension services (Mwaura et al., 2010) as well as veterinary services (Kumar et al., 2011). The major reasons for its use are that the technique is simple to conceptualize and also intuitive, although it is not always easy to undertake, and its theoretical underpinnings can be located in conventional economic theory (Birch and Donaldson, 2003).

The methods of eliciting consumers' or producers' WTP may be broadly classified into revealed preference or stated preference. Elicitation methods are also described as being incentive compatible or not. A WTP technique is incentive compatible if it is able to cause respondents to reveal their true WTP (Jayson and Hudson, 2004). In other words, the survey design allows for telling the truth about the maximum amount each respondent will be willing to pay. It is not uncommon to come across respondents overstating (under hypothetical conditions) or understating their willingness to pay (Sattler and Volckner, 2002). Respondents understate WTP when confronted with actual purchase and payment decisions or when respondents believe that their responses can affect the price of the good when it is finally offered on the market.

There are several methods available to estimate consumer or producer WTP (Chase et al., 2009) for novel goods or changes in the qualities of existing goods. Mostly, WTP

studies involve contingent valuation (CV) and hedonistic methods. The choice of a method generally depends on the good under investigation, the nature of the statistical technique used, the targeted respondents as well as the cost implications of the survey. Auctions, contingent valuation, conjoint analysis have been used widely to elicit WTP responses.

2.10.1 Auctions

Auctions are based on revealed preference data that is observed by using a purchase obligation in the experimental design and thus measures real WTP. There are different types of auction procedures often used to elicit WTP and the choice of one procedure depends on the study in question. These include Vickrey auction, first- price sealed bid auction and second price sealed bid auction (Mitchell and Carson, 1989). Vickrey auctions are from a theoretical view point incentive compatible while first price sealed bid auctions are not (Sattler and Volckner, 2002). However in 2008, Colson and Huffman wrote that random *nth* price auction mechanism had been shown to be a demand revealing mechanism that engages off-margin bidders better than a Vickrey second price auction and employed it in their experiment to determine consumers' willingness to pay for new genetically modified food products. These auctions are however rarely used because market simulations are costly to undertake and even when conducted the posted prices only indicates a buyer's WTP at that price and a lower price for a non buyer (Sattler and Volckner, 2002).

2.10.2 Conjoint analysis (CA)

Conjoint analysis (CA) is one of the most effective models for extracting consumer behaviour into an empirical procedure and it is a widely used marketing methodology.

This is because traditional rating surveys have limited capability to place value on the different attributes that make up a given product or service. However, all products or services can be modeled as an entity with a set of attributes and varying levels of each attribute. The special strength of CA is in being able to develop market simulation models that can forecast consumer behaviour to product changes as well as to market changes (Mennecke et al., 2007). Sattler and Volckner, (2002) indicated that CA may be the most widely used stated preference method with pricing and product development applications.

2.10.3 Contingent Valuations

This is the most popular method for measuring hypothetical WTP as indicated by some researchers (Alberini and Cooper, 2000) and is more cost and time effective (Volckner, 2006). Carson et al., (1999) argue that generally, conventional contingent valuation techniques such as the single-bounded dichotomous choice question are not incentive-compatible when the provision of a new private good in a hypothetical context is the objective. Agribusiness applications have the advantage that goods are typically private and tangible, which is not the case in environmental applications (Jayson and Hudson, 2004). Put differently, when asking an individual what they would be willing to pay for a new product, the valuation setting can almost always be made non-hypothetical, thus making the elicitation method incentive-compatible.

The single-bounded dichotomous choice question is perhaps the most frequently used method in the environmental valuation literature because of its proposed incentive-compatibility properties (Carson et al., 1999; Jayson and Hudson, 2004). Furthermore, estimation of the WTP value is straightforward using existing software. The

advantage of the double-bounded dichotomous choice framework is one of statistical efficiency. Hanemann et al., (1991) and Chase et al.,(2009) have shown that more efficient estimates of mean WTP are obtained when the double-bounded approach is employed than the single-bounded approach, basically because the former incorporates more information about an individual's WTP than a single dichotomous choice question.

2.11 Empirical Studies on WTP

This section of the work reviews a number of models that have been used in studies involving willingness to adopt and willingness to pay. The theory often applied in adoption studies has underpinnings in the threshold theory of decision making. The decision to adopt or not to adopt a given technology is a discrete choice. Models that involve such discrete choices are widely estimated by use of discrete choice econometric models (Guere and Moon, 2004). Other researchers like Feder et al., (1985) also recommend the use of qualitative response models in such studies. It is important to mention that a number of models exist and there is also a consensus of their usage among researchers. However there is generally no agreement on which is the best model. Thus the choice of a model depends on factors like the objective of the study being conducted (Adejobi and Kormawa, 2002), assumed distribution of the sample (Maddala, 1983), the researchers understanding and experience with the use of models as well as the statistical values obtained for goodness of fit tests.

2.11.1 Models for Adoption Behaviour

According to Adeogun et al., (2008), a large number of studies have investigated the impact of various socio-economic, cultural and political factors on the willingness of

farmers to use new technologies (see Adesina and Zinnah, 1993; Polson and Spencer, 1992 and Strauss et al., 1991) and that in many of such studies on adoption behavior, the dependent variable is constrained to lie between 0 and 1 and the exponential functions models used. They further wrote that univariate and multivariate logit and probit models as well as their modified forms have been used extensively to study the adoption behaviour of farmers and consumers. Also Shakya and Flinn, (1985) recommended probit model for functional forms with limited dependent variables that are continuous between 0 and 1 and logit models for discrete dependent variables.

2.11.2 The Logit Model

The logit model, which is based on cumulative logistic probability functions, is easier to use in terms of the computations than other types of models and it also has the advantage to predict the probability of farmers adopting any technology (Adeogun et al., 2008). Adeogun et al., (2008) sampled 95 fish farmers in Lagos state, Nigeria using both structured and unstructured questionnaire. In this study, the responses recorded are discrete (mutually exclusive and exhaustive) and therefore, a univariate logit model was developed to analyse the adoption behaviour of farmers to hybrid catfish. They measured rate of adoption based on the proportion of pond area ever used or still under use for cultivation of hybrid catfish.

Kevin et al., (1991) examined attributes associated with producers' decisions to adopt IPM practices. They used the logit analysis on the data collected and included attributes from four categories: producer characteristics, farm characteristics, management practices, and institutional factors. It was observed that variables from three of the four categories were significantly associated with adoption decisions.

However, the institutional variable, receipt of extension materials, had the greatest association with adoption decisions. The results suggest that IPM education programs should turn and focus more on non-traditional audiences and the development of educational programs targeted to specific agricultural activities and producer characteristics may increase adoption.

Xie et al., (2011) researched on factors influencing the establishment of traceability systems in 81 food manufacturing firms in Sichuan Province in China. They analyzed data collected on these firms using a logistic regression. Their results show that peer pressure, age of firm, location of market and the expectation of enhancing economic benefits have the greatest influence on establishment of quality traceability systems by firms.

2.11.3 The Probit Model

A linear probability model (LPM) is a model obtained when OLS is used on a binary dependent variable. The major problem with a LPM is that the predicted values are not constrained to be between 0 and 1. Alternatively $P(Y=1/x) = \beta_0 + x\beta$ can be estimated by modeling the probability as a function, $G(\beta_0 + x\beta)$ where $0 < G(z) < 1$.

A probit model results when $G(z)$ is the standard normal cumulative density function. The logit model and the probit are similar functions increasing in z . Since these are now nonlinear in parameters, OLS is inappropriate and we must use maximum likelihood estimation. A number of studies in which data is analyzed by use of probit models are reviewed below.

Mwuara et al., (2011) conducted a study on farmers' willingness to pay for extension services in Uganda. They collected data on 5,363 crop and 3,318 livestock farmers and fitted a Probit regression model at multivariate level to assess the factors that may be associated with willingness to pay (WTP) for the extension services stratified by agricultural activity. In this study, it was found that about 35% and 40 % of the farmers were willing to pay on average UGX 3,400 and 3,700 for extension services in crop and animal husbandry respectively. It also established that sex, age, education level and preferred means to receive extension services are key farmer attributes influencing the willingness to pay for the services. Danso et al., (2006) estimated a probit model to explain farmers WTP for municipal waste compost in three cities of Ghana. They interviewed a total of 700 farmers using stratified and random sampling techniques through structured questionnaires with both open and closed ended questions. The statistics indicate that in the case of Kumasi, farmers' perception, level of education, current inputs use (poultry manure), total annual income and age were all significant at the 0.01 and 0.05 levels. And in Accra, income, age and perception were significant, while in Tamale income, location, education, age and experience with compost were significant.

2.11.4 Tobit Model

The tobit model was named after James Tobin (1958) who proposed the model when he analyzed household expenditure on automobiles. In this study, expenditure for many of the households was zero and Tobin proposed that estimation of this model with ordinary least squares would yield coefficients biased towards zero. The underlying assumption in Tobit estimation is that any observations for which the dependent variable is zero or negative are not observed. The Tobit estimation has

since been used by many researchers with data in which the dependent variable is censored or truncated or latent. In these studies, the limited dependent variable is often specified either as a ratio (see Adeola, 2010; Chiputwa et al., 2011; Mengstie, 2007) or as levels (see Clark et al., 2005; Basarir et al., 2009; Kumar et al., 2011; Qualls et al., 2011; Mukhopadhyaya et al., 2004) depending on whether the dependent variable is to be analyzed qualitatively or quantitatively (Melo and Pires, 2012). A number of such studies are reviewed below.

A study by Adeola, (2010) in the Oyo State of Nigeria on socio-economic factors which influence adoption reveals Adeola used the Tobit regression model with ratio dependent variables and indicated that education, land ownership, farm size and access to extension services positively influence the intensity of the adoption of soil conserving practices. Again, he concludes that farmer's involvement in identifying productivity enhancing practices would increase the likelihood of farmer's adoption.

Chiputwa et al., (2011), in determining farmers adoption of agricultural conservation technologies in Zimbabwe, employed the Tobit regression model, and found several variables such as training of farmers, education, labour, extension, income, livestock owning and age to have differential effects on adoption and intensity of adoption although significant.

Mengstie, (2007) in Ethiopia studied the adoption behaviour of farmers in soil and water conservation practices using the tobit model. He found a positive and statistically significant relationship between labour, slope of land, information, farm size, education and household size and adoption behaviour. However the study found

a negative relationship between adoption and distant markets. His study therefore concludes that soil and water conservation practices policies which do not consider variations in household and geographical and agro-ecological locations are likely to fail.

A study by Basarir et al., (2009) was conducted to analyse producers' willingness to pay for high quality irrigation water by vegetable farmers in Turhal and Suluova, Turkey. Using a Tobit model and Heckman sample selection model to analyse the data collected on 130 randomly selected vegetable farmers via a survey technique, the researchers found that farmers with larger vegetable farms were willing to pay extra for improving water quality since they expected higher incomes (Basarir et al., 2009). They also analyzed the data with a probit model and found gender and the presence of dirty water to impact farmers' WTP.

In a study to estimate livestock producers' WTP for veterinary services, Kumar et al., (2011) explained that the WTP values estimated were for hypothetically providing total annual animal health care for their animals at either the veterinary centre or farmer's doorstep. They assumed WTP to be a function of both respondent's attributes and an error term that caused WTP value to vary across respondents, even if they possessed same attributes. The researchers followed Cameron and Huppert's (1989) suggestion that there could be some bias and that its sign would be indeterminate in OLS, and used the maximum likelihood interval technique on interval midpoints in their analysis of data collected for the WTP estimation. Furthermore, they assumed a normal distribution in the random component in the

payment card estimation of WTP and went ahead to confirm this normality with a Kolmogorov-smirnov test.

Clark et al., (2005) investigates respondents' WTP for a referendum which would prevent flood risks from worsening. The surveys questioned respondents about their attitudes concerning flooding and ecological risks, political beliefs, information seeking behavior, and other psychological factors unique to the respondent. Data was also gathered on demographic characteristics of the respondent, and also that individual's address. The address was geocoded and hydrologic modeling was used to determine the unique flood risk associated with the residence. A Tobit analysis was used to estimate the willingness to pay function. The researchers' preliminary findings indicated that location, demographic and attitudinal factors influence willingness to pay, with psychological factors and flood risk factors having a relatively strong impact on willingness to pay.

Hagos et al., (2012) used a cross-sectional survey of 226 randomly selected households in Mekelle City, Ethiopia, to assess the current municipal sanitation fees and the willingness to pay (WTP) of residents for improved urban waste management. They used Tobit and probit models in the empirical analysis to determine the factors that influence households' WTP for improved solid waste management. Their research reveal that residents' WTP for improved solid waste management is significantly related to income and awareness of environmental quality, among other factors, and that the current city fee for sanitation is far below residents' WTP.

2.12 Summary of chapter

In summary, this study adopts single bound dichotomous choice approach of elicitation in the contingent valuation method to elicit LICFPs WTP since there exists a market price for PQC and it also eliminates starting point bias (Jayson and Hudson, 2004; Sattler And Volckner, 2002). The study first estimates a logit regression following after Xie et al., (2011); Adeogun et al., (2008) and Hagos et al., (2012) and a tobit regression following after Chase et al., (2009); Hagos et al., (2012) and Qualls et al., (2011) with level of maximum WTP as dependent variable. The variables identified and which are considered for inclusion in the logit and tobit models of this study are age, educational level, sex and awareness of certification of manager or owner of the firm, number of years in operation (firmage), inspections by regulatory bodies, customers and media demands, manager's perception of quality, sales and profit improvements achievable from certification and customers perception of the reliability or reputation of certifier, firm's access to formal credit and annual income.

CHAPTER THREE

METHODOLOGY

3.1 Introduction

This chapter presents the methodology for the study. It discusses the study area, scope of the study, the theoretical framework, empirical models as well as methods and concept adopted for this study. The chapter also provides information on the sources of data and techniques employed in gathering data for the study. The section on sampling and sample size describes the procedure of selecting respondents for this survey.

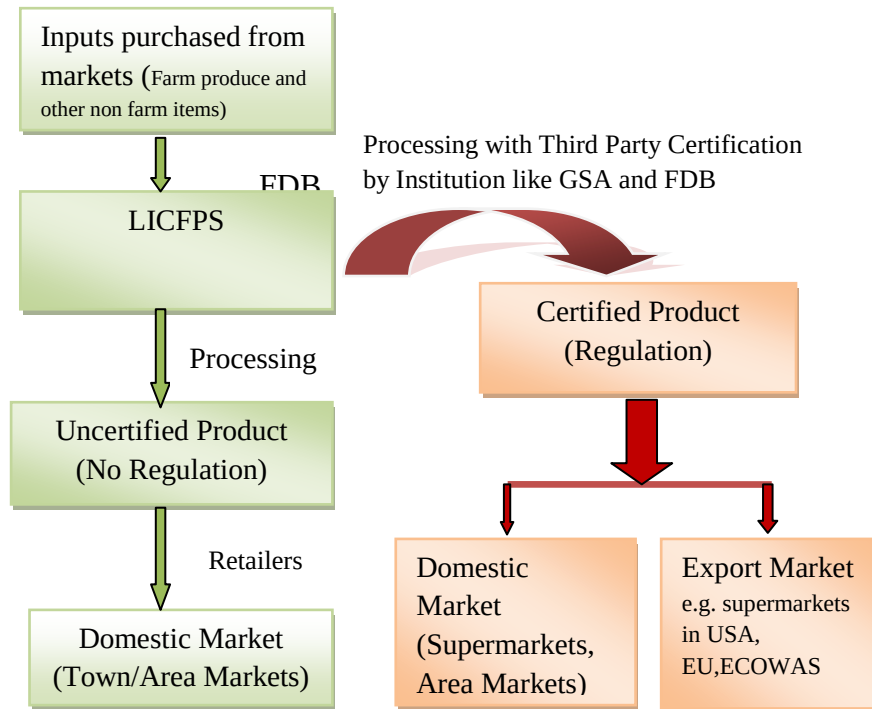
3.2 Conceptual Framework

The objective of this study is to assess the willingness of LICFPs to pay for product quality certification (PQC) for their products. To do this, factors that will influence processors' willingness to pay for PQC and the amount they are willing to pay are determined. The study focused on processors in the Accra and Tema metropolitan areas of the Greater Accra Region of Ghana. There are a number of mechanisms and strategies by which SMEs and enterprises generally could promote or improve their businesses and ensure survival.

Figure 3.1 shows a conceptual framework for the study. In this framework, LICFPs employing both farm produce and other raw materials as inputs for production offer consumers a final good for infants. On one hand the quality of this product is not perceivable on the market by mothers and care givers even after purchase. On the other hand LICFPs face competition from foreign branded and certified products as well as more stringent consumer demands on food safety and quality. LICFPs can

enhance their competitiveness and ensure survival by embarking on quality signaling like branding or certification or promotional activities.

Figure 3.1 Conceptual Framework



Food firms and especially manufacturing type firms operate in complex supply and production chains as there are many potentially constraining factors to adoption of quality assurance systems generally and traceability systems specifically (Karipidis et al., 2009; Xie et al., 2011). This is so because enterprises upstream have greater responsibility for quality and safety than firms further down the supply chain of agrifood systems. Thus this study assumes that LICFPs being upstream production type will, by virtue of their operations, be influenced to participate in quality assurance programmes like product quality certification. The complexity of the supply chain is further complicated by growing consumer demands as well as globalization and trade liberalization. For the processing firm to remain in business, it must be able

to supply consumers with the kind of products they demand as this is the only means by which the firm can survive stiffer competition with the influx of foreign certified and branded infant cereal foods on the Ghanaian market. However, a manager of an LICFP enterprise' decision to adopt product quality certification may be influenced by several other factors besides the core activities. These factors may be internal or external to the enterprise in question (Karipidis et al., 2009).

3.3 Method of Analysis of Specific Objectives

In this section, the method employed in achieving each specific objective for the study is described. Also, the design of the experiment and the contingent valuation procedure are presented.

3.3.1 Describing the characteristics of LICFPS

The characteristics of business managers and the characteristics of the firms were obtained from the responses to the questions in the survey instrument. Some key indicator variables used in describing the characteristics of LICFPs include the age, gender, education and perceptions of the respondent; number of employees, institutional affiliations, gross margins and age of the firm. For discrete variables, frequencies and percentages were estimated and analyzed. However, means, minimum and maximum values and standard deviations were also included in the estimations for those variables that are continuous. Some characteristics like off-cereal food products and non-manufacturing activities were described and tabulated to help discuss the results.

3.3.2 Study design and Contingent Valuation procedure

The survey asked YES and NO questions about processors' willingness to participate in Product Quality Certification in the first instance. In the second instance, the study asked YES and NO questions about willingness to pay using a single bound dichotomous choice question. The study also elicited specific monetary values for NO responses in the third stage of the experiment.

The contingent valuation procedure adopted is as follows:

“Ghana Standards Board offers PQC at GHC 530 for SMEs. This cost is made up of cost of application forms (GHC 5), cost of product standard (GHC 30), cost of license mark (GHC 100) and testing fees (GHC 395)”.

Q1. ARE YOU WILLING TO PARTICIPATE IN PQC?

Q2. ARE YOU WILLING TO PAY FOR PQC AT GHC 530?

Q3. IF NO, WHAT IS THE MAXIMUM AMOUNT YOU ARE WILLING TO PAY FOR PQC ? GHC

A logit model was used to estimate the probability of WTP at GHc 530 (Q2) whilst a Tobit model was estimated using information from the second and third stages to identify factors that may be associated with the amount processors are willing to pay for PQC.

3.3.3 Estimating the magnitudes and the effects in the factors on WTP

This objective was achieved using a binary logistic regression analysis with WTP as the dependent variable. During the survey respondents were asked whether or not they were willing to pay for PQC at a bid price mentioned in the single bound dichotomous contingent valuation scenario. Respondents who answered “no” were then asked a follow up question about how much they will be willing to pay. The YES and NO answers were used in the estimation of the logistic function while the answers to the follow up question were used in estimating the tobit function. Several explanatory variables hypothesized to influence processors’ decision to participate in and pay for PQC were inputted.

Theoretical Framework

Willingness to pay is almost always discussed within the context of utility maximization of consumers. Nonetheless, the concept can also be extended to cover the situations of producers. In this case, a matter for consideration can be a producer's profit maximization decision subject to a given production function (Jayson and Hudson, 2004). A manager of an agro-processing enterprise’ decision to participate in certification will be based on the expectation that the step will ultimately lead to profit maximization. An LICFP’s WTP is preceded by the decision to participate in certification or not. Once the decision to adopt has been made, the WTP for the cost involved in certification is presented.

This study uses the logistic regression analysis in the first instance, following after Sanni and Doppler, (2007), Adeogun et al., (2008) and Xie et al., (2011). Next, the study uses tobit analysis in the second instance as used by Hagos et al., (2012), Chase et al., (2009), Qualls et al., (2011) and other researchers (see Androkovich et al.,

2008; Clark et al., 2005 and Mukhopadhyaya, 2004), since the dependant variable (MaxWTP) is continuous and also censored. A manager of an agro-processing enterprise' decision to pay for certification is a function of various social and economic factors (Adeogun et al., 2008). The probability that a manager is willing to pay for certification (Y_i) is specified as a function of economic and social factors in the external and internal environments of firms processing infant cereals (Xie et al., 2011). This function can be represented as follows:

$$Y_i = f(X_1, X_2, \dots, X_n)$$

$$Y_i = \beta \sum X_{ij} + \varepsilon_i, \quad (1)$$

Where X_{ij} 's are the firm and manager specific characteristics, or indicators proposed to influence willingness to pay for PQC. Several socioeconomic variables are hypothesized to influence the decision of a manager to pay for PQC. The socioeconomic variables included as explanatory variables for estimating the WTP model are similar to those used by Adeogun et al., (2008); Kumar et al., (2011) and Xie et al., (2011). The logit model is based on the cumulative logistic distribution function which is expressed as

$$P_i = \frac{1}{1 + e^{-z}} \quad (2)$$

Where Z is an underlining stimulus index, which is a random variable that impacts on the probability of willingness to pay for any respondent and is the observation on variables for the willingness to pay model.

If P_i is the probability of willingness to pay for PQC, then the probability of unwillingness to pay is $1 - P_i$ which can be expressed as

$$1 - P_i = 1 - \frac{1}{1 + e^{-z}} \quad (3)$$

$$= \frac{1}{1 + e^z} \quad (4)$$

The ratio of the probability of willingness to pay to that of unwillingness to pay is the odds ratio. That is equation (2) to equation (3) is the odds ratio denoted by the expression:

$$\frac{P_i}{1 - P_i} = \frac{1 + e^{-z}}{1 + e^z} \quad (5)$$

$$\frac{P_i}{1 - P_i} = e^z \quad (6)$$

Equation (6) is the odds ratio in favour of respondents' willingness to pay for PQC, that is, the ratio of the probability that a firm manager will be willing to pay for PQC to the probability that he will not be willing to pay. The natural log of both sides of equation (6) yields equation (7)

$$\ln \frac{P_i}{1 - P_i} = z \quad (7)$$

Where:

$$z = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \dots + \beta_k X_k + \mu \quad (8)$$

This means equation (7) can be written as:

$$\ln \frac{P_i}{1 - P_i} = \beta_0 + \sum \beta_i X_{ij} + \mu_i \quad (9)$$

Where X_{ij} are the firm and manager specific characteristics or indicators proposed to influence willingness to pay for PQC and β_i s is the vector of parameters to be estimated from the maximum likelihood method; the μ_i s are the error terms and are normally distributed with zero mean and zero variance.

Empirical Model Specification

The attributes in equation (9) were specified in the empirical model to include the following four groups of variables: age, educational level, gender were among managers characteristics; firm size, annual income measured as annual gross margin, management model and experience in certification were included as characteristics of the firm; while access to credit, frequency of inspections by regulatory bodies and managers awareness and understanding of the requirement for certification were some of the institutional factors influencing willingness to pay. Some variables were also categorized as market factors and included consumer complaints and media attacks, sales strategy and competitors' participation.

The empirical model is specified as follows:

$$\begin{aligned} WTP = & \beta_0 + \beta_1 Firmage + \beta_2 Fmscal + \beta_3 Mgtyp + \beta_4 Gender + \beta_5 Educ + \beta_6 Certreq \\ & + \beta_7 Estcertreq + \beta_8 QIpercep + \beta_9 SIpercep + \beta_{10} PIpercep + \beta_{11} AICer + \beta_{12} Inspections \\ & + \beta_{13} Perceprepu + \beta_{14} Cusmedia + \beta_{15} Competition + \beta_{16} Age + \beta_{17} (Firmage)^2 + \beta_{18} (Age)^2 + \mu_i \end{aligned}$$

Where: β_1 to β_{18} are parameter estimates of the independent variables.

Variable Definitions and Measurements

Willingness to Pay (WTP) and MaxWTP: *WTP* is the respondent's willingness to pay for certification and the dependent variable for the logit regression. *WTP* is a dichotomous choice variable taking on the value of 1 if respondent is willing to pay for product quality certification at the specified cost (bid) and 0 if not. *WTP* is hypothesized to be influenced by demographic and firm characteristics as well as producer perceptions of QAS and product quality certification. *MaxWTP* is the maximum amount of money the respondent stated that he will be willing to pay. This is the dependent variable for the tobit regression.

Age: This represents the age of the respondent in years. Many researchers have found a negative association between age and adoption. It is therefore expected that the younger the manager of the enterprise the more likely the firm would be willing to pay.

Gender: This is the sex of the firm owner or manager and it is measured as a dummy variable: 1 when the respondent is a male and 0 when respondent is a female. On the one hand males are receptive to new technologies than their female counterparts mainly because they tend to be less risk-averse. On the other hand women have the reserve of feeding children and may be more inclined towards ensuring high quality of infant cereals than their male counterparts as firm managers. Thus, sex of the respondent can have either a positive or negative influence on *WTP*.

Manager's educational level (EDUC): This variable is a measurement of formal education attained by the respondent. The higher the educational level of the manager the better his understanding of the new technology and consequently the higher his probability to be willingness to pay.

Perception of quality improvement (QIpercep): This variable is a qualitative measure of a manager's belief that the system of certification has capacity to enhance the quality of their products. This belief results from the knowledge that a product presented for certification must necessarily be tested and found to meet a specified standard. This perception is high when the manager trusts the verifier to actually perform the testing and also when the verifier is trusted by the final consumers. Respondents were asked how they think certification improves quality of products. Four answers were provided- two correct and 2 wrong answers. Any correct answer is measured as 1 while any wrong answer chosen was awarded 0. The hypothesis here is that if a manager perceives certification to help in improving the quality of his products (i.e. a measure of 1), then he is more likely to be willing to pay for certification.

Perception in profit improvement (PIpercep): This is another qualitative variable which measures whether or not a manager thinks adoption of a quality assurance system like certification, can ultimately lead to increased profits. It is measured by 'yes' for a manager who perceives QAS to enhance a firm's profits and 'no' otherwise. Yes takes on the value 1 and no is 0.

Firmage: This is measured by the number of years the firm has been producing infant cereals. The greater the number of years the firm has been in operation the less likely they would be willing to participate in certification. This is because it is possible for older firms to gain experience with how to manage errors and challenges to ensure survival such that they tend to discount the important role of new technologies. However new entrants in the industry may have a higher willingness to participate in certification solely to capture or gain market shares. This study hypothesizes that the

firm age can have either a positive or negative impact on a manager's decision to pay for certification.

Firm scale (Fmscal): This variable describes the size of the firm in terms of number of employees as categorized by the National Board for Small and Medium Scale Enterprises (NBSSI). It is a dummy variable; assigned 1 if the firm has five or less employees otherwise 0, 1 if it has 6-29 employees otherwise 0; and 1 if it employs more than 30 workers otherwise 0. It has been observed that large scale enterprises with higher annual incomes are more likely to adopt new technologies especially those which are capital intensive (Karipidis et al., 2009). It is thus expected that the higher the number of employees and consequently the larger the firm, the greater its probability of being willing to participate. Thus a positive relationship is hypothesized.

Firm structure (Mgttyp): This variable measures the type of management strategy in operation in the firm and is also a dummy with four categories: 1 to sole proprietors, 0 to partnerships, limited liability companies and cooperatives. A positive relationship is expected.

Annual income of enterprise (AICer): This is the annual income of the enterprise measured as the yearly gross margins. The annual income of an enterprise and especially an SME has been found to affect a manager's decision to adopt new technologies (Karapidis et al., 2009). Many adoption studies that have analyzed off-farm and farm income also indicated a strong relationship between income and adoption. This study hypothesis that the higher the firm's gross margin the more willing the firm will be to pay for PQC.

Inspections: This is a qualitative dummy variable that measures whether or not a firm had received inspectors at the factory in the year. One (1) is a yes response and 0 is a

no response. A one (1) is assigned where inspectors had visited at least once in the course of the year and zero (0) otherwise. It is hypothesized that a firm that answers yes will be more willing to pay than one which answers no.

Reliability/ trust in TPC (Perceprepu): This is a categorical measurement of the respondent's perception of his or her clients' trust in the certifier. A positive perception is assigned 1 (one) and is expected to influence willingness to pay positively whilst the converse situation is assigned 0(zero). Thus the hypothesis is for a positive relationship.

Awareness of certification (CertReq): This variable is measured both qualitatively and quantitatively. The qualitative variable specifies two categories of a managers reported awareness of certification where 1 is for a yes response and 0 is for a no response.

The estimated awareness of certification is the quantitative measure where a set of statements about certification is presented to a respondent and his level of awareness is estimated based on the number of correct answers obtained. Some researchers have observed a positive relationship between level of awareness and adoption of new technologies. This study states a hypothesis that the higher a managers' level of awareness the higher his willingness to participate in certification.

Consumer demands: This is measured as the number of customer complaints regarding quality issues of a firm's products. Hooker and Caswell, (1999) and Karipidis et al., (2009) wrote that a firm's primary incentive for implementing a QAS is to promote consumer confidence in its ability to offer high quality products. The more complaints or demands from consumers, the higher a manager's willingness to participate in a quality assurance scheme. This is a positive influence.

Table 3.1: Description Of Variables and Summary Of Hypotheses

Variable	Description	Null hypothesis (H ₀)	Alternate hypothesis (H _a)
FIRMAGE	Firm Age/ years in operation	$\beta_1 = 0$	$\beta_1 \neq 0$
FMSCAL	Firm Scale	$\beta_2 = 0$	$\beta_2 > 0$
MGT TYP	Firm structure	$\beta_3 = 0$	$\beta_3 \neq 0$
GENDER	Sex	$\beta_4 = 0$	$\beta_4 \neq 0$
EDUC	Manager's educational level	$\beta_5 = 0$	$\beta_5 > 0$
CERTREQ	Managers reported awareness of certification	$\beta_6 = 0$	$\beta_6 > 0$
ESTCERTREQ	Estimated awareness of certification	$\beta_7 = 0$	$\beta_7 > 0$
QIPERCEP	Perception of quality improvement	$\beta_8 = 0$	$\beta_8 > 0$
SIPERCEP	Perception of sales improvement	$\beta_9 = 0$	$\beta_9 > 0$
PIPERCEP	Perception of profit improvement	$\beta_{10} = 0$	$\beta_{10} > 0$
AICER	Annual income of enterprise from infant cereal production	$\beta_{11} = 0$	$\beta_{11} > 0$
INSPECTIONS	inspection Team received or not	$\beta_{12} = 0$	$\beta_{12} > 0$
PERCEPREPU	Reliability/ trust in TPC	$\beta_{13} = 0$	$\beta_{13} > 0$
CUSMEDIAC	Customer and media demands (number of customer and media complaints	$\beta_{14} = 0$	$\beta_{14} > 0$
COMPETITORS	Number of competitors certified	$\beta_{15} = 0$	$\beta_{15} > 0$
AGE	Age of manager	$\beta_{16} = 0$	$\beta_{16} > 0$
(FIRMAGE) ²	Relatively old firms	$\beta_{17} = 0$	$\beta_{17} \neq 0$
(AGE) ²	Relatively older managers	$\beta_{18} = 0$	$\beta_{18} < 0$

Table 3.1 provides a summary of the hypotheses as well as description and apriori of the variables used in the study

Media demands: This is the actual number of media attacks on the quality of a firm's products. In environments where media is vibrant, firms are pressured to ensure that their products meet minimum standards. It is expected that media attacks will have a positive influence on a manager's decision to adopt a QAS.

Competitors' participation: This variable is measured by the number of certified competitors as known to the respondent. A study conducted in India also revealed that adoption by an individual farmer is positively correlated with the extent of prior adoption by his “neighbors”, in this case measured by the number of adopters in the village.

3.3.4 Estimating processors' mean Willingness-To-Pay (WTP)

This estimate was computed for all sampled firms including firms that answered NO to the ‘bid price’ of Gh 530.00. The mean WTP for the adoption of certification is estimated as:

$$\overline{WTP} = \sum_{i=1}^{n=35} WTP_i / N$$

Where:

WTP_i is the maximum WTP in Ghana cedi given by the i th firm manager

N is the total number of observations

And $\overline{WTP}$ is the mean maximum WTP

The estimated mean WTP was then discussed in relation to the stipulated cost of PQC as well as the existing subsidy for certification.

3.3.5 Factors influencing the maximum amount processors are willing to pay

For this objective to be achieved, a Tobit regression analysis was applied on the data collected. It is important to note that the dependent variable, or the MaxWTP, is not fully observed and also assumes zero values for some part of the sample. Because an

OLS (ordinary least squares) estimator cannot be applied, a Tobit model was used for the observed maximum willingness to pay (MaxWTP):

$$\begin{aligned} \text{MaxWTP}_i^* &= \alpha + \beta X'_i + \mu_i \\ \text{MaxWTP}_i &= \text{MaxWTP}_i^* \quad \text{if } \text{MaxWTP}_i^* > 0 \\ \text{MaxWTP}_i &= 0 \quad \text{if } \text{MaxWTP}_i^* \leq 0, \end{aligned}$$

Where

MaxWTP_i* is a processor's unobserved maximum willingness to pay for product quality certification; MaxWTP_i is a processor's stated maximum willingness to pay for product quality certification; X' is vector of independent variables; β is vector of coefficients to be estimated; α is the intercept; and μ_i is error term, which is assumed to be normally and independently distributed, i.e. NID (0, σ²) and independent of x_i.

Assuming that censoring point is zero, then:

$$\begin{aligned} \text{MaxWTP} = & \beta_0 + \beta_1 \text{Firmage} + \beta_2 \text{Fmscal} + \beta_3 \text{Mgtyp} + \beta_4 \text{Gender} + \beta_5 \text{Educ} + \beta_6 \text{Certreq} \\ & + \beta_7 \text{Estcertreq} + \beta_8 \text{QIpercep} + \beta_9 \text{SIpercep} + \beta_{10} \text{PIpercep} + \beta_{11} \text{AICer} + \beta_{12} \text{Inspections} \\ & + \beta_{13} \text{Perceprepu} + \beta_{14} \text{Cusmedia} + \beta_{15} \text{Competition} + \beta_{16} \text{Age} + \beta_{17} (\text{Firmage})^2 + \beta_{18} (\text{Age})^2 + \mu_i \end{aligned}$$

if MaxWTP_i* > 0; = 0 otherwise (if MaxWTP_i* ≤ 0).

It is expected that the coefficient on agesquared be negative; whilst those on firmage, firmagesquared, management model adopted, gender could be either positive or negative and the remaining, age, scale, education, inspections, annual income, competitors, customers, media and perception of profit, sale and quality improvements should all be positive.

3.4 Assumptions and Limitations

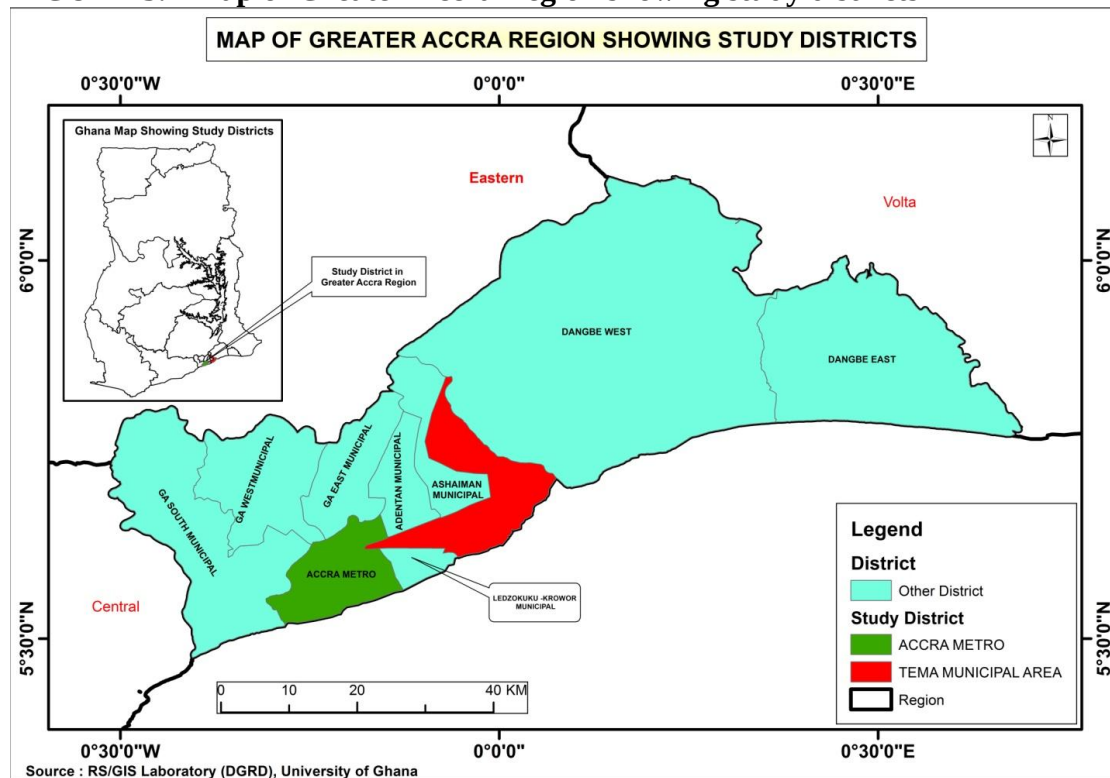
In this study it is assumed that there exists a market for locally produced infant cereal foods. The study also assumes that the certified product is preferred by consumers

who are also willing to pay for the certified product. This preference of consumers is based on the expectation that a certified product is of a higher quality. It was also assumed that a firm which had ever obtained certification was willing to pay the stipulated or bid amount. Another assumption made for this study is that all manufacturers have duly gone through the process of registering a business as required and therefore the cost of such registration was not added to those of certification. For the purpose of this study, the National Board for Small Scale Industries' categorization is adopted. In their groupings, firms with fewer than 5 employees are referred to as micro or cottage enterprises. Others who employ between 6-29 persons are small scale enterprises while businesses employing 30-100 are medium scale. This study refers to all these categories as SMEs even though some writings refer to them as MSMEs. Also the cost of registration of SMEs with NBSSI was not added to the CV scenario as it was assumed that all SMEs must have already registered. The study faced a number of challenges. In the first instance, a listing of these processors could not be obtained and this hindered the use of probability sampling procedures. Thus the findings here may not be generally reflective of the actual population in this sector. Secondly, many of the processors contacted expressed misgivings about participating in the survey. This was due to the fact that most processors believed certification to be compulsory and producers of uncertified products could be prosecuted. Only those who wanted to participate were interviewed. Thirdly there were many more unidentified products and the processors of such products could not be included in the survey. Finally, the short duration (three months) of the survey did not permit the researcher to include willing but unavailable processors.

3.5 Study Area

The Greater Accra Region (GAR) even though it is the smallest of the 10 administrative regions of the country, is considered the hub of economic activities in Ghana. It is made up of Ga East, Ga Central, Ga West, Dangme East, Dangme West, Tema, Adenta and Accra Metropolitan Assemblies (refer figure 3.2). The major activities in the region are trading and manufacturing with AMA and TMA having the most of industries in GAR.

FIGURE 3.2 Map of Greater Accra Region showing study districts



It is for this reason that the study focused on the AMA and TMA. Accra accounts for a major portion of the production of manufactured goods and serves as one of the biggest and most important marketing centres for all agricultural products. As the hub of Ghana's economic activities, it has a huge and comparatively affluent market both for consumer goods and intermediate capital goods. As Accra grows so does demand for relaxation which invariably increases the demand for convenient food products.

The industrial sector contributes the most to local revenue and is made up of several major food and fish processing companies. The municipality has a huge port, and the location of a Free Port and Export Processing Zone, where special facilities are accorded to imports and exports without payment of customs duties or local taxes presents LICFPs with a good incentive to expand their businesses to cover international markets.

3.6 Sampling Procedure and Sample Size

The data in which the empirical model is based were drawn from a sample size of thirty five (35) firm managers, using a combination of convenience and snowballing sampling techniques. Since an SME is not a person, its decisions are taken by the person managing the business. For this work, the decision maker is the one interviewed as the respondent. The decision maker may be the owner or manager of the firm and takes decisions concerning various aspects of production like cost minimization, profit maximization, optimization problem, and utility maximization among others.

The Greater Accra Region and two metropolitan areas of the region were selected purposively. This selection was based on the assertion that the Greater Accra region is the hub of industries and that most industries are located in urban areas in Ghana. As an attempt to obtain an official listing of SMEs in the infant food sector proved futile, the snowballing and convenience sampling techniques were used to select the respondents in each metropolitan area. Here major markets, supermarkets and hospitals were visited to collate a listing of products displayed on the shelves; their manufacturers and their addresses and contact numbers were also collated. A survey

technique was used to collect data for the study through structured questionnaires. The survey instrument was pretested with a small group to ensure that the questions were clear and that the surveys could be quickly completed. All necessary revisions of the questionnaire were done before actual administering of questionnaires commenced. Potential respondents were contacted by telephone a number of times and suitable meeting dates, venues and times were scheduled. The list prepared showed a greater number of firms in the AMA than the TMA. Also not all products were sold in supermarkets with labels.

Only managers and owners of firms in production were interviewed. To avoid inaccurate responses from unwilling managers, only managers who were contacted and were willing to participate in the survey were included to be interviewed. In all, thirty five (35) respondents were interviewed from the list compiled (see Appendix 2) from visits to shops, markets, supermarkets and hospitals in and around the two metropolitan areas chosen. Of the 35 respondents, 20 are micro firms and 15 are small firms. Both open and closed-ended questions were posed in the questionnaire. The contingent valuation employed a single-bounded dichotomous choice format, followed by open-ended questions in the maximum WTP section.

3.7 Scope of Study

There are a number of strategies that enterprises can employ to improve sales and market shares. These include product differentiation strategies. Some of these strategies can be classified as cost effective whilst others may not be cost effective. There are also strategies that may be suitable for small firms and those that suit large firms. This study focuses on product quality certification because at present it

constitutes a cheaper option for product differentiation than branding for small enterprises. The special attention and concentration on certification, stems from the potential increase in sales and profits resulting directly from improvement in quality of LICFPs' products. This study focuses on infant cereal food processors as a subsector of SMEs in the food industry.

Many researchers have studied SMEs in all the major industries as a group in Ghana. This may be due to the variability in operations and numbers of firms registered as SMEs. The closest other researchers have come to segregating SMEs into industry categories has been to look at them in for example the food industry, construction and mining industries or service industry to mention a few. This study tries to distinguish between various sectors of the food industry by focusing on infant cereal foods basically because with the subject of product certification, the standards that need to be complied with apply usually to and differ between given products.

The World Health Organization (WHO, 2008) has recommendations on how to meet the nutritional requirements of infants and young children between the ages of six (6) and twenty-four (24) months by feeding complementary foods. Many local manufacturers of complementary foods for young children produce the cereal based products even though other kinds do exist. This is attributable to the availability of different cereals domestically and the relatively accessible and less capital intensive technology often used in the production of these cereal based products. Masters et al., (2011) indicate that the cereal based products for young children from local processors are of uneven quality putting these firms and their products at a competitive disadvantage. This study thus assesses whether these firms will be

interested in quality improving strategies and hence pay for product quality certification.

CHAPTER FOUR

RESULTS AND DISCUSSIONS

4.1 Introduction

This chapter presents the results and discussions of the study. The characteristics of local infant cereal food processors are described and the factors affecting LICFPs' WTP for product quality certification are identified. The chapter also presents and discusses estimates of the effects of the factors on LICFPs willingness-to-pay (WTP) for product quality certification and finally discusses the maximum amount LICFPs are willing to pay for product quality certification. The section concludes with a presentation and discussion of the factors influencing this maximum amount.

4.2 Characteristics of LICFPs

Thirty five processors of local infant cereal food were interviewed. The study found 24 (68.6 percent) of the processors sampled were females and 11 (31.4 percent) of the sample were males. The mean age of the processors was 42 years, the minimum age is 21 and the maximum age is 63. This shows that most of the respondents were middle aged or at the end of their youthful years. Qualls et al., (2011) indicate that the planning horizon for older producers may not be long enough for them to recapture the benefits of investing in new technologies. The survey also found that 93 percent of the processors interviewed were married, 3 percent single, 2 percent separated or divorced and 2 percent widowed. As shown in Table 4.1 the respondents have attained various levels of education. It was found that most of the respondents (42.9 percent) have had tertiary or professional education, 25.7 percent have secondary education, 14.3 percent have primary education, and 17.1 percent had had technical

education. An interesting finding was that none of the respondents answered yes to ‘no formal education’. This shows that a minimum of primary education may be necessary to engage in this business and to understand the issues of PQC.

Table 4.1 Educational Level of Respondents

	Frequency	Percent
No Formal Education	0	0
Primary	5	14.3
Secondary	9	25.7
Tertiary/Professional	15	42.9
Technical/Vocational	6	17.1
Total	35	100.0

Source: Author’s Computations

The mean age of the business is 5 years. The maximum age of establishment of the business is 13 years and minimum is 6 months. This is indicative of a relatively young industry as categorized by MacPherson and Hartung, (2001).

Table 4.2: Number of Years of Establishment of Firm

	Mean	Minimum	Maximum
Number of years in production (firmage)	4.68	0.42	13.00

Source: Author’s Computations

Seventy seven percent (77%) of the respondents said their business were being managed as sole proprietor firms while the other twenty three percent were managed either as partnerships or limited liability companies. This could be due to the comparative ease associated with setting up sole proprietorship than the other business or management forms.

Table 4.3: Management Model of firms

	Frequency	Percent
Otherwise: limited liability and partnership	8	22.9
sole proprietor	27	77.1
Total	35	100.0

Source: Author's Computations

In terms of size of the business or the scale of operations, there were 48.6 percent of small scale enterprises (firms with 6-29 employees) and 51.4 percent micro scale enterprises (firms with 0-5 employees). This is similar to what was reported by Abor and Quartey, (2010). It was also found that the subsector employs more women (68.6%) than males. Agyapong, (2010) also found that most SMEs in Ghana were managed by women. Expansion of such SMEs may boost employment more than large firms' growth because SMEs are more labor intensive. From this perspective, subsidizing LICFP firms may serve as a poverty alleviation tool (Beck, 2005).

Approximately 98 percent of respondents were using family labour for processing, packaging and marketing operations in their businesses. In addition to family labor, approximately 93 percent of the respondents also employed permanent workers.

Table 4.4 Firms' annual income from infant cereals in GH Cedis

	Minimum	Maximum	Mean	Std. Deviation
Annual income from infant cereals	115	436,000	54,250	90,900

From Table 4.4, the minimum annual income of the LICFPs' interviewed is GH¢115 and the mean annual income being GH¢54,250. However there were 24 firms (that is 68.6% of the sampled firms) earning below this mean amount. Funding for processing was raised in two main ways, that is, personal sources (equity) and borrowed funds.

Table 4.5: Access to Formal Credit

	Frequency	Percent
No	22	62.9
Yes	13	37.1
Total	35	100.0

Source: Author's computation

From table 4.5, the analyses show that 62.9 percent of the respondents reported not having access to formal credit from banks and micro finance companies, whilst 37.1 percent reported otherwise.

The main raw materials used for the processing of local infant cereals are usually rice, maize, ground nut, soya beans, wheat, millet and beans. Two or more of these cereals are processed to make a local infant cereal food. These cereals are durable after they have been cleaned and dried; the raw materials are obtained from three main sources, that is, farm gate, middlemen and open market. Table 4.6 shows that 77.1 percent source their raw materials from the open market. This could be due to the fact that most of the businesses are operating as small and do not buy the raw materials in bulk quantities. It could also be due to the urban location of these businesses which makes buying from the open market more convenient and accessible to them. About fourteen percent (14%) of the LICFPs' sourced their raw materials from middle men whilst close to nine percent (9%) sourced from the farmgate. Sourcing from the farmgate is

relatively cheaper in terms of the price of the raw material but may be expensive in terms of transportation costs and time.

Table 4.6: Source of raw materials in Infant Cereal Processing

	Frequency	Percent
Farm Gate	3	8.6
Middlemen	5	14.3
Open Market	27	77.1
Total	35	100.0

Source: Author's computations

As shown in Table 4.7, about 57 percent of the respondents asserted 'yes' whilst the other 42.9 percent said 'no' to questions about full plant capacity utilization throughout the year. This may be due to the fact that most of the firms visited did not have facilities assembled solely for the production of cereal foods for infants but were using simple home utensils like pans, ladles and sieves. For the 42.9 percent underutilizing their plants, they attributed it to the fluctuating nature of demand for the finished products. In other words, production frequency and quantities depended on demand by customers.

Table 4.7: Full Plant Capacity Utilization

	Frequency	Percent
Yes	20	57.1
No	15	42.9
Total	35	100.0

Source: Author's computation

On the issue of product certification, 60 percent were unwilling to pay the bid price of GH C 530, whilst 40 percent were willing to pay (see Table 4.8). The most common

reason given by the unwilling LICFPs was that certification was expensive. For those who were willing to pay, the opportunity of increasing client base (to schools, institutions, restaurants, supermarkets, and exports) more than compensates for the high cost of PQC.

Table 4.8: Processors' willingness to pay for Certification

	Frequency	Percent
No	21	60
Yes	14	40
Total	35	100.0

Source: Author's computation

Table 4.9 shows that 65.7 percent of the respondents perceived that obtaining product certification had the potential of improving their profits whilst 34.3 percent perceived otherwise.

Table 4.9: Perception of Profits Improvements after Certification

	Frequency	Percent
No	12	34.3
Yes	23	65.7
Total	35	100.0

Source: Author's computation

4.3 Estimating processors' willingness to pay for certification at "bid price"

In this section estimates of the parameters of the logit model for willingness to pay for certification are presented. It must be stated that during the survey all respondents were willing to participate in certification. The study therefore did not estimate a willingness to participate function. On the willingness of the processors to pay for

product quality certification, 40 percent said ‘yes’ they were willing to pay for certification at the “bid” price of GHC 530 whilst 60 percent said ‘no’ they were not willing to pay for product certification at that “bid” price. This is presented in Figure 4.1.

Figure 4.1: Processors’ Willingness to Pay for Product Quality Certification

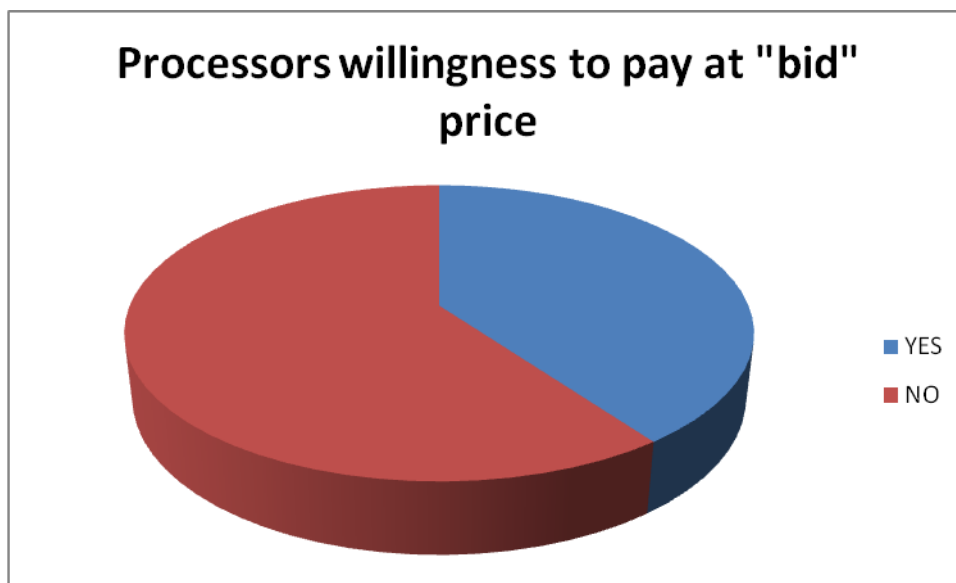


Table 4.10 summarizes the categorical variables examined in the study and how they correlate with WTP. Contrary to expectation, men were more willing to pay for certification than women (ie.5 out of 11 men and 9 out of 24 women answered YES to the WTP question).

Also the study found that the higher the level of education, the more willing the manager to pay for PQC. Thus some formal education may be necessary for participation in PQC.

Table 4.10: WTP responses and Categorical Variables of respondents

Respondent attributes		WTP=0	WTP=1
		Frequency	
Gender	Females	15	9
	Males	6	5
Level of Education	Primary	4	1
	Secondary	5	4
	Tertiary/Professional	8	7
	Technical/ Vocational	4	2
Management Model	Sole Proprietors	16	11
	Partnerships	2	2
	Companies	3	1
Inspections	Yes	7	9
	No	14	5
Registered	Yes	16	13
	No	5	1
Access to Credit	Yes	5	8
	No	16	6
Experience with Certification	Yes	12	9
	No	9	5
Effect on Sales	Yes	8	8
	No	13	6
Awareness of PQC	Yes	17	14
	No	4	0
Access to Certification	Yes	18	14
	No	3	0

Table 4.11 presents the logit results on the processors' willingness to pay for product quality certification at the "bid" price in the local infant cereal foods sector. Since all the respondents were willing to participate in certification, the study avoids the use of the Heckman's specification test. It can be seen from the estimated results that all the variables apart from age and scale, conform to the a priori expectations.

Table 4.11: Logit results for WTP for Product Quality Certification

Dependent variable: Willingness to pay for certification at “bid”price” = 1, otherwise 0
 Method: ML – Binary Logit

Independent Variable	Coefficient	P> z	Marginal Effect
Age of respondent	-.9127336*	.054	.1633882
Age squared	0.0104597*	.061	.0018724
Annual income	.0000608**	.030	.009e-05
Firm age	1.623609***	.004	.2906418
Firm age squared	-.2182381***	.000	.0390668
Vocational/technical education	1.072853	.567	.2234497
Inspections in factory by regulatory bodies	-2.465989	.279	.4107656
perception of profit improvement	-1.969116**	.037	.3524909
Loan access	6.713388***	.000	.9294205
Sole proprietorship	1.04542	.445	.1592611
Small scale	-5.418911***	.000	.7430012
constant	15.34214	0.88	
Wald Chi ²	27.29		
Log Likelihood	-9.555462	McFadden R ²	0.5943
No. of Observations	35	Probability Chi ²	0.0042

Notes: * Significant at 10 percent, ** Significant at 5 percent, *** Significant at 1 percent

The coefficient of determination, that is, the Mc Fadden R-squared is 0.5943 implying that about 59.4 percent of the variations in willingness to pay for infant cereal food quality certification in Ghana is explained by age, annual income, firm age, inspection, education, inspection, perceptions, access to loans, type of management and the scale of business.

The results in table 4.11 show that all the variables apart from age, firm age squared (i.e. very old and established firms); inspections and perception of profit improvement are significant.

The results confirm the theoretical underpinning that income has a positive relationship with willingness to pay for certification. Annual income has an estimated coefficient of .0000608 and is significant at 5 percent. This is similar to findings from Shaik et al, (2008) where wealth had a positive and significant effect on WTP for insurance. This means that a 1 cedi increase in annual income would increase willingness to pay by .0000608. This variable also has a marginal effect of 1.09e-05 which implies there's a 0.000109 percent increase in probability for the processors to pay for adoption should income increase by 1 percent. The possible explanation to this is that as firm's income increases management has more to pay for the price of the certification, meanwhile this value is very small.

Firm age met its expected positive coefficient of 1.623609 and is significant at 1 percent. This study corroborates the findings of Xie et al., (2011). The implication here is that for any additional year the firm stays in business, there is an increase in processors' willingness to pay for certification of infant food products in Greater Accra region. This coefficient has an associated marginal effect of 0.2906418 implying that the probability of processors to pay for the certification would increase by 0.29 percent if firm's age is to increase by a year. The explanation to this is that newly established firms are more likely to adopt certification so they could stay in business longer whilst older firms do not have any incentive to adopt certification. Also older firms may have the trust of their customers already and may not see any reason to pay for product quality certification. Meanwhile when firm age was squared the results revealed a significant negative relationship.

Furthermore, an expected positive relationship between education and producers' willingness to pay is realized. But this was statistically insignificant. This study

confirms findings of Thi and Lim, (2011) who estimated the determinants of business to business e-commerce adoption among small & medium enterprises and found that CEOs with college and university qualifications have a higher probability to choose high adoption level. They indicated that, the effect is significant across all adoption level and that those with tertiary education are more likely to adopt new technology. This result also corroborates the findings of de Mel et al., (2009) while investigating the subject of determinants of innovation in micro, small, and medium enterprises. They indicate that all three measures of human capital (that is number of years of education, logical ability and short-term cognitive processing ability) are positively and significantly associated with the likelihood of innovating and that more educated individuals, those with higher Digitspan recalls, and higher scores on the Raven test are more likely to innovate.

The estimated coefficient of loan access is 6.713388 and is significant at 1 percent. This implies that if there's a unit increase in processors' access to loan then they will be willing to pay for infant product certification by 6.71 units. A marginal effect of 0.9294205 means that, producers moving from unwillingness to pay for Product Quality Certification to willingness to pay come with a probability of 92.94 percent. The implication here is that if infant food producers are given access to enough loans then there is a high chance (92.94%) they would be willing to pay for the certification of their products. de Mel et al., (2009) also report similar finding of a positive correlation between loan from bank and CEOs probability of innovating.

Management type also had a coefficient of 1.04542 as expected but not statistically significant in its influence on WTP. This implies the producers that operate with sole

proprietors are more willing to adopt certification. This could be explained by the fact that sole proprietors may not have to consult other people before agreeing to pay for the product quality certification.

The coefficient for SCALE was found to be negative instead of a positive relationship as a study of farmers in India (Badal et al., 2007) indicated that larger and wealthier farmers were more likely to adopt new technologies than poorer farmers. The value is -5.418911 and significant at 1 percent but is contrary to the findings of Xie et al., (2011) where enterprise scale was insignificant in the model. This means that as a firm expands from being micro scale through to small scale, managers' willingness to pay for certification decreases by 5.42 units. This result could be explained by the fact that firms that start off on a larger scale with a large number of employees have a higher tendency of surviving the market and therefore larger scale firms may not see the need for certification as a means of helping them carry on with the business or as strategies for survival. Karshenas and Stoneman, (1993) studied technology adoption in an industrial setting. They examined the cost benefit equilibrium that must be attained before a firm manager makes the decision to invest in new technology. They found that the decision to adopt new technologies came sooner for larger firms and for those expanding rapidly. Their conclusion is closely related to the idea of economies of scale which constitutes an important consideration in the situation of QASs than for other technologies, since initial investment required to implement these QASs may be large. This may lead to a lower propensity to adopt, especially by smaller firms, than would be seen for a technology requiring little capital outlay.

Age of respondent had a negative relationship with processors' willingness to pay for certification and is significant at 5%. This is contrary to findings of many studies (McCorkle, 2007; Kathiravan et al., 2007; Mwaura et al., 2010; Qualls et al., 2011; Kumar et al., 2011) and suggests that older producers are more likely to be interested in adopting PQC or that that younger managers are more unlikely to try new things.

4.4 Estimate of Mean Willingness to pay amount

Results from the survey indicated that 60% of LICFPs were unwilling to pay for product certification at the bid price of GHC 530. About 5.71% of firms sampled were not willing to pay any amount at all for PQC. However 54.28% of sampled firms were willing to pay between GHC 10 and GHC 300.

Table 4.12 summarizes the distribution in the maximum amount respondents were willing to pay for certification. Besides the 40% of respondents who were willing to pay the “bid price” of GHC 530, of the 60% who were not willing to pay the “bid price”, the mode WTP amount was GHC 100

Table 4.12 Summary of maximum willingness to pay for certification

Stated Maximum Amount Of Respondents	Frequency	Percent
0	2	5.7
10	1	2.9
50	5	14.3
60	1	2.9
100	6	17.1
120	1	2.9
150	1	2.9
200	2	5.7
265	1	2.9
300	1	2.9
530	14	40
TOTAL	35	100

The mean amount that processors were willing to pay was GHS 273.57 with a standard deviation of 221.39.

Table 4.13: Respondents maximum willingness to pay

	Minimum	Maximum	Mean	Std. Deviation
Respondent's maximum wtp	0.00	530.00	273.57	221.39123

The mean WTP amount constitutes just about 51.62 % of the total stipulated cost of certification (GHS 530). The managers gave quotations for monthly and quarterly installment payments which were then used to compute their various yearly sums. Product certification cost was found to be a major cost component of processor's total production cost (estimated to be about 15% of total production cost). This is a contributing factor to majority of LICFPs escaping product certification. This finding is similar to that of Kumar et al., (2011) that farmers have no felt need to buy veterinary services package for their livestock.

According to Xie et al., (2011) the Chinese government often offers policy supports for enterprises who have established traceability systems in the form of financial capital or tax exemption. Moreover, financial sectors at all levels provide financial support to facilitate the establishment of traceability systems among firms involved in the sale and distribution of food products.

4.5 Factors influencing the maximum amount to be paid

The survey asked respondents who answered NO to the question on willingness to pay at “bid price” to state the maximum amount they will be willing to pay (see Table 4.12). The elicited amounts were then combined with the rest of the dataset to estimate a tobit model. The dependent variable was specified as the magnitude or level of maximum willingness to pay following after Qualls et al., (2011) and Chase et al., (2009) since the study analyzes this variable quantitatively.

The Tobit results in table 4.14 indicate that age and educational level of owner or manager of the firm impact the amount firms are willing to pay for product quality certification. In table 4.14, six of the eleven explanatory variables are statistically significant: educational level, number of years of establishment, annual income measured as annual gross margin, scale and access to loan. Four variables (education, firmage, annual income and access to loan) have a positive effect on the WTP amount whilst two (scale and firmage squared) are negative in their effect. The number of years the firm has been operating positively correlates with the WTP amount and is significant at 5 percent. Educational level and access to loan by respondents are strongly positive for WTP amount and are significant at 10 percent. Income of respondents is also positive for WTP amount (significant at 10 percent), indicating that Product Quality Certification is a normal good since its demand increases with income. The other five variables included in the model have no significant effect on the amount of WTP for Product Quality Certification.

As already indicated the mean age of LICFPs was 5years indicating that most firms are fairly young and may be constrained with several factors such as access to capital, market and technology as well as procurement challenges which in the long run deter

the firms from certifying their products. This agrees with the work of Xie et al (2011) that young firms are unable to establish quality traceability systems due to capital, technology and human resource restrictions.

The tobit result show that education level, access to loan and number of years the firm has been operating are significant in explaining the amount an LICFP will be willing to pay for PQC. Whilst the estimated coefficient on scale of firm is statistically significant at 10%, its negative sign is contrary to expectation. Even though the management model adopted by firm, gender and number of inspections by regulatory bodies met their prior expectation they were not statistically significant in determining the amount to be paid for PQC. Education and access to loan had a positive influence on the WTP amount and significant at the 10% level.

Table 4.14 Tobit results for WTP for Product Quality Certification

Dependent Variable: Willingness to pay amounts of processors

Method: ML – Tobit

Independent Variable	Coefficient	P > z	Marginal Effect
Age of respondent	6.548858	0.793	6.548858
Agesquared	-0.0795487	0.79	-0.0795487
Tertiary/ Professional education	120.4101*	0.077	120.4101
Gender	18.83005	0.765	18.83005
Firm age	71.96688*	0.062	71.96688
Firm age squared	-6.935908**	0.029	-6.935908
Sole proprietorship	6.106945	0.946	6.106945
Scale	-116.1819*	0.097	-116.1819
Annual income	0.0008059*	0.071	0.0008059
Inspections in factory by regulatory bodies	37.42732	0.635	37.42732
Loan access	125.1555*	0.031	125.1555*
constant	-95.4145		
		Wald Chi ² (10)	9.45
Log Likelihood	-217.36946	McFadden R ²	0.0483
No. of Observations	35	Probability(Chi ²)	0.0000

*, ** and *** show significance at 10%, 5% and 1% levels respectively

CHAPTER FIVE

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.1 Summary

The study sets out to assess local infant cereal food processors' willingness to pay for product quality certification in Ghana. The characteristics of LICFP's were described using statistics such as means and frequencies. Literature was reviewed to identify the factors that influence processors willingness to pay; a binary logit model was used to determine the effects of the identified factors on willingness to pay for product quality certification at "bid price". The mean amount that LICFPs are willing to pay for product quality certification was estimated and a tobit model was used to determine the factors that influence this amount.

Findings from this study showed that the SMEs involved in local infant cereal food processing were mainly operated by women, who have attained some level of education with the minimum being primary school. It also showed that the industry is labour intensive as most firms used both family labour as well as employed labour. Approximately 77.1 percent of the firms sourced their raw materials from the open market, even though it is more expensive. Another finding was that 16.7% of the sampled firms had not even registered their businesses even though they had product names. However there were many more processors of products with no identification. About 60 percent of the firms interviewed were unwilling to pay for certification at the stipulated price whilst 40 percent were willing to pay. From literature reviewed, factors identified to influence processors' willingness to pay for PQC include the age of the firm, scale of operation of the firm, the structure or management model adopted

by the firm, managers awareness of certification, managers' understanding of the requirements of certification, number of inspections by regulatory bodies, income of firm, access to credit, reliability or trust in Third Party Certifier, perception of quality improvement, consumer demands, perception of profit improvement. However from the logit results, only annual income, firm age, education, management type, scale of operation were significant in explaining willingness to pay for product quality certification, firm scale measured as number of employees having a negative effect on WTP contrary to expectation. Again about 50% of sampled firms said certification has no influence on the sales of their products. The maximum amount firms were willing to pay is GH ₵273.53 which is 51.62% of the "bid price".

5.2 Conclusions

As the mean age of firms is 5 years, this study concludes that the infant cereal food sector of Ghana is a fairly young industry or subsector (Macpherson and Hartung, 2001) that employs more women (66.7%) than males (Agyapong, 2010). Also 50% of firms interviewed were categorized as small scale enterprises (Abor and Quartey, 2010) while another 50% were at the micro or cottage level and implies that the possibility exists that the subsector has no large scale and medium scale operators. The study concludes that expansion of such SMEs may boost employment more than large firm growth because SMEs are more labor intensive. From this perspective, subsidizing these firms may serve as a poverty alleviation tool (Beck, 2005) as well as an avenue for reducing unemployment in females.

The study also concludes that most firms do not buy in bulk thus not achieving economies of scale and may have higher unit cost of production.

Majority of LICFPs have not certified their products, therefore this study concludes that products of unguaranteed quality are offered to consumers. This may serve as a threat to the quality and safety of infant foods. A contributing factor has been the huge cost of product certification which is beyond the means of young and small-scaled enterprises. This therefore calls for a collaborative effort of government, NGO's and various stakeholders to support and make product certification affordable for LICFPs.

The study also concludes that many managers in the sector do not perceive the need for PQC basically as a result of misunderstanding of the concept and the role certification plays in product differentiation. Finally, a non zero maximum willingness to pay amount of GH273.53 implies that the certification body, government and other stakeholders can expect to recoup about 51.4% of the cost of certification from processors should a subsidy or credit facility be instituted to facilitate the process of PQC.

5.3 Recommendations

This study obtained some findings upon which the following recommendations have been made.

National Board for Small Scale Industries (NBSSI), Ministry of Trade and Industry (MoTI) and other stakeholders may facilitate the formation of processor-based groups in this sector to help the sourcing of raw materials from farm gate as has been instituted for other crops like pineapple and mango. Government, financial institutions and the private sector should support the product certification process through the

provision of tax free policies, credits and infrastructure that in the long run will reduce certification costs and motivate more LICFPs to certify their products.

It is recommended that National Board for Small Scale Industries (NBSSI) as well as other microcredit firms strengthen their business advisory services and design credit schemes for processors in the infant cereal sector.

MoTI (Ministry of Trade and Industry) should repackage the subsidy on certification to meet the financial needs of the micro enterprises in order to increase participation in PQC, by looking critically at the annual income, scale of production, management model and age of the firms in the infant cereal food sector since these have significant influence on processors' willingness to pay for PQC.

The Ghana Standards Authority together with other stake holders should consider other payment forms of product certification so as to make it more convenient for processors to pay and entice even the smallest micro firm in this sector to participate in Product Quality Certification, as in the long run, this may go a long way to enhance the quality of products and reduce malnutrition in children.

The Ghana Standards Authority together with other stake holders like FDB and NBSSI should strengthen their education campaigns to help processors to better understand the importance of PQC.

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APPENDICES

Appendix 1- Sample Questionnaire

SURVEY QUESTIONNAIRE FOR ASSESSING PROCESSORS' WILLINGNESS TO PARTICIPATE IN CERTIFICATION

Date of interview:

Name of interviewer

Area

A. Demographic Characteristics

“I would like to ask you some questions that would assist policy makers in determining how to improve the growth of small and medium scale processors and especially processors of infant cereal foods. These questions usually take about 30 minutes. We are interviewing a sample of 30 firms or establishments in Accra and Tema Metropolitan areas, so your input is considered very valuable to this survey. Let me first ask you a few questions to identify this establishment and you.”

1. Firm or establishment identification:

.....

2. Name of Respondent:

.....

3. Position of Respondent:

Owner ☐ Manager of firm ☐ Chief executive officer ☐ Spouse of owner of firm ☐

Other, please specify

.....

4. Age.....

5. Gender Male=1 ☐ Female=2 ☐

6. What is your level of education

Primary level=1 ☐ Secondary level=2 ☐

Tertiary/ Professional Level=3 ☐ Technical l/ vocational level=4 ☐

No formal education=5 []

7. Marital status

Married=1 Single=2 Divorced=3 Widowed=4

B FIRM CHARACTERISTICS

8. Since when has this firm been in production?

9. Are you able to meet your production capacity? 1= YES [] 2= NO []

10. Do you consider this industry as being promising? 1 =Yes [] 2 =No[]

Table 1: Management Characteristics		
11. Management type	1sole proprietor	{ partnership limited liability cooperative}=0
12. Who takes decision for this firm?	1Owner	{Manager CEO Other (please specify)}=0
13. Source of agricultural raw materials?	1 Farm gate	{Open market Middlemen Wholesalers}= 0

Table 2: Employee or Labour Characteristics

Number of Employees	Male	Female	Total
14. number of Permanent employees			
15. number of skilled employees			
16. number of casual workers			

C MARKET FACTORS

17. Do you have wholesalers? YES=1 [] NO=2 []

18. Do you sell directly to consumers? YES=1[] NO=2 []

19. How many different types of infant cereal foods does this firm produce? []

20. Frequency and costs of production data (please *use table below*)

Number of production months/yr.	Frequency of production	Products	1	2	3	4	5
	Daily	CAPACITY(BAGS)					
	Weekly	Capacity in Kg					
	biweekly	COST (GHC)					
	monthly	Output(Kg)					
	other						

21. Unit size and unit selling price in GHC information

	1	2	3	4	5
SIZE 1					
SIZE 2					
SIZE 3					
SIZE 4					
SIZE 5					

22. Do you produce other products apart from infant cereals? 1=Yes [] 2 =No []

23. If yes please specify.....

24. If yes, how much income is obtained annually from these other sources?

GHC.....

No. of production months/yr.	Frequency of production	Products	1	2	3	4	5
	Daily	CAPACITY(BAGS)					
	Weekly	Capacity in Kg					
	biweekly	COST (GHC)					
	monthly	Output(Kg)					
	other						
Selling prices							
SIZE 1							
SIZE 2							
SIZE 3							
SIZE 4							
SIZE 5							

25. How many of your wholesalers and retailers demand registration with FDB/GSB?

.....

D INSTITUTIONAL FACTORS

26. Have the employees of this firm been trained on quality assurance? 1=Yes [] 2=No []

27. If yes, by whom?

28. Are you aware of a government regulation regarding certification of your products
1=Yes [] 2= No [] 3=Do Not Know []

29. Has this firm been registered with any institutions or organizations? 1=Yes [] 2=No []

30. Which of the following institutions or organisations are you registered with?

Registrar General's Department []

National Board for Small Scale Industries []

Association of Ghanaian Industries []

Ghana Standards Board []

Food and Drugs Board []

Others (please specify).....

31. Have officials of any of the above organisations ever visited your factory premise?
1=Yes [] 2 =No []

32. If yes, how many times in this year.....

33. Do customers and the media have a means or procedure for addressing quality issues for your products? 1= Yes [] 2= No[]

34. Are you able to access loans for production? 1=Yes [] 2= No[]

35. Do your suppliers or wholesalers sometimes lend money or inputs to you for production?

1=Yes [] 2 =No []

36. Do you supply on credit to your wholesalers? 1=Yes [] 2= No[]

E PREVIOUS KNOWLEDGE OF CERTIFICATION

37. Has this firm or you ever undertaken certification for any product? 1= Yes []
2= No[]

38. Are any of your products certified? 1 =Yes [] 2= No []

39. If no, what is the reason for this? 1=No knowledge [] 2 =Costly [] 3=Tedious []
40. Has your answer in 38 above affected sales? 1 =Yes [] 2= No []
41. Have you heard of product quality certification? 1= Yes [] 2 =No []
42. If yes, from where?
43. Name the organization responsible for certification in Ghana?
44. Do you have access to certification? 1 =Yes [] 2 =No []
45. Do you agree that GSB has a very high reputation in quality certification both domestically and internationally? 1 =Yes [] 2 =No []
46. Participation in certification can help improve the quality of my products through
1. Development of Quality assurance policy
 2. Inspections and testing
 3. Advertising and branding
47. Do you understand that participation in certification can help you improve your market share / sales? 1 =Yes [] 2 =No[]
48. Do you understand that participation in certification can help improve profits for this firm?
- 1Yes [] 2 No []
49. Do you know the requirement for certification? 1 =Yes [] 2= No[]
50. Will you be willing to participate when your competitors participate? 1=Yes [] 2 =No[]

51. Certification involves

ITEM/ QUESTION	1 YES	2 NO
compliance with standard procedures, processes and ingredients' use		
buying product standard		
freedom on advertising, labeling and declaration of nutritive value		
investment in documentation		
inspections by customers		
Hiring quality control staff		
investment in factory and machines		
quarterly renewals		
development of quality assurance policy		

SCENARIO DESCRIPTION

There is a system of quality management run by Ghana standards board called product quality certification. This scheme has several advantages. An important advantage is product differentiation. This quality certification helps processors to distinguish their high quality products from those of poor quality. It also allows your products to compete with other products both on the local and international markets. This will translate into high quality and higher prices, higher sales and higher profits. However, there are a number of things that this firm will need to do in order to attain this certification. Some of the requirements demand the performance of certain activities by you. Under this scheme, record keeping and documentation on all production and procurement processes are mandatory. Other activities will be performed by the certifier but at a fee that you will have to bear. The requirements are listed below with their associated costs:

REQUIREMENT	COST (GHC) YR 1
Purchase of CM1 form	5.00
Purchase of product standard	30.00
License fee	100+50/product
Testing fee	395.00
<u>Yearly renewals</u>	
Total cost	530.00

Can you please, based on the information I have provided, answer the following questions?

F. WILLINGNESS TO PAY

52. Are you willing to participate in the certification? 1. YES [] 2. No []

53. Are you willing to pay the price above for this scheme? 1. YES [] 2. NO []

54. If yes, why are you willing to pay for this scheme? (***Please tick the box or boxes that apply***)

1= my customers demand it []

2=I do not want any legal problems []

3=I do not want any media problems []

4=I want to sell more ☐

5=I want to reduce costs ☐

6=I want to sell in international markets ☐

55. If no, what is your reason for not being willing to pay a fee to cover the full cost of this scheme? *(please tick the boxes that apply)*

It takes too long ☐

I cannot afford it ☐

It is not relevant ☐

I do not believe it has the benefits mentioned ☐

I do not trust the certifier ☐

56. If no, what is the maximum amount you are willing to pay? GHC.....

57. If there is need to seek your advice further, may we contact you again?"
Yes ☐ No ☐

58. Do you know other cereal food producers in this community?
1=Yes ☐ 2= No ☐

Appendix 2- List of Processors Identified

No	Enterprise Name	Location of product	Contact	Remarks
1	Ghatty Foods	Mallam	Reached 0206374702	Willing to participate
2	Selasie Farms And Grocery	Spintex Shoprite	Reached 0208178761	Very busy
3	Comas	Achimota	Reached 0208173123	Not in production
4	Cynland	Achimota-Sarlinesta Supermarket	Reached 0277747055	Willing to participate
5	Blessed Child	Ofankor	Reached 0242376586	Willing to participate
6	Makers Industries	Achimota-Sarlinesta Supermarket	Reached 026440459	Willing to participate
7	Emarks	Achimota-Sarlinesta Supermarket	Reached 0243209130	Very busy
8	Winnie's Food	Achimota-Sarlinesta Supermarket	Reached 0244058590	Willing to participate
9	Fathad Afrik Ent	Medie	Reached 0270132343	Willing to participate
10	Reny Foods	North Kaneshie, Demod	Reached 0273632800	Willing to participate
11	T-Flo Ent	Dansoman	Reached 0265008986	Willing to participate
12	Vidamix Foods	Burma Camp	Reached 0248122171	Willing to participate
13	Finer Foods	East Legon	Reached 0541207610	Willing to participate
14	Elsa Foods	Kpone	Reached 0302712187	Very busy
15	Tims Ltd	Tema/ Sakumono	Reached 0243647622	Willing to participate
16	Esisel	Kumasi	Reached 0243455107	Willing to participate
17	Gangela	Tema	Reached 0272366607	Willing to participate
18	Meanan	Tema	Reached 0244280527	Willing to participate
19	Babrina	Madina	Reached 0247706678	Willing to participate
20	Unimix	Ghana Standards	not reached	

		Authority	0208246234	
21	C4 Food And Beverages	Ghana Standards Authority	Reached 0200940760	Not in production
22	Aduanepa Soya Wheat Powder	Ghana Standards Authority	not reached Abeka	
23	Afrocrown Trading Company Ltd	Ghana Standards Authority	not reached 0302257874	
24	Y&J Pharmaceuticals	GNTC- LEGON CAMPUS	Reached 0302947777	Willing to participate
25	PhD Ventures Ltd	Tema C18	Reached 0244974846	Willing to participate
26	Fruitful-Bough Ltd	Tema	Reached 0277128153	Not in production
27	May-Just Ind	Tema	Reached	Not in production
28	CasbeaPdxnEnt	NunguaAddagono (ICGC)	Not REACHED	
29	GerockEnt	Cantonments	Reached 0205743839	Not in production
30	ElarkoEnt	Tema C1	Reached 0246229307	Willing to participate
31	MerandaGh Ltd	Race Course	Reached 0244670415	Willing to participate
32	Anointing Weanimix	Abokobi- Seseme	Reached 0276839184	Willing to participate
33	Mary's Groceries	Ofankor	Reached 0208179773	Willing to participate
34	Kings Touch Cereals	TeshieNngua	Reached 0270972833	Willing to participate
35	Best Energy Foods	Tantra Hills	not reached 0247940410	
36	Dor Special Food	Makola Market	Reached 0244183119	Unwilling to participate
37	Mawusi Enterprise	Dworwulu	Reached	Unwilling to participate
38	M.K. Ameyaw	Ministries	Reached 0244446355	Willing to participate
39	JehovaJirehEnt	Ministries	Reached 0274245446	Willing to participate
40	Theomens Soya Foods	Korle-Bu	Reached 0262965944	Willing to participate
41	Harney Ent	Kaneshie Poly Clinic	Reached 0542195991	Very busy
42	Rosaqueen Foods	Children's Hospital	Reached 0207773811	Unwilling to participate
43	Makoma Foods	Korle-Bu	Reached 0277797695	Unwilling to participate
44	Nekelly Foods	Tema Market	Reached 0244535991	Willing to participate

45	Vernic Ventures	Tema Market	Reached 0207224377	Willing to participate
46	Emma's Tombrown	Tema Market	Reached 0247158482	Willing to participate
47	Asetenapa Cereals	Tema Market	Reached 0244141970	Willing to participate
48	QfoodsEnt	Circle Overhead	Reached 0244742400	Willing to participate
49	Lotty Foods	Dansoman Market	Reached 0244503402	Willing to participate
50	Evinos Foods	Madina Market	Reached 0242128569	Very busy
51	Palm Touch Ventures	Tema Shoprite	not reached 0302322372	
52	Visari Products	Tema Shoprite	Reached 0244629595	Unwilling to participate
53	JedidaEnt	Tema Shoprite	not reached 0269605399	
54	WeidjieEnt	Tesano Supermarket	Reached 0277442787	Unwilling to participate
55	Vinolia Foods	Tesano Supermarket	not reached 0274532033	
56	Dicta Foods	Abeka Total Shop	Reached	Very busy
57	HajiaTsotsoTombrown	Kaneshie Market	Reached 0208641148	Very busy
58	Virginia Foods	Kaneshie Market	Reached 0277341018	Willing to participate
59	Caro Weanimix	Kaneshie Market	Reached	Willing to participate
60	Antie Tina Weanimix	Kaneshie Market	Reached	Willing to participate
61	Zina Foods	Lapaz Market	Not REACHED	

Appendix 3- Logit Regression Results

Logistic regression

Number of obs = 35
 Wald chi2(11) = 27.29
 Prob > chi2 = 0.0042
 Pseudo R2 = 0.5943

Log pseudolikelihood = -9.555462

wtpr	Coef.	Robust Std. Err.	z	P> z	[95% Conf. Interval]	
age	-.9127336	.9416824	-0.97	0.332	-2.758397	.9329301
agesq	.0104597	.0110017	0.95	0.342	-.0111032	.0320226
annualincome	.0000608	.0000315	1.93	0.053	-8.65e-07	.0001224
firmage	1.623609	1.516906	1.07	0.284	-1.349472	4.59669
firmagesq	-.2182381	.1932757	-1.13	0.259	-.5970516	.1605754
educ4	1.072853	2.107453	0.51	0.611	-3.057679	5.203385
inspections	-2.465989	3.90228	-0.63	0.527	-10.11432	5.18234
pipeccep	-1.969116	1.589634	-1.24	0.215	-5.084741	1.14651
loanaccess	6.713388	4.331005	1.55	0.121	-1.775225	15.202
mgtyp	1.04542	1.223811	0.85	0.393	-1.353206	3.444045
scale	-5.418911	2.067049	-2.62	0.009	-9.470254	-1.367569
_cons	15.34214	17.39137	0.88	0.378	-18.74432	49.42859

Note: 0 failures and 1 success completely determined.

. mfx compute, dydx at(mean)

Marginal effects after logit
 y = Pr(wtpr) (predict)
 = .23356006

variable	dy/dx	Std. Err.	z	P> z	[95% C.I.]		x
age	-.1633882	.08484	-1.93	0.054	-.329673	.002896	42.3429
agesq	.0018724	.001	1.88	0.061	-.000084	.003828	1895.6
annualinc	.0000109	.00000	2.18	0.030	1.1e-06	.000021	54557.5
firmage	.2906418	.10057	2.89	0.004	.093521	.487763	4.68114
firmagesq	-.0390668	.00959	-4.07	0.000	-.057869	-.020265	32.7244
educ4*	.2234497	.39019	0.57	0.567	-.541311	.988211	.171429
inspec~s*	-.4107656	.3792	-1.08	0.279	-1.15399	.332454	.457143
pipeccep	-.3524909	.16888	-2.09	0.037	-.683497	-.021485	.771429
loanac~s*	.9294205	.13339	6.97	0.000	.667987	1.19085	.371429
mgtyp*	.1592611	.20845	0.76	0.445	-.249293	.567815	.771429
scale*	-.7430012	.20894	-3.56	0.000	-1.15252	-.333482	.428571

(*) dy/dx is for discrete change of dummy variable from 0 to 1

Appendix 4: Tobit Regression Results

Tobit regression

Number of obs = 35

11(24) = 9.45

Prob > F = 0.0000

Log pseudolikelihood = -217.36946

Pseudo R2 = 0.0483

maxwtp	Coef.	Robust Std. Err.	t	P> t	[95% Conf. Interval]	
age	6.548858	24.89597	0.26	0.795	-44.83391	57.93162
agesq	-.0795487	.2990026	-0.27	0.792	-.6966598	.5375623
educ3	120.4101	68.14278	1.77	0.090	-20.22967	261.0499
gender	18.83005	63.07105	0.30	0.768	-111.3422	149.0023
firmage	71.96688	38.57233	1.87	0.074	-7.642499	151.5763
firmagesq	-6.935908	3.169264	-2.19	0.039	-13.47695	-.3948684
mgttp	6.106945	90.2302	0.07	0.947	-180.119	192.3329
scale	-116.1819	70.01645	-1.66	0.110	-260.6888	28.32491
annualincome	.0008059	.0004462	1.81	0.083	-.0001151	.0017268
inspections	37.42732	78.85764	0.47	0.639	-125.3269	200.1815
loanaccess	125.1555	58.08262	2.15	0.041	5.278879	245.0322
_cons	-95.40086	540.4984	-0.18	0.861	-1210.935	1020.133
/sigma	165.4145	15.80802			132.7884	198.0407

Obs. summary: 2 left-censored observations at maxwtp <= 0
33 uncensored observations
0 right-censored observations

. mfx compute, dydx at(mean)

Marginal effects after tobit
y = Fitted values (predict)
= 268.01497

variable	dy/dx	Std. Err.	z	P> z	[	95% C.I.	]	x
age	6.548858	24.896	0.26	0.793	-42.2464	55.3441	42.3429	
agesq	-.0795487	.299	-0.27	0.790	-.665583	.506486	1895.6	
educ3*	120.4101	68.143	1.77	0.077	-13.1473	253.968	.428571	
gender*	18.83005	63.071	0.30	0.765	-104.787	142.447	.685714	
firmage	71.96688	38.572	1.87	0.062	-3.6335	147.567	4.68114	
firmagesq	-6.935908	3.16926	-2.19	0.029	-13.1476	-.724264	32.7244	
mgttp*	6.106945	90.23	0.07	0.946	-170.741	182.955	.771429	
scale*	-116.1819	70.016	-1.66	0.097	-253.412	21.0478	.428571	
annualinc~e	.0008059	.00045	1.81	0.071	-.000069	.00168	54557.5	
inspec~s*	37.42732	78.858	0.47	0.635	-117.131	191.985	.457143	
loanac~s*	125.1555	58.083	2.15	0.031	11.3157	238.995	.371429	

(*) dy/dx is for discrete change of dummy variable from 0 to 1