THE ASSESSMENT OF MARKET POTENTIAL AND MARKETING PROSPECTS OF ORGANIC FRUITS AND VEGETABLES IN KUMASI METROPOLIS OF GHANA

BY

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DECLARATION

I hereby declare that this submission is my own work towards my MPhil degree and that, to the best of my knowledge, it contains no material published by another person or material which has been accepted in any other University for any degree except where due acknowledgement has been made in the text.

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DEDICATION

This thesis is dedicated to my wonderful and supportive family especially my parents for their financial and spiritual support and encouragement throughout my education.

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ABSTRACT

Organic products are considered to be superior in quality compared to conventionally produced products, since it has been proved that organic products help prevent several health and environmental hazards. Therefore, the demands for organic products are increasing all over the world, as well as in Ghana. Given this increasing demand for organic products, this study was conducted with the aim of estimating the market potentials and consumer willingness to pay for organic fruits and vegetables in the Kumasi metropolis of Ghana. Further, the study identifies the factors that influence the consumers' willingness to pay premium for organic fruits and vegetables. A face-to-face household-level survey of 450 respondents was conducted in Kumasi, Ghana in 2008 with a structured questionnaire. The double-bounded dichotomous choice contingent valuation method (CVM) was employed to elicit consumers' WTP information. The study found that, most consumers had positive perception on organic fruits and vegetables with benefit perception index (BPI) of 0.76, quality perception index (QPI) of 0.60 and environmental risk perception index (EPI) of 0.55. The empirical results revealed that consumers' willingness to pay (WTP) premium for organic fruits and vegetables were more than 20% of the prices of the conventional products. Also consumers were willing to pay 6% to 39% premium for organic fruits and vegetables in Kumasi. The estimated market potential for organic fruits and vegetables were GH¢839,407,549 (US$ 599,576,821) and GH¢ 3,714,112,152 (US$ 2,652,937,251) respectively. The empirical results also show that age, education, income, gender, and household size significantly influence consumers' WTP for organic fruits and vegetables. Also product characteristics such as colour, size, hardness, freshness and cleanliness statistically influence consumers' WTP for organic fruits and vegetables.

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LIST OF ABBREVIATIONS

BPI	Benefit perception index
CVM	Contingent valuation method
DfiD	Department for International Development - UK
EPI	Environmental risk perception index
EU	European Union
FiBL	Research Institute of Organic Agriculture (Forschungsinstitut für biologischen Landbau)
GDP	Gross Domestic Product
GLSS	Ghana Living Standards Survey
GM	Genetically Modified
GOAN	Ghana Organic Agriculture Network
GOVGA	Gyinyase Organic Vegetables Growers' Association
HDRA	Henry Doubleday Research Association
IFOAM	International Federation of Organic Agriculture Movements
ITC	International Trade Centre
KMA	Kumasi Metropolitan Assembly
MoH	Ministry of Health
NGO	Non Governmental Organisation
PAN-UK	Pesticide Action Network UK
QPI	Quality perception index
UK	United Kingdom
US/USA	United States of America
WTA	Willingness to Accept
WTP	Willingness to pay

CHAPTER ONE

INTRODUCTION

1.1 Background of the Study

Agriculture is the most important sector of the Ghanaian economy as it employs about two thirds of the population, and contributes to half of the country's Gross Domestic Products (GDP) and export earnings (IFOAM, 2003). Agricultural production in Ghana consists of organic and conventional methods. Although the organic sub-sector in Ghana is relatively underdeveloped, land area under organic cultivation has increased from an estimated 5,453 hectares in 2003 to 19,132 hectares in 2006 (Yussefi *et al*., 2003; IFOAM and FiBL, 2006). However, the 19,132 hectares accounts for only 0.13 % of the total area under agricultural production in Ghana (IFOAM and FiBL 2006). These numbers including fully converted land as well as "in conversion" land area have been growing substantially in recent years. The sub-Saharan Africa has a potential for developing a formal organic sector with regards to tropical fruit and oil palm production. Ghana for instance does not have significant domestic market for organic produce, so the future development of this sub-sector would rely on organic trading links with established export markets like Europe (Gyau and Achim, 2007).

Ghana's main organic export commodities are palm oil and fresh fruits (IFOAM, 2003). The certification of farms already using organic methods makes progress in these markets. Other key organic products include cocoa, bananas, cashews, cereals and vegetables (IFOAM, 2003). The non governmental organisation (NGOs) and farmers' groups in Ghana promote the expansion of organic production with

indigenous groups are active in the development and dissemination of improved organic farming methods.

Stakeholders involved in the development of organic products include NGOs such as the Ghana Organic Agriculture Network (GOAN) and trade associations working actively with organizations such as ITC, HDRA, DfiD and PAN-UK (IFOAM, 2003). The largest urban Vegetable Farmers' Association in Kumasi is the Gyinyase Organic Vegetable Growers' Association (GOVGA). It was formed through the merger of smaller associations in three of the main farming sites in Kumasi and has about 10 main markets oriented vegetable farming sites, many of which are linked to farmers' associations (Osei *et al*., 2007). With the assistance from HDRA and PAN-UK, GOAN established a centre in 1995 to provide information, training and advice on organic agriculture practices. In addition, GOAN links with other research institutions to examine the alternative methods of pest control for cocoa, oil palm, fruits and vegetables (IFOAM, 2003).

Vegetable production in urban, peri-urban and rural areas plays important roles in the socio-economic development of Ghana. It ensures food security, provides raw materials for local industries, and generates foreign exchange, employment and incomes for a section of the population (Nouhoheflin *et al.*, 2004; Obuobie *et al*., 2006). Although vegetable production contributes to poverty alleviation in Ghana, evidence exist that it is associated with some health hazards due to misapplication of chemicals and inorganic fertilizers (Nouhoheflin *et al.*, 2004). The risk to consumers as a result of inappropriate use of chemical pesticides and inorganic fertilizers are high because

producers may not be aware of the health hazards associated with chemical residue in vegetable (Nouhoheflin *et al.,* 2004).

With food safety and environmental quality issues high on the agenda of most policy makers all over the world, organic food has speedily emerged as an important food industry in the U.S and other countries since the early 1980s (Thompson, 1998; Lohr 1998). For instance, the total retail organic food sales in U.S increased from $178 million in 1980 to $1 billion in 1990 and reached $7.8 billion in 2000 (Vandemen and Hayden, 1997; Myers and Rorie, 2000). Organic agriculture has been practiced in the United State for over half a century. It involves working with natural systems, instead of controlling them **(**Klonsky *et al.,* 1998). Organic farming refers to a farming system which uses organic manure, and avoids or largely excludes the use of synthetic fertilizers, pesticides and chemicals (Gil *et al.*, 2000). They indicate that adequate management of organic farming generates a positive impact on the environment by reducing water contamination, and increasing soil fertility through crop rotation.

The main difference between organic and conventional production practices are soil and pest management aspects of production (Philips and Peterson 2001; Gilroy *et al.*, 1993). Organic farming systems rely on ecologically based practices such as biological pest management and compositing; virtually excluding the use of synthetic chemicals, antibiotics, and hormones in crop production (Karen *et al*., 2005). One advantage of organic farming is that it does not contribute to water pollution through chemical pesticide runoff and as Phillips and Peterson (2001) rightly pointed out,

consumers do not have to worry about pesticides residue on fresh vegetables produced from organic farming.

The most commonly grown organic vegetables in Ghana are lettuce, cabbage, green pepper, carrot, tomato, garden eggs, green beans and spring onions, which are often used in exotic diets and frequently eaten raw. Organic fruits also include pineapple, pawpaw, mango, and pear and water melon. In Accra, the capital city of Ghana for example, there are about 800-1,000 farmers engaged in commercial urban vegetable farming where the vegetable produced are eaten by more than 200,000 urban dwellers daily (Obuobie *et al.*, 2006). Apart from ensuring balanced diets, urban vegetable farming is a major source of income to many urban dwellers and thus contributes significantly to urban food security and poverty alleviation (Nouhoheflin *et al.*, 2004).

1.2 Problem Statement

The consumption of large quantities of fruits and vegetables in a diet protect against various health problems such as coronary heart disease (Rapley *et al.*, 2005), stroke (Bradley and Shinton, 1998) as well as some forms of cancer (Rapley *et al.*, 2005; Weisburger, 1991; Block *et al.*, 1992). But a lot of concerns have been raised about the production methods employed by vegetable producers. The increasing use of synthetic chemical products in vegetable and fruit production does not promote food safety and environmental quality. In Ghana, the Ministry of Health (MOH) is advocating for consumption of more fruits and vegetables but these products as already

indicated have health implications, due to the production methods applied by farmers (Obuobie *et al.*, 2006). Although organic farming has been identified as an effective way to improve food safety and environmental quality (Wang and Sun, 2003) its adoption in most sub-Saharan African countries is highly determined by the market potential (size) and marketing prospects (demand) for organic food products (Hine and Pretty, 2007).

On the production side, many farmers are hesitant to adopt organic farming due to limited information on market size, marketing prospects and its profitability (Wang and Sun, 2003). Although, organic systems are more profitable, have similar yields, better tasting products and environmentally more sustainable and energy efficient than other systems, production appears to be low (Reganold *et al.*, 2001). One of the problems producers of vegetables and fruits in Ghana face is the marketing of the produce (Obuobie *et al.*, 2006). The producers of vegetables and fruits in Ghana who have received some training from GOAN are also hesitant to convert fully to organic production, due to undefined markets for organic products as well as not being sure whether consumers would be willing to pay a premium for organic products compared to the conventional products (Danso *et al.*, 2002). There are major problems which face marketing of crops in Ghana. Specifically the problems of marketing potential of organic vegetables and fruits in Ghana are that it relies solely on the export market, lack of developed domestic market, and also fragmented in its approach to develop production and marketing strategies (Sefa-Dedeh and Adovor, 2005).

1.3 Research Questions

The issues discussed above raise the following research questions:

1. What is the perception of consumers on organic fruits and vegetables?
2. Are consumers in Kumasi willing to pay a premium for organic fruits and vegetables?
3. What factors determine consumers' willingness to pay premium for organic fruits and vegetables?
4. Is there any market potential for organic fruits and vegetables in Kumasi?

1.4 Objectives of the Study

The main objective of the study is to assess the market potential and marketing prospects of organic vegetables and fruits in Kumasi Metropolis of Ghana.

The specific objectives of the study are:

- To examine consumers' attitudes and perceptions towards organic vegetables and fruits.
- To assess consumers' willingness to pay (WTP) a premium for organic vegetables and fruits.
- To identify the factors which influence consumers' willingness to pay a premium for organic vegetables and fruits.
- To estimate market potential (size) for organic products consumption in Kumasi.

1.5 Justification of the Study

The increasing public concerns about food safety issues on the use of fertilizers, pesticide residues, growth hormones, GM organisms, and increasing awareness of environmental quality issues have led to an expanding demand for environmentally friendly products (Thompson, 1998; Rimal *et al*., 2005). As a result national governments are concerned about diet and health, and there has been renewed recognition of the role of public policy in promoting healthy diets, thus to provide healthier, safer, more confident citizens (Poole *et al*., 2007). In view of this, a health and consumer protection strategy addresses the need for better informed and educated consumers. This is with the aim of ensuring that consumers, through better information, are able to make informed, environmentally and socially responsible choices on food, the most advantageous products, and those that correspond most to their lifestyle objectives thus building up trust and confidence (Poole *et al*., 2007) due to the health cost implication to a country's economy. In fact, nutrition transition towards unhealthy diets, which is occurring at a faster rate in developing countries than was the case for developed countries, is a global problem (Fraser, 2005) which must be addressed. Organic fruits and vegetables consumption would help contribute to the management of public health costs (Cheftel, 2005) for citizens in a country as well as the country in general.

Organic food is rapidly emerging as an important food industry in the world with Ghana not being an exception. Organic farming and its products provide various benefits to farmers, consumers and other stakeholders. On the part of consumers the

benefits are obtained through fruits and vegetables consumption. Low fruit and vegetable intake is a characteristic of a poor diet that is one of the major risk factors in chronic diseases and a change in eating habits can effectively influence health in well-fed or over-fed societies (Poole *et al*., 2007). Research also suggests that high levels of fruits and vegetables consumption reduce antisocial behaviour (Gesch *et al*., 2002). Fruits and Vegetables are an excellent source of antioxidant nutrients which lower the risk of heart disease and several types of cancers. They are a good source of fibre which helps control cholesterol levels in humans. Fruits and Vegetables are beneficial to salt balance particularly in cases of hypertension, and provide vitamins in addition to antioxidants, such as folic acid which helps in the prevention of birth defects (Poole *et al*., 2007). The link between ill-health and 'obesogenic' diets with low Fruits and Vegetables levels has important economic implications for a country (McCarthy, 2004).

With these benefits, a study into organic fruits and vegetables would be very vital to all the major stakeholders. The empirical findings of this proposed study would provide quantitative WTP estimates, and the availability of this detailed monetary estimates on individuals WTP for organic fruits and vegetables would help in the design and execution of suitable national incentive programme for the diffusion and adoption of more environmentally friendly agricultural practices. The findings from this study would be useful to organic food industry players in designing and implementing programs relating to organic fruits and vegetable production. The study would provide insights to producers and retailers with regard to how much the consumer would be willing to pay at marketplaces for reductions in perceived risk. Knowledge of

consumers' perceptions and attitudes toward risk should help in formulating regulations that ensure the safety of the food supply. The identification of factors influencing purchase of organic food would provide valuable information in formulating short and long term marketing programs. Also, the outcome of the study would benefits Government and NGOs in their policy makings towards organic farming and organic products. The Ministry of Health (MoH) in Ghana would benefit from the findings too, to know the policy direction in its advocacy for increase consumption of fruits and vegetables. It would also help to improve the long term productivity and diversity of vegetable and fruit production in the urban and peri-urban poor who are mostly involved in urban agriculture.

However, consumer studies on fruits and vegetables in Ghana (Danso *et al.*, 2002; Obuobie *et al*., 2006) have focus largely on risk reduction in contaminated water usage and farmers' and consumers' perceptions on organic agriculture. These researches were however silent on marketing potential of organic fruits and vegetables. Even though, fewer studies exist on marketing potential of organic vegetable and fruits in Ghana. Nouhoheflin *et al.* (2004) researched into organic vegetables demand at household consumer level, and only concentrated on consumers' perceptions and willingness to pay for only two organic vegetables (tomato and cabbage). The study did not consider willingness to pay for organic fruits and many other vegetables such as lettuce, spring onions, carrots, green pepper and green beans. Also, perceptional variables that influence consumers' willingness to pay for fruits and vegetables were not considered. It did not address the attitudes of consumers towards organic fruits and

vegetables, and there was no estimated market value for organic fruits and vegetables. Nouhoheflin *et al.* (2004) study did not use CVM which is appropriate for non use values and hypothetical situations evaluation of goods and services (Bennett and Blamey, 2001) but rather employed hedonic–pricing method model. This study therefore seeks to provide empirical findings on willingness to pay, market size and the factors that influence household consumption of organic fruits and vegetables. Specifically, the study investigated the effect of socio-economic variables, perceptional factors, institutional variables and products characteristics as well as the attitude of the consumers in the Kumasi Metropolis on organic fruits and vegetables. The contingent valuation model (CVM) was employed for this study.

1.6 Organization of the Study

This study is organized into five chapters. Chapter one contains the background of the study, the research questions and the relevance of the study. Chapter two provides an extensive literature review on market potential and marketing prospects, whiles section two reviews literature on consumer behaviour, empirical studies on consumers' WTP, and consumers' attitudes and perceptions on organic food. Socio-economic variables and product attributes which influence WTP a higher price and methodological review are discussed. The chapter three describes in detailed the study area, and discusses the conceptual framework on willingness-to-pay (WTP) premium, which includes consumers' utility and willingness to pay, willingness to pay and contingent valuation method, the estimation of mean WTP, empirical discussion on the factors influencing WTP and the procedure for estimating market potential as well as

the sampling techniques adopted for data collection and sample size used in the study. Chapter four provides descriptive analysis from the survey data and also discusses the empirical findings. Chapter five provides a summary of the research findings, conclusion and some policy recommendations.

CHAPTER TWO

LITERATURE REVIEW

This chapter consists of four sections. The first section covers market potential and marketing prospects, whiles section two reviews the literature on consumer behaviour, empirical studies on consumers' WTP premium, and consumers' attitudes and perceptions on organic food. In the third section, socio-economic variables and product attributes which influence WTP a higher price are discussed. The final section presents methodological review, which discusses the strengths and weaknesses of methods employed in willingness to pay studies.

2.1 Market Potential and Marketing Prospects

Market potential is the maximum sales reasonably attainable under a given set of conditions within a specified period of time (Lehmann and Winer, 2005). A review of relevant literature revealed that organic fruits and vegetables have high potential as an alternative to conventional counterpart for farmers, especially small and limited resource farmers. However, there is a great need to understand and explore market potential and prospects, in order to take advantage of the benefit from producing these commodities. Wier and Calverley (2002) evaluated market potential for organic foods in Europe. The study revealed that a potential exist for sales of highly processed organic foods in supermarket sales, and the role of information and systematic proficient promotion of organic products is a necessity for future expansion. Wang and Sun (2003) assessed market potential for organic apples and milk in the state of Vermont, U.S.A. Their results showed that there is a significant niche market for organic apples and milk,

and many consumers, especially people who have purchased organic food products, are willing to pay more for organic apples and milk.

In a study conducted on coffee production status and potential of organic arabica coffee in Chiang Mai, Thailand, Angkasith (2001) concluded that depending on market demand for organic coffee, there is a high potential for its production on the highlands, and organic production methods will be of mutual benefit to the farmers, the highland ecology, and the consumers. Mainville and Peterson (2005) explore the potential to develop a cherry-apple and hard cider markets as a means to increase demand for and the value of Michigan fruit growers' product and factors affecting both the development of hard cider markets in Michigan and cherry-apple hard cider. The study results show that the potential value of Michigan hard cider market is relatively small but significant, estimated at a range between $580,000 and $2,900,000 per year. The research also showed high potential for hard cider that blends cherries (and many other fruits) with apple.

Edward *et al*. (2007) studied marketing opportunities for Jamaican's grapefruit industry. Their preliminary assessment of the market potential for Jamaica's exports of grapefruit to the EU suggests that the prospects are promising from several perspectives; grapefruit industry points to a bleak future for Florida and suggests that these developments are likely to cause grapefruit prices to remain relatively high in the EU market over the long term. Jamaica has certain comparative and other advantages over US that make it ideally suited for large-scale citrus production.

2.2.1 Empirical Studies on Consumer Behaviour

According to Lancaster *et al*. (2001), consumer buying behaviour consists of activities involved in the buying and using of products or services for personal and household use. The consumer buying behaviour is influenced by factors such as; psychological factors (perception, motivations and attitude), lifestyle, demographic and economic variables. Padberg *et al*. (2002) also stated that consumer behaviour is a complex, multidisciplinary approach with contributions of different social sciences: economics, psychology, sociology, anthropology, geography, nutritional sciences and medicinal sciences. The basic forces of consumer behavior are emotions, motives and attitudes (Kroeber-Riel, 1992 in Padberg *et al*., 2002). Thus the stronger the emotion the stronger the motive, and the more positive (negative) an attitude towards the product, the higher (lower) is the probability of purchase.

Numerous surveys regarding consumer behaviour towards food products (vegetables and fruits) have been conducted in the world. In a study conducted in Vietnam by Mergenthaler *et al*. (2007) found that the demand for fruits and vegetables from modern supply chains especially modern retailers and non-traditional imports is highly income elastic as well as supermarkets expansion had impact on consumer demand. In Croatia, fruit and vegetable buyers consider freshness and quality as most important characteristics of fruits and vegetables during purchases (Kovacic *et al*., 2002). In a study to investigate the role of trust as a determinant of consumer behaviour in Germany, Dierks (2006) found that in situation of food scandal, trust proves to be among the most decisive factors influencing the behaviour of consumers. Naspetti *et al.*

(2005) found that consumers will be more motivated in purchasing organic products by being informed on producers and handlers (improved traceability) and by having more transparency of the inspection methods and results. A study conducted in Alabama by Mukiibi *et al*. (2006) revealed that the several factors that seem to be strongly correlated with consumer purchasing behaviors and attitudes toward shopping at public markets, including income, education, age of household head, household size, price and quality of produce. In South Africa, Vermeulen (2007) found that price premiums and consumer behaviour associated with organic production is significant in consumers' willingness to pay for intangible product attributes such as health, and this reflect the current supply and demand imbalance in the organic sector. A study by Oboubie *et al*. (2006) conducted in Ghana found that characteristics such as freshness, colour and spotless leaves were considered by consumers' when buying vegetables.

2.2.2 Consumers' Willingness to Pay for Organic Products

Willingness to pay is the maximum amount of money a consumer is willing to pay for the product of choice. In the past years consumer demand for niche products such as organic food has grown substantially (Dimitri and Greene, 2002). Consumers value organic foods because they perceive the products to be healthier, and more environmentally friendly. This preference may translate to a willingness to pay a premium price for organic product.

Several studies have investigated consumers demand and their willingness to pay for organic products (vegetables and fruits) in developed countries. However, some

studies have focused on consumers' willingness to pay for organic, pesticide-free fresh and non-genetically modified produce. Gil *et al.* (2000) employed contingent valuation method to value Spanish consumers' willingness to pay for organic products. Their results indicate that consumers were willing to pay higher premium for organic fruits and vegetables. In a study among Canadian consumers, Cranfield and Magnusson (2003) used contingent valuation method (CVM) to examine consumer willingness to pay for pesticide-free food products. They found that consumers would be willing to pay higher premiums relative to a conventional food product. Boccaletti *et al*. (2000) and Misra *et al*. (1991) also use CVM to analyzed consumer willingness to pay for pesticide-free fresh fruits and vegetables in Italy and USA respectively. Moon and Balasubramanian (2001) examined the linkages between subjective risks and benefit perception and willingness to pay a premium for non-genetically modified (non-GM) food among US and UK consumers. Their studies reveal that UK consumers were significantly more willing to pay a premium to avoid GM foods than US consumers. Wang and Sun (2003) examined consumer preference and demand for organic apples and milk using a conjoint analysis in the State of Vermont in the United States. Results found suggest that there is likely a significant niche market for organic apples and milk and many consumers, especially people who have purchased organic food products, are willing to pay more for organic food produced locally and certified.

Nouhoheflin *et al*. (2004) used hedonic pricing method (thus indirect method of valuation) to assess consumers' perceptions and willingness to pay for organic vegetable in Benin and Ghana. Their results reveal that Ghanaian consumers were

willing to pay more than 50% as price premium for chemical free vegetable. The price premium for organic foods over comparable conventional food ranged from 10-100%, but the predominant price premium around the world is 10-50% (Bonti-Ankomah and Yiridoe, 2006). Hutchins and Greenlagh (1997) found consumers in UK are willing to pay 30% price premium, especially for organic cereals, fruits and vegetables.

2.2.3 Consumer Attitude and Perception towards Organic Products

An attitude is the willingness or predisposition of the consumer to react positively or negatively to a stimulus pattern of a product offer: the consumer's evaluation or image of a product (Padberg *et al*., 2002). There is a link between attitude and perception. Consumers attitude towards a product depend heavily on their perception of the product (von Alvensleben and Meier, 1990; Padberg *et al*., 2002). Several studies have investigated what consumers are willing to pay base on consumers' attitude and perception towards organic food and its attributes. Williams and Hammitt (2000, 2001) and Underhill and Enrique (1996) show that WTP for organic foods is related to a perception of its being more environmentally friendly and supportive of small-scale agriculture and local rural communities. Loureiro *et al*. (2001) assess consumer choice of eco-labeled, organic, and regular apples, and identify socio-demographic characteristics affecting the choice among those three alternatives. They found higher food safety concerns, and attitudes about the environment increase the likelihood a consumer will prefer an organic product. Thus consumers who have strong environmental and food safety concerns will prefer organic apples, while people with weaker environmental and food safety concerns will prefer regular apples.

Roosen *et al*. (2004) analyzed food risk perceptions of German consumers over the eleven year period from 1992 to 2002. The analysis cover the respondents general risk attitudes and the specific perception of food safety risks. General risk attitude were described by variables relating to environmental, lifestyle and food risks. Food safety concerns were grouped into concern about use of biotechnology, about residues, about unhealthy eating habits, and about natural contaminants. The results reveal that general risk perceptions and knowledge about food safety hazards are highly significant in the explanation. A study on consumer perceptions and attitudes towards food safety was conducted in Portugal by Ventura-Lucas (2004). The results indicate that, with exception of the residence place, the other socio-economic variables play an ever-decreasing role when explaining the consumer behaviour. The factors measuring lifestyle, especially those related to safety, and mainly, consumption experience, seem to be the main aspects explaining Portuguese consumers' perception on food safety. In the consumers attitudes to food price, a clearly discontentment of respondents is the main result. In relation to the impact of food production processes on environment, consumers are very concerned and they consider the ordinary production system aggressive to the environment.

Naspetti and Zanoli (2006) evaluated organic food quality and safety perception throughout Europe. The results indicate that quality dimensions and considerations are among the most important aspects in any food purchase, including organic ones. However, average organic consumers usually connect quality to health, and much less to safety, and don't have a separate organic food quality perception. The research also

showed that there is still little knowledge of how organic products are produced and processed and which characteristics are fundamental for the consumer with regard to quality and safety.

Nouhoheflin *et al.* (2004) assessed consumers' perception and willingness to pay for organic vegetables in Accra and Tema, Ghana. A hedonic-pricing model was used to identify the key factors most likely to affect consumers' willingness to pay for bio-vegetables. Their results show that consumers are aware of health hazards linked to chemical pesticides. Also, the study found that consumers in Accra do not consider risk of health hazards due to heavy chemical residues as a major factor in buying vegetables. These studies have contributed to the understanding of consumer demand, perception and willingness to pay for organic products in the food industry. However, a significant need to extend this work to represent a broader view of Ghanaian consumers has necessitated this study.

2.3.1 Socio-economic Variables Affecting Consumers' WTP for Organic Products

These are personal factors which affect consumers demand decision making. Govindasamy and Italia (1999) showed that younger consumers, regardless of gender, would pay higher premiums for organic produce, as did females with higher annual incomes. They also found that the probability of paying a premium goes down as the number of individuals in the household rises. Thompson and Kidwell (1998) found that families with children were more likely to buy organic produce than those without children, whereas Loureiro and Hine (2002) and Wang and Sun (2003) show the

opposite. Arbindra, Wanki and Balasubramanian (2005) in their study in UK found that household income positively influenced consumers' likelihood of buying organic food. Also, female respondents were likely to purchase organic food more than their male counterparts, and older respondents were less likely to buy organic foods compared to younger respondents. In a similar study in the United States, Arbindra and Wanki (2005) found that among the socio demographic variables, age of the respondents was the only variable which had statistically significant impact on the organic food purchase pattern. Thus older respondents were less likely to buy organic foods compared to younger respondents. Wang and Sun (2003) reported from their demographic variables analysis that young people with higher income, smaller household size and fewer children in a household were willing to pay more for organic food. A study by Boccaletti *et al.* (2000) reveal that age, sex, education and income of consumers influence their willingness to pay for pesticide-free fruits and vegetables. Sex and education were negatively related to WTP, thus indicating that male respondents and those with a university degree were less likely to be willing to pay more for pesticide-free produce. In a study of multi-ingredient organic foods by Batte *et al*. (2007) and a study by Darby *et al*. (2006) found that shoppers who were aware of the National Organic Program seal for food products were more likely to be willing to pay a premium price. Conditioned on a willingness to pay a premium, they found older consumers and those with higher income per household member were willing to pay higher premium. Females, consumers with children were also willing to pay prices that were significantly larger than their counterparts. Also, older buyers, female and married consumers were more likely to choose stores offering pesticide- free products (Byrne *et*

al., 1994 in Bonti-Ankomah *et al*., 2006). Loureiro *et al*. (2001) assess consumer choice of eco-labeled, organic, and regular apples, and identify socio-demographic characteristics affecting the choice among those three alternatives. They found the presence of children under 18 in the household, higher food safety concerns, and attitudes about the environment increase the likelihood a consumer will prefer an organic product. Thus consumers who have children and strong environmental and food safety concerns will prefer organic apples, while people without children and with weaker environmental and food safety concerns will prefer regular apples. Cranfield and Magnusson (2003) establish that consumers are more likely to pay a higher premium if they are younger whiles other socio-demographic factors prove to be relatively unimportant as compared to shopping behaviour and concern over pesticide use in agriculture. Roosen *et al.* (2004) analyse food risk perceptions of German consumers over the eleven year period from 1992 to 2002. The results reveal that socio-economic variables were highly significant in at least one of the eleven years. Studies by Nouhoheflin *et al*. (2004) found that the most likely socio-economic factor influencing consumers' willingness to pay for chemical free vegetable is the socio-professional category acting as a proxy for income level.

2.3.2 Product Attributes Affecting Consumers' WTP for Organic Products

Several studies have investigated what consumers are willing to pay to avoid or obtain various food attribute. A study conducted by Nouhoheflin *et al*. (2004) revealed that the characteristics Ghanaian consumers look for in assessing the quality of vegetable are: damage free, freshness, size, bright colour and hardness. Their

willingness to pay for chemical free vegetable is influence by factors such as the awareness of chemical residue, the availability, the label and the taste. Poole and Martínez-Carrasco (2007) studied the relationship between information (such as fruit quality perceptions and consumer satisfaction) and WTP. It was found that participants' purchase decisions were based mainly on overall visual appearance, firmness of the fruit, colour of peel, aroma and fruit size. In Bonti-Ankomah and Yiridoe (2006), Wolf (2002) found that attributes that are very desirable or extremely desirable to consumers included fresh looking, fresh tasting, high quality, seedless, reasonably priced, healthy, high in nutrition, looks sweet, free of insects, sale priced, and free of pesticides. Van der pol and Ryan (1996) used conjoint analysis to establish consumer preferences for fruit and vegetables in Scotland. Their results reveal that factors which influence consumption of fruit and vegetables are freshness, appearance, season and nutritional value. A study by Fotopoulos and Krystallis (2002) examine the organic products as "eco-products" suitable for "green" consumers. Their results reveal that consumers consider attributes such as appearance, size, colour, freshness and other intrinsic attributes like taste, and nutritional value during purchase of organic products.

2.4 Methodological Review

In the study of market potential and marketing prospects for non-market goods, there are several methods employed. These are stated preference method; that is, elicit environmental values directly from respondents through survey techniques and revealed preference method; thus, it makes use of individuals' behaviour in actual or stimulated markets to infer the value of an environmental good or service (Asafu-Adjaye, 2000).

The stated preference method includes; choice experiment (conjoint analysis and choice modeling), and contingent valuation method whiles the revealed preference method comprises; hedonic pricing, travel cost model, dose-response approaches, and averting expenditure/avoided cost approaches (Hanky *et al*., 1997 and Asafu-Adjaye, 2000).

The revealed preference methods have not been able to satisfy all the demands for non-market valuation. This is because revealed preference methods are limited to the provision of information regarding values that have been experienced. Again revealed preference methods in the past may be of little interest in situations where new circumstances are expected to emerge from a proposed change (in this situation the demand for organic fruits and vegetables). Also there is limited number of cases where non-market values exhibit a quantifiable relationship with a marketed good. Due to these limitations, the focus is now on stated preference methods which deal with the estimation of 'total economic value' of environmental impact (Bennet and Blamey, 2001). The stated preference methods are flexible and can be applied to a wider range of environmental goods and services. Also they can be used to estimate use values and non-use values. Furthermore, they are relatively straightforward for eliciting individuals' valuations of non-market environmental goods and services, and require few theoretical assumptions compared to revealed preference approaches (Asafu-Adjaye, 2000).

The stated preference techniques; conjoint analysis, choice modelling and contingent valuation methods have their strengths and weaknesses. In conjoint analysis the explicit trade-offs between attributes provide a more realistic approach and part-

utilities produced provide a common scale facilitating direct comparison (Murphy *et al*., 2000). It helps to quantify and predict the individual's overall judgement of a product based on its most important attributes (Steenkamp, 1987 in Monteiro *et al*., 2001). Despite these strengths it has the following shortcomings; difficulty involved in making interpersonal comparisons of ranking or rating data, the difficulty of respondents to rank large number of alternatives and the fact of rating tasks in particular involve a departure from the context of choice actually faced by consumers (Morrison *et al*., 1996 in Bennet and Blamey, 2001). Again it does not provide the respondent with an opportunity to say 'no' to the good and considered to be unconditional or relative measures of WTP that could be understated (Asafu-Adjaye, 2000). Choice modelling is used to value multiple sites or multiple use alternatives and can provide conditional and absolute measures of WTP (Asafu-Adjaye, 2000). It has the ability to embed a range of potential substitute goods within the alternatives from which respondents are asked to choose (Bennet and Blamey, 2001). The choice modelling requires complex survey designs. Thus the number of choice sets can be large, and tends to affect the outcome (Asafu-Adjaye, 2000). Furthermore, there is difficulty in the selection of attributes to be used to describe the choice alternatives because of apparent contradictions between what policy makers regard as key factors and what really matters to respondents (Bennet and Blamey, 2001). The contingent valuation technique has the capacity to estimate non-user values. Also CVM is the most useful technique for estimating economic values for some non-market resources. Again it has the ability to estimate existence values which are theoretically meaningful aspect of value, and very useful in hypothetical market situations (Hanley and Spash, 1993). The CVM offers respondents one or sometimes

two alternatives to evaluate, and thus improved response rate (Asafu-Adjaye, 2000). This study will employ the use of contingent valuation method which is consistent with random utility theory in economics (Bennet and Blamey, 2001). This method provides a holistic view of a new product by determining consumers' willingness to pay.

CHAPTER THREE

METHODOLOGY

This chapter consists of two main parts. In the first part, the conceptual framework of the study is presented. This includes a discussion on Contingent Valuation Method (CVM) employed in the analysis of consumers' willingness to pay (WTP) premium, after which the empirical models on factors influencing consumers' willingness to pay for organic fruits and vegetables were specified. In the second part, the study area is described, followed by a discussion on how the data employed in the study was collected.

3.1 Conceptual Framework

This section is devoted to the conceptual framework of the study. Consumers' utility and willingness to pay, willingness to pay and contingent valuation method, and the estimation of mean WTP are discussed. The empirical discussion on the factors influencing WTP and the procedure for estimating market potential are also discussed.

3.1.1 Consumers' Utility and Willingness to Pay

Willingness to pay could be analyzed as a consumer choice problem. Following Cranfield *et al*. (2003), let us assume that a consumer who buys and consumes a conventionally produced food products encounters the same food products but in an organic form on the market. The consumer, who decides to purchase an organic product instead of the conventional one, does so because it is assumed that his/her consumption utility is higher for the organic product (Magnusson *et al*., 2005). If the utility does not

change, then a rational consumer will not be willing to pay, as an increase in the price results in a lower level of utility compared to the base level of utility. Also if the utility increases, then the consumer may be willing to pay more for organic product, on the basis that the price increase does not lower the utility beyond the base level (Cranfield *et al*., 2003). The consumers' willingness to pay is therefore a function of the change in utility arising from the consumption choice. Thus:

$$WTP = f(\Delta U), \tag{1}$$

where, ΔU is the change in utility and $f' > 0$.

Since the choice of one product over another is a discrete one, it is convenient to look at consumers' choice problem in a random utility setting. Random utility models have been used extensively in the valuation literature in the analysis of consumer food safety valuation and assessment of consumer response to new (or different) products (Eom, 1994; Veeman and Adamowicz, 2000; Kuperis *et al*., 1999; Quagrainie *et al*., 1998). Following the random utility framework proposed by Cranfield *et al*. (2003), it is assumed that a consumer faces a choice between buying either the conventional (non-organic) or organic variety of the same product. The utility derived from consuming a given product by a consumer is given as:

$$U_i = X_i'\beta + \varepsilon_i \tag{2}$$

Where,

U_i is the utility arising from choosing the *i*th alternative, $X'_i\beta$ is the deterministic component of the utility function,

X_i is a vector of observable alternative specific factors that influence utility. β is a vector of parameters and ε_i is the stochastic component. The consumer chooses alternative i if and only if $\mu_i > \mu_j$ for all $j \neq i$ (or that $\Delta U = U_i - U_j > 0$). Without loss of generality, willingness to pay can be expressed as:

$$WTP = X_i\beta + \varepsilon_i \tag{3}$$

where, $X = X_i - X_j$ and $\varepsilon = \varepsilon_i - \varepsilon_j$. As Cranfield *et al*. (2003) pointed out, consumer or household characteristics could be included in the matrix X since WTP is likely to vary among consumers. Given that ε is unobservable and stochastic, the consumer's choice is not deterministic and can be predicted exactly. The probability that the consumer will purchase the organic variety of the product is given by:

$$P_i = Prob\left\{\varepsilon_{ci} - \varepsilon_{zi} < (X\beta)_{zi} - (X\beta)_{ci}\right\} = \left\{\varepsilon < (X\beta)_{zi} - (X\beta)_{ci}\right\} \tag{4}$$

where;

ci = conventional product and zi = organic product.

The probability of having *WTP* between two defined WTP levels is expressed as:

$$\Pr\left(WTP_1 < WTP \leq WTP_2\right) = \Pr\left(X'\beta + \varepsilon \leq \bar{y}\right) - Pr\left(X'\beta + \varepsilon < \underline{y}\right) \tag{5}$$

where $Pr(\cdot)$ is the probability of WTP between the two levels, WTP_1 and WTP_2 are lower and upper limits of willingness to pay that the consumer is interested in, $\bar{y}$ and $\underline{y}$ are threshold changes in utility consistent with the lower and upper ranges of WTP (Cranfield *et al*., 2003).

3.1.2 Willingness to Pay and Contingent Valuation Model

In examining the viability of a new product, cost of production and consumer demand for the product have to be taken into consideration (Kimenju and De Groote, 2005). Studies which have evaluated products or services that are not yet on the market asked consumers to value their products contingent upon market availability of the product (Kimenju and De Groote, 2005; Quagrainie, 2006). This helps to determine the consumer demand or willingness to pay (WTP) for such products in a hypothetical markets situation. These markets are set up using Contingent Valuation Methods (CVM) where consumers are asked to value a new product (Lusk and Hudson, 2004). That is directly asking consumers in a survey on how much they would be willing-to-pay for the new product. The Contingent Valuation method is a survey-based technique used to examine how consumers evaluate goods and services not found in the market place (Venkatachalam, 2004). This method is used to estimate non-use values and nonmarket use values, and it is the most widely used method for estimating non-use values. While the conventional revealed preference methods such as travel cost method are not capable of capturing non-use values, the only method that is identified for estimating these values is the contingency valuation (Venkatachalam, 2004).

A vast literature exists on contingent valuation where willingness to pay (WTP) or willingness to accept (WTA) has been employed to obtain valuation measures (Halstead *et al*., 2002). The WTP or WTA from the hypothetical market are treated as estimates of the value of the non-market good or service, contingent upon the existence of the hypothetical market. However, Hanemann and Kanninen (1996) note that CVM

surveys produce meaningful results if they are properly grounded in a consumer maximization framework In this framework, the consumer is assumed to maximize his/her utility subject to a budget constraint, and would choose the option that gives him/her the highest utility. In this context, WTP is the maximum amount of money a consumer would be willing to pay for the new product (Kimenju and De Groote, 2005). In CVM, WTP can be solicited by using open-ended questions where respondents are asked to state the maximum amount they would be willing to pay for a product with no value suggested to them, or close-ended questions where respondents are asked if they would be willing to pay a specific amount or not-known as dichotomous choice response (Hanky *et al*., 1997). The Open-ended questions provide direct estimates and are easy to analyze in a willingness to pay situation for the product or service (Hanemann and Kanninen, 1996). As rightly pointed out by Arrow *et al*. (1993), the open-ended format could be problematic since the respondent might not have sufficient information to thoroughly consider the values they would attach to such good if a market were to exist, and might not return realistic estimates. Close-ended questions on the other hand, are easier to respond and are more realistic since they correspond more to a real market situation, where the consumer is presented with a price for a product, and faces a "yes/no" decision (Kimenju and De Groote, 2008).

There are various formats of close-ended questions used in willingness to pay or willingness to accept studies, but the most commonly used close-ended questions are single-bounded and the double-bounded dichotomous choice questions (Hanemann and Kanninen, 1996). In the single-bounded method, the individual only responds to one bid. This could be incentive-compatible since it is the respondent's strategic interest to

say "yes" if his/her WTP is greater or equal to the proposed price and "no" otherwise (Mitchell and Carson, 1989). A respondent whose utility is maximized answers "yes" to the offered bid if his/her maximum WTP is greater than the bid. However, the single-bound method requires a large sample size and is statistically not very efficient (Hanemann *et al*., 1991). With the double-bounded dichotomous choice technique, a second bid is offered, which is higher or lower depending on the first response. This makes the double-bounded technique statistically more efficient than the single-bounded dichotomous choice technique (Kanninen, 1993; Hanemann *et al*., 1991). This method also incorporates more information about an individual's WTP and therefore provides more efficient estimates and tighter confidence intervals (Hanemann *et al*., 1991). The double-bounded approach has been used extensively in valuing nonmarket goods, as well as for consumer acceptance of GM crops (Kaneko and Chern, 2003; Li *et al*., 2002; McCluskey *et al*., 2003). The analysis however requires maximum likelihood estimation, and the interpretation is not always straightforward.

Different consumers have different WTP for a particular good, and it is the distribution of this WTP among the target population that offers interesting market information. In the dichotomous choice approach, WTP is not directly observed, but assumptions are made about its distribution, thus allowing for estimation of the parameters of the distribution. With this approach, the mean WTP in monetary terms could be derived from the survey (Lusk and Hudson, 2004). The Contingent Valuation Method is selected for this study because of its appropriateness when dealing with estimation of non-use values, despite the criticisms of its hypothetical nature

(Hanemann *et al*., 1991). Out of the several dichotomous choice approaches that have been developed, including the single-bounded, the double-bounded, and the multi-bounded approaches (Kimenju and De Groote, 2008). The double-bounded dichotomous choice technique is employed in this study. This technique has a good theoretical justification in that it is incentive compatible and leads to unbiased estimates. It is more efficient than the single-bounded approach and has been used in many consumer studies on acceptance of GM food (Hanemann *et al*., 1991). Moreover, the maximum likelihood procedure of using the logistic distribution is fairly straightforward with standard econometric software.

3.1.3 Empirical Estimation of Mean WTP

WTP can be assumed to have a probability density function (pdf) around a mean in the function of the price. In most valuation literature, the logistic distribution is employed where the price enters indirectly in the argument, called the index function ν (Kimenju *et al.*, 2005). The most common index function is linear in the price or bid β:

$$\nu = \alpha - \rho\beta \tag{6}$$

and the probability density function (pdf) of the WTP is expressed as:

$$P(WTP = \beta) = \exp(\nu)/(1+\exp(\nu)) \tag{7}$$

The logistic function has an advantage of a closed form cumulative distribution function (cdf), which represents the proportion of the population whose willingness to pay falls below a certain value β (Kimenju *et al.*, 2005),

$$G(\beta) = P(WTP < \beta) = 1/(1+\exp(\nu)) \tag{8}$$

Consumers who accept an offer β are those whose WTP is higher than β, so the probability of someone accepting is the opposite of the above function:

$$P(WTP > \beta) = \pi^{y}(\beta) = 1 - G(\beta) \tag{9}$$

In a double bounded contingent valuation framework, the consumer is presented with two bids, with the second bid contingent upon the response to the first bid (Kimenju *et al.*, 2005). If the individual responds "yes" to the first bid, the second bid B_i^u is some amount greater than the first bid $\left(B_i^u > B_i\right)$; if the individual responds "no" to the first bid, the second bid, B_i^d is some amount smaller than the first bid $\left(B_i^d < B_i\right)$. There is therefore four possible outcomes: a "yes" to the bid followed by a "yes" to the second bid (π^{yy}), a "yes" followed by a "no" (π^{yn}), a "no" followed by a "yes" (π^{ny}), and the case where both responses are "no" (π^{nn}) (Kimenju *et al.*, 2005). To receive information on a wider range of values, the bids differ between respondents.

The probability that both questions receive a "yes" answer equals the probability that the respondent's WTP is higher than the highest bid (Kimenju *et al.*, 2008):

$$\pi^{yy}\left(B_{i,}B_i^u\right) = \Pr\left(B_i^u \le \max WTP_i\right) = 1 - G\left(B_i^u\right) \tag{10}$$

Similarly, the probability of receiving a "yes" followed by a "no" answer equals the probability that the WTP of respondent fall between the initial bid and the second higher bid (Kimenju *et al.*, 2005):

$$\pi^{yn}\left(B_{i,}B_i^u\right) = \Pr\left(B_i \le \max WTP_i \le B_i^u\right) = G\left(B_i^u\right) - G\left(B_i\right) \tag{11}$$

The probability of receiving a "no" followed by a "yes" is again the probability that the WTP falls between the initial and the second lower bid:

$$\pi^{ny}\left(B_{i,}B_i^d\right)=\Pr\left(B_i^d\le\max WTP_i\le B_i\right)=G\left(B_i\right)-G\left(B_i^d\right) \tag{12}$$

The probability of receiving two "no" answers are equal to the probability that the WTP falls below the second lower bid:

$$\pi^{nn}\left(B_{i,}B_i^d\right)=\Pr\left(B_i>\max WTP_i\ ;B_i^d>WTP_i\right)=G\left(B_i^d\right) \tag{13}$$

Combining the probabilities of the four outcomes, the log-likelihood function for a sample takes the form:

$$\ln L^D\left(\theta\right)=\sum_{i=1}^{N}\begin{Bmatrix}d_i^{yy}\ln\pi^{yy}\left(B_{i,}B_i^u\right)+d_i^{nn}\ln\pi^{nn}\left(B_{i,}B_i^d\right)+d_i^{yn}\ln\pi^{yn}\left(B_{i,}B_i^u\right)\\+d_i^{ny}\ln\pi^{ny}\left(B_{i,}B_i^d\right)\end{Bmatrix} \tag{14}$$

where, d_i^{yy}, d_i^{nn}, d_i^{yn} and d_i^{ny} are binary variables denoting 1 if the consumer is willingness to pay for the organic product and 0 otherwise. Kimenju *et al.* (2008) point out the parameters could be estimated by maximizing the likelihood function. The mean WTP can then be evaluated as: Mean WTP= $\frac{\alpha}{\rho}$

where, α is the coefficient of the intercept term and ρ = bid price

3.1.4 Empirical Discussion on Factors which Influence WTP

The demand for quality products are determined by different sets of variables compared to the traditional market demand analysis. Every consumer perceives quality differently so it is normal to find that one consumer's utility would increases as particular quality attribute increases, whereas another consumer's utility decreases for the same quality (Kimenju *et al*., 2008). Demand for products therefore depends on an individual's perceived qualities, which are subjective implying the demand is influenced by an individual's knowledge and perception of that quality as well as

product attributes or characteristics associated with the quality. As Kimenju *et al.* (2005) has indicated, WTP is influenced by consumer's knowledge and perception, in addition to price and socio-economic factors. Moreover, consumer's WTP may be influenced by individual's tastes and preferences, income, and perceptions on the products, in addition to household and socio-economic characteristics (Cranfield and Magnusson, 2003).

Following Chen *et al*. (2002) and Kimenju *et al*. (2005), a logit model is specified to examine the relationship between WTP and socio-economic variables, product characteristics, and attitudes and perceptions about the product. The WTP by a consumer j choosing an organic food can be specified as:

$$WTP = \rho_i \beta_j + \phi_i Z_j + \varepsilon_{ij} \quad (15)$$

The error term in (14) is assumed to have a logistic distribution with zero mean and a variance of $\tau^2/3$.

Formally, the logistic model explaining consumers' WTP premium for organic products is specified as:

$$WTP = \alpha + \rho\beta + \phi Z + \varepsilon \quad (16)$$

where;

$$WTP = \begin{cases} 1 \text{ if the consumer is willing to pay a premium for an organic food product} \\ 0 \text{ otherwise} \end{cases}$$

β = price bid

z = a vector of explanatory (Kimenju *et al.*, 2008; Chen and Chern, 2002).

Specifically, the logit regression explaining consumers' WTP for organic vegetables is specified as:

$$\begin{aligned} WTPVEG = {} & \alpha + \rho\beta + \phi_1 Age1 + \phi_2 Age2 + \phi_3 Age3 + \phi_4 Gend + \phi_5 Hhsize \\ & + \phi_6 Child + \phi_7 Maristat + \phi_8 Edu + \phi_9 Rincome + \phi_{10} Incomelow \\ & + \phi_{11} Incomemidd + \phi_{12} Occuphh + \phi_{13} Or\inf o + \phi_{14} Know \\ & + \phi_{15} Pestconcern + \phi_{16} Hrisk + \phi_{17} Econcern + \phi_{18} Envirperc \\ & + \phi_{19} Tasteperc + \phi_{20} Hameffperc + \phi_{21}\Pr eserperc + \phi_{22} Tasham \\ & + \phi_{23} Enviham + \phi_{24} Vegcolour + \phi_{25} Vegfreshness + \phi_{26} Vegsize \\ & + \phi_{27} Veghardness + \phi_{28} Vegindaf + \phi_{29} Vegclean\phi + \varepsilon \end{aligned} \quad (17)$$

Similarly, the logit model explaining the factors which influence consumers' WTP for organic fruits is formally specified as:

$$\begin{aligned} WTPFRUIT = {} & \alpha + \rho\beta + \phi_1 Age1 + \phi_2 Age2 + \phi_3 Age3 + \phi_4 Gend \\ & + \phi_5 Hhsize + \phi_6 Child + \phi_7 Maristat + \phi_8 Edu \\ & + \phi_9 Incomelow + \phi_{10} Incomemidd + \phi_{11} Incomehigh \\ & + \phi_{12} Occuphh + \phi_{13} Or\inf o + \phi_{14} Know + \phi_{15} Pestconcern \\ & + \phi_{16} Hrisk + \phi_{17} Econcern + \phi_{18} Envirperc + \phi 19 Tasteperc \\ & + \phi_{20} Hameffperc + \phi_{21}\Pr eserperc + \phi_{22} Tasham + \phi_{23} Enviham \\ & + \phi_{24} Frugcolour + \phi_{25} Frufreshness + \phi_{26} Frusize + \phi_{27} Fruindaf \\ & + \phi_{28} Fruclean + \varepsilon \end{aligned} \quad (18)$$

The detailed definitions of the variables employed in the empirical models (17) and (18) are provided in table 3.1.

Table 3.1: List of variables and their definitions

Variable	Definition of variable
Demographic	
AGE	Age (years)
AGE 1	1 if individual is 35 years or less, 0 otherwise
AGE 2	1 if individual is between 35 – 55 years , 0 otherwise
AGE 3	1 if individual is above 55 years, 0 otherwise
GEND	Gender (1 if individual is a male, 0 otherwise)
HHSIZE	Household size (total number)
CHILD	Household with children less than 15 years (total number)
MARISTAT	Marital status (1 if individual is married, 0 otherwise)
EDU	Educational level (years)
RINCOME	Average monthly income (Ghana Cedis)
INCOMELOW	Low income (1 if individual household earns at most Gh¢ 100, 0 otherwise)
INCOMEMIDD	Middle income (1 if individual household earns between Gh¢ 100 and Gh¢200, 0 otherwise)
INCOMEHIGH	High income (1 if individual household earns at least Gh¢200, 0 otherwise)
OCCUPHH	Employment (1 if individual is employed, 0 otherwise)
Knowledge and awareness	
ORINFO	Organic information (1 if individual has heard about organic products, 0 otherwise)
KNOW	Knowledge (1 if individual has knowledge about chemical residues in conventional products, 0 otherwise)
PESTCONCERN	Pesticides concern (1 if individual has concern about pesticides usage, 0 otherwise)
HRISK	Health risk (1 if individual has knowledge about health risk associated chemically grown products, 0 otherwise)
ECONCERN	Environmental concern (1 if individual has concern that chemically grown products affect the environment, 0 otherwise)
Product perception	
ENVIRPERC	Environmental perception (perception indices calculated from likert scale of 1-strongly disagree to 5-strongly agree)
TASTEPERC	Taste perception (perception indices calculated from likert scale of 1-strongly disagree to 5-strongly agree)
HAMEFFPERC	Harmful effect perception (perception indices calculated from likert scale of 1-strongly disagree to 5-strongly agree)
PRESERPERC	Preservation quality perception (perception indices calculated from likert scale of 1-strongly disagree to 5-strongly agree)
TASHAM	Taste-harmful effects perception (perception indices calculated from likert scale of 1-strongly disagree to 5-strongly agree)
ENVIHAM	Environment-harmful effects perception (perception indices calculated from likert scale of 1-strongly disagree to 5-strongly agree)
Product characteristics	
VEGCOLOUR	Vegetable colour (1 if individual considers colour, 0 otherwise)
VEGFRESHNESS	Vegetable freshness (1 if individual considers freshness, 0 otherwise)
VEGSIZE	Vegetable size (1 if individual considers size, 0 otherwise)
VEGHARDNESS	Vegetable hardness (1 if individual considers hardness, 0 otherwise)
VEGINDAF	Vegetable insect damage free (1 if individual considers insect damage free,

	0 otherwise)
VEGDFCLEAN	Vegetable cleanliness (1 if individual considers dirt free, 0 otherwise)
FRUCOLOUR	Fruit colour (1 if individual considers colour, 0 otherwise)
FRUFRESH	Fruit freshness (1 if individual considers freshness, 0 otherwise)
FRUSIZE	Fruit size (1 if individual considers size, 0 otherwise)
FRUINDAF	Fruit insect damage free (1 if individual considers Insect damage free, 0 otherwise)
FRUDFCLEAN	Fruit cleanliness (1 if individual considers dirt free, 0 otherwise)

Source: Field Survey, 2008

3.1.5 Estimation of Market Potential

The estimation of market potential for a product is critical in evaluating its viability. It also provides an estimate of the maximum total sales potential for a given market (Lehmann *et al.*, 2005; Wolfe, 2006). Once the estimated market potential has been calculated, it would be possible to determine if the market is large enough to sustain the proposed production or sustain an additional producer in the market place (Wolfe, 2006). The total value of the product is estimated by multiplying the mean WTP by the number of household or the population depending on the sample unit used (Asafu-Adjaye, 2000). It is important to note that the estimated market potential sets an upper boundary on the market size and can be expressed in either units and/or sales (Wolfe, 2006). Estimating the market potential for a product requires specific information such as the number of potential buyers, an average selling price, and an estimate of the consumption or purchasing rate for a specific period of time. Once these variables are obtained, the market potential is derived as:

$$MP = N \times P \times Q \times \mathrm{A} \tag{19}$$

where: MP = Market potential, N = Number of possible buyers, P = Average selling price or average premium willingness to pay, Q = Average annual purchasing rate, A = Average purchase quantity.

3.1.6 Hypotheses of the Study

The following hypotheses would be validated:

1. Consumers who perceive organic fruits and vegetables as risky are less likely to consume the products.
2. Consumers' willingness to pay for organic fruits and vegetables are influenced by socio-economic and product characteristics such as age, sex, education, income, household size and children in households.
3. There is a market potential for organic fruits and vegetables in Kumasi.

3.2 Study Area

Kumasi is the second largest and one of the fastest growing urban cities in Ghana with an estimated population of 1.6 million and annual growth rate of 4.7% (Ghana Statistical Service, 2002). The population of Kumasi is made up of about 49.8% male as compared to about 50.2% female population (GLSS, 2002). The total number of houses in the metropolis was estimated to be about 67,434 constituting about 231,434 households with an average annual increase of 2.6% (GLSS, 2002). It covers a total area of 157km^2 and the topography of the region varies from gently undulating to distinctly hilly and mountainous (Obuobie *et al.*, 2006). The city is located in the middle portion of Ghana. The middle belt of Ghana is predominately rainforest and is one of the major cocoa-producing regions in Ghana. The region has two major seasons, the rainy and dry seasons. The rainy season experiences major rains between March and July and the minor rains between September and November with an annual rainfall of about 1300mm. The relative humidity ranges between 1270 to 1410mm with average

daily sunshine durations ranging between 2 to 7 hours and daily minimum and maximum temperatures of 21.20^{o}C and 35.50^{o}C, respectively (Kumasi Meteorological Service Station, 2002).

The economically active population in the metropolis is 71.4%. Majority of these people are self-employed, mainly in the private informal sector. The private informal sector provides job opportunities particularly for females with little or no formal education. The main economic activities in the metropolis are; the agricultural sector, the industrial sector and the services sector. The agricultural sector accounts for about 10% of the metropolis gross domestic product (GDP). The industrial and service sectors contribute approximately 30% and 60% of the metropolis gross domestic product (GDP) respectively. Almost 50% of the labour force in the industrial sector is employed in the wood and wood related industries. The service sector is the largest important sector in the metropolis, contributing about 60% of its gross domestic product (GDP). The metropolis is noted for its small-scale enterprises and artisan activities, particularly in the areas of furniture-making, vehicle engineering, woodwork, leatherwork and cloth weaving. The shoe-making activities are prominent in Kumasi too, because the city once hosted a state-owned shoe factory (Suraj, 2004). Significant non-traditional skills in the Kumasi metropolis workforce are displayed in the broad range of auto-motive workshops within the Suame Magazine and also in breweries such as the Guinness Brewery in the city (Suraj, 2004). Kumasi has 41 hectares in urban area under vegetable irrigation and about 12,000 hectares of peri-urban area is under irrigated vegetable farming mostly during the dry season (Cornish and Lawrence, 2001).

Kumasi is a major market for vegetables produced within urban and the peri-urban areas of the city (Obuobie *et al.*, 2006).

3.3 Data Collection

This section considers the sampling procedure, survey design, and questionnaire design employed in the data collection. In addition data analyses are discussed.

3.3.1 Survey Design, Sample Size and Sampling Method

The data used in this study was obtained through a household survey conducted in Kumasi metropolis of Ghana in November, 2008. The surveyed population was fruits and vegetables consuming households, and was selected based on income groups of households. One reason for using income groups as a basis is that consumption is a function of income (Edgmand, 1987). Also, literature (Boccaletti *et al.*, 2000) suggests that households with higher income are willing to pay more for organic fruits and vegetables. A multistage sampling technique was employed for this study. This was used to ensure fair representation of the various consumer groups within the metropolis. The communities were clustered into low, middle and high income groups using available data from Kumasi Metropolitan Assembly (KMA).

For the first stage, the communities were purposefully sampled. In all, a total of 20 communities were considered in the survey for this study; 10 communities from low income category, 6 communities from middle income category and 4 communities from high income category. At the second stage, households were randomly selected from the various communities accordingly.

Table 3.2: Residential Income Classes of Communites in the Kumasi Metropolis

High Income	Dadiesoaba, Asokwa, West Ayigya, Mbrom, Adiebeba, Adiembra, Ahodwo, Danyame, Odeneho Kwadaso, Aketego, Bomso, Bompe, Ridge, Nhyiaso, Extension, Parakuo Estate, Daban New Site, New Amakom Extension, Asokwa Residential Area
Middle Income	Asafo, Amakom, Airport, Bantama, Dichemso, Aprade, New Tafo, Asebi, Anyinam, Kuwait, Atonsu, New Atonsu, Gyenyase, New Agogo, Adoato, Kyirapatre Estate, Bohyen, Adumanu, Adumanu Extension, Asanti Newtown, Apiri, North Suntreso, Kotei, South Suntreso, Boadi West Patase, Ohwimase, Kwadaso Estate, Santase Odumase Extension, Patase, Kentinkrono
Low Income	Apatrapa, Dompoase, Aboabo, Moshie Zongo, Dichemso, Old Tafo, Ayigya Zongo, Dakwadwom, Sawaba, Yalwa, Daban, Kaase, Sokoban, Nsenee, Ahinsan, Anwomaso, Gyinyase, Adukrom, Asewase, Buobai, Nima, Pakuso, Abrepo, Sokoban, Amanfrom, Yenyawso, Buokrom, Ayeduase

Source: Kumasi Metropolitan Assembly (2007)

A total of 450 households were randomly selected with the expression $n = \left(\frac{zs}{E}\right)^2$ where, n is the sample size, z is the standard normal corresponding to the confidence level, s is the population standard deviation and E is the standard error (Lind *et al*., 2005; Bluman, 2004). The households within each stratum were proportionately sampled according to these percentages; 19.3%, 30% and 50.7% (GLSS, 2000) for high, middle and low income earning categories of respondents. Table 3.3 shows the communities and the corresponding households sampled for the study. Within the households, the required information were collected from individuals in charge of food purchasing and preparation.

Table 3.3: Distribution of Households Sampled within the Sampled Residential Communities.

Income Category	Communities	No of Households
High Income	Asokwa	22
	Bomso	22
	Dadiesoaba	22
	Nyieso	21
Middle Income	Ashanti New Town	22
	Dichemso	23
	Kwadaso estate	22
	New Tafo	23
	Suntreso	23
	West Patasi	22
Low Income	Aboabo	23
	Anwomaso	22
	Asuoyeboa	22
	Daban	23
	Dakodwom	23
	Dompoase	23
	Gyinyase	23
	Kaase	23
	Pankrono	23
	Sokoban	23

Source: Survey data, 2008

Within houses which contain several households, systematic random sampling method was employed. If a household is sampled and it turns out that they not consume fruits and vegetables, the household is dropped and the next household immediately after that selected instead. The face-to-face interview technique was employed using a structured questionnaire. This was to provide the opportunity to explain questions which were difficult to answer, to obtain the exact information needed for the study, and also to afford the interviewer the opportunity to educate the respondents.

3.3.2 Questionnaire Design and Data Analysis

The questionnaire comprised of five sections; the first section included questions on consumers' socio-economic characteristics such as age, income, gender, household size, number of children in a household and educational level. The second section contained questions on consumers' food safety concerns and product characteristics, and the third section included questions on consumers' food purchase frequency, expenditure on fruits and vegetables and their usage rate. In the fourth section, questions on consumer attitude and perception were discussed whilst the final section obtained information on consumers willingness to pay (WTP) for organic fruits and vegetables. The WTP questions were design with double-bounded, dichotomous choice contingent valuation format. The contingent valuation method questions were included in the survey instrument to assess consumers' willingness-to-pay a premium for organic fruits and vegetables. The survey questionnaire was pre-tested in 30 households at Bomso and Pankrono, all suburbs of Kumasi. The structured questionnaires consisted of both open-ended and closed-ended questions. The open-ended questions gave the respondents the chance to express their views about organic products. The closed-ended questions on the other hand gave the respondents pre-coded responses in which the respondents selected the option they agreed most. In the double-bounded, dichotomous choice contingent valuation part of the questionnaire, the consumers were presented with a first bid. The consumer who accepts initial amount was given a second bid which is higher than the initial bid. The second bid was varied among the respondents. On the contrary, where the consumer declined the initial bid, a second lower bid was offered. Amounts in the second bids were also varied with consumers. In both scenarios, some

consumers accepted the second bids whiles some also declined. However, before the Contingency Valuation was presented to the respondents, the concept of organic products in terms of its attributes and the benefits were explained to those unaware of the products. The double-bound dichotomous choice contingent valuation approach was used to estimate the mean willing-to-pay for organic fruits and vegetables. This method gave more information about an individual's WTA and provided more efficient estimates and tighter confidence interval (Hanemann et al., 1991).The attitudes of consumers were measured using perception indices. Respondents were asked if they agree or disagree with some statements on organic fruits and vegetables. The responses were coded into five classes from strongly disagree to strongly agree (-1=strongly disagree, -0.5=disagree, 0=neutral, 0.5=agree and 1=strongly agree). These responses were then averaged to form an index called the perception index.

A total of 429 out of 450 questionnaires were valid and included in the data analysis accordingly. The data were analyzed in two ways. First, a descriptive analysis of important variables was conducted using frequency analysis and mean tests. Second, the association of organic food willingness to pay with socio-economic, institutional, perception variables and product characteristics were analyzed using logit regression analysis. The estimated parameters were obtained using the STATA software.

CHAPTER FOUR

RESULTS AND DISCUSSIONS

This chapter is made up of three main sections. In Section one, descriptive analyses based on the survey data are undertaken. The descriptive analyses cover socio-demographic characteristics, the knowledge of consumers on organic products and their sources of information, fruits and vegetable consumption behavior, consumer health concerns on fruits and vegetables, purchase frequency and expenditure on products, consumer perception on organic fruits and vegetables, organic price premium information, distribution of willingness to pay responses, and consumers willingness to pay for fruits and vegetables. Section two, discusses the empirical results on WTP without consumer characteristics and WTP with consumer characteristics or attributes. Finally, the estimated market potential for organic vegetables and fruits are discussed in Section three.

4.1 Descriptive Analyses

This section is made up of the descriptive part of the results. In this section, socio-economic characteristics, consumer knowledge on organic products and sources of information, fruits and vegetables consumers' behavior, consumer health concerns on fruits and vegetables, and purchase frequency and expenditure on organic products. Also, consumer perception on organic fruits and vegetables, information on price premium for organic products, distribution of responses on consumers' WTP, and consumers' willingness to pay for organic vegetables and fruits are discussed.

4.1.1. Socio-Demographic Characteristics

The socio-demographic characteristics of the sampled fruits and vegetables consumers are shown in table 4.1. The sample was made up of about 93% females.

Table 4.1 Distribution of socio-demographic characteristics

Variable		Frequency	Percentage (%)
Edu (Education level)			
	No Education	56	13.05
	Primary	41	9.56
	J.H.S/Middle	216	50.35
	Senior High School	74	17.25
	Voc/Tech	22	5.13
	Tertiary	20	4.66
Gend (Gender)			
	Male	30	7
	Female	399	93
Maristat (Marital Status)			
	Married	263	61.3
	Single	106	24.7
	Divorced	29	6.8
	Widowed	31	7.2
Occop (Employment Status)			
	Formally employed	49	11.4
	Self-employed	349	81.4
	Unemployed	21	4.9
	Students	10	2.3
Variable		Mean	Standard Deviation
Edu		8.55	4.217
Age		35.99	13.186
HHsize (Household Size)		5.39	3.120
Number of children < 18 years			
Children (Less than 6 years)		0.86	0.973
Children (Between 6-14 years)		1.09	1.135
Children (Between 15-18 years)		1.43	1.737
HHincome (Household Income/month)		262.59	314.971

Note: 1 US Dollar ($) =1.2141 Ghana New Cedi (GH¢) in 2008.
Source: Field Survey, 2008

The high female percentage may be attributed to the fact that in most households in Ghana, females (women) are responsible for purchasing and preparing of food

(Assibey-Mensah, 1998). The average age of the sampled consumers was 35.99 years with a minimum age of 13 years and a maximum age of 80 years.

About 50% of them had junior high school/middle school education, 17% had senior high school education and 4.66% had tertiary education. However about 13.05% of the consumers had no education. The average number of years of education among the respondents was 8.55, which is higher than the average Ghanaian schooling years of 5.16 (GLSS, 2000), suggesting that this study captured more educated consumers. The average household size was 5.4 members per household, and this compares favourably with the national average of 5.5 members per household (Ghana Statistical Service, 2000). The mean number of children of respondents less than 6 years in a household was 0.86. For the children between 6 – 14 years, the average was 1.09 per household whilst the mean number of children between 15 – 18 years per household was 1.43. The average household income per month of the sampled consumers was GH¢262.59 with a minimum of GH¢10.00 and a maximum of GH¢4000.00.

4.1.2 Consumer Knowledge on Organic Products and Sources of Information

As shown in table 4.2, about 46.6% of the respondents indicated some awareness of organic products. They became aware of organic products through radio (38%), newspaper (2.5%), television (2.5%), friends and relative (47%), and either from schools or by reading of books and magazines (9.5%). Both newspapers and television as an information source for organic fruits and vegetables recorded 2.5% each from the

sampled respondents. The high percentage for friends and relatives could be attributed to the closely net social structure in Ghanaian communities.

Table 4.2 Knowledge on organic products and sources of information

Variable		Frequency	Percentage (%)
Respondents awareness about Organic Products			
	Yes	200	46.6
	No	229	53.4
Source of Information			
	Radio	77	38.5
	Newspaper	5	2.5
	Television	5	2.5
	Friends/Relatives	94	47.0
	Schools/Books/ Magazines	19	9.5

Source: Field Survey, 2008

The proliferation of radio stations across the country of late, and also most health education programmes are broadcast in the local languages might also have contributed to higher awareness of organic products through the media.

4.1.3 Fruits and Vegetables Consumers' Behaviour

The motive of most of the consumers for purchasing organic products was based on health grounds (96.04%). Magnusson *et al*. (2001) reported that most Swedish consumers consider organic fruits and vegetables to be healthier than their conventionally produced alternatives. Other previous studies have also shown that health is a strong motive for buying organic products (Tregear *et al*., 1994; Wandel and Bugge, 1997; Magnusson *et al*., 2001). About 29.37% however preferred organic products because of their tastes compared to conventional products. This result agrees with other existing consumer surveys which found taste as one of the most important

motives for purchasing organic fruits and vegetables by consumers (Magnusson *et al*., 2001; Wandel and Bugge, 1997). The safety and environmental reasons for consuming organic products also accounted for 16.78% and 0.47% respectively. About 35.5% of the respondents indicated that they would always buy organic fruits and vegetables but 38.9 % also mentioned they purchase organic products frequently. Only 1.2 % admitted they would never purchase organic fruits and vegetables (Table 4.3).

Table 4.3 Fruits and Vegetable Consumption Behaviour

Variable		Frequency	Percentage (%)
Motives for purchases			
	Healthy	412	96.04
	Safer	72	16.78
	Taste better	126	29.37
	Better for the environment	2	0.47
Frequency of purchase			
	Always	161	37.5
	Frequently	167	38.9
	Sometimes	88	20.5
	Very seldom	8	1.9
	Never	5	1.2
Market preference			
	Farm gate	53	12.35
	Market retailers	301	70.16
	Street hawkers	10	2.33
	Supermarket	79	18.42
Method of differentiation			
	Labeling	208	48.50
	Selling in special market and stores	154	35.90
	Labeling and selling in special markets	39	9.10
	Declaration by sellers	4	0.90
	Price differentiation	13	3.00
	No response	11	2.60

Source: Field Survey, 2008

To improve access to organic products, most of the sampled consumers (70.16%) preferred the products to be sold by foodstuff retailers. Fotopoulos *et al*.

(2002) also found out that 75.1% of consumers buy organic products from open or retail markets.

The survey data also indicate that, 18.42% of the consumers would prefer buying organic products from supermarkets, a result which is inconsistent with the study by Fotopoulos *et al*. (2002), who observed 80.9 % of consumers making their purchases from supermarkets because of the quality of their products. Only 2.33% indicated they would purchase organic produce from street hawkers. Based on the results obtained for market preference, 48.5% of the respondents stated that they want organic products to be differentiated from conventional products by labeling. About 35.9% of the consumers indicated they want special markets or shops to be created for organic products in Ghana.

4.1.4 Consumers Health Concerns on Fruits and Vegetables

As already indicated in table 4.3, most of the consumers gave health concerns as the main reason why they preferred organic products. We therefore investigated their specific health concerns on consuming organic fruits and vegetables. As reported in table 4.4, about 85.3% of them were aware of the use of chemicals in the production of fruits and vegetables. About 74.8% cautioned that the use of chemicals in fruit and vegetable production has negative implications for the environment while 25.2% were of the view that chemical usage has no environmental effect.

Table 4.4 Consumer Health Concerns on Fruits and Vegetables

Variable		Frequency	Percentage (%)
Knowledge of used of chemical on vegetables and fruits			
	Yes	366	85.3
	No	63	14.7
Concerns about the environment			
	Yes	321	74.8
	No	108	25.2
Knowledge of diseases associated with the consumption of chemically grown fruits and vegetables			
	Yes	381	88.8
	No	48	11.2
Diseases cause by chemically grown and Contaminated fruits and vegetables			
	Blood Pressure	149	34.73
	Stroke	54	12.59
	Heart attack	45	10.49
	Cancer	49	11.42
	Diabetes	43	10.02
	Typhoid	26	6.06
	Cholera/Diarrhoea	63	14.69

Source: Field Survey, 2008

About 88.8% were of the opinion that consuming fruits and vegetables produced with chemicals could cause diseases to humans. The mentioned diseases like blood pressure (34.73%), stroke (12.59%), diabetic (10.02%), typhoid (6.06%), and cholera/diarrhoea (14.69%) (Figure 1). Some were even of the view that improper use of chemicals in the production of fruits and vegetables could cause heart attack (10.49%), and cancer (11.42%). However, some of the diseases mention show that consumers have misconceptions about the consumption of conventional fruits and vegetables which need to be addressed.

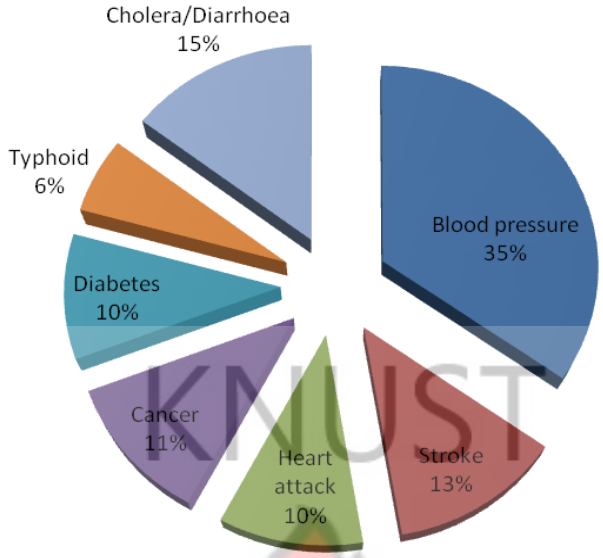

Figure 1 Distribution of diseases caused by chemically produce fruits and vegetables

Source: Survey data, 2008

4.1.5 Consumers Purchase Frequency and Expenditure on Organic Products

As indicated in table 4.5, an average expenditure on vegetables per month was GH¢2.37,

Table 4.5 Distribution of Purchase Frequency and Expenditure on Organic Products

Products	Mean purchase frequency per month	Standard deviation	Mean expenditure on the products per month	Standard deviation
Vegetables				
Green pepper	5.52	5.7	2.5353	3.31
Spring onions	6.18	7.63	3.1070	4.46
Green beans	3.63	4.11	1.4629	2.77
Carrot	5.59	6.19	2.9683	4.40
Lettuce	3.79	5.28	1.7110	3.15
Fruits				
Water melon	5.80	7.49	3.2446	5.50
Pineapple	3.89	5.52	2.2233	3.85

Note: 1 US Dollar ($) = 1.2141 Ghana New Cedi (GH¢) in 2008.
Source: Author's calculations, 2009

and the average amount spend on fruits was GH¢2.73 per month per household. The average annual expenditure on vegetables was GH¢28.44 and for fruits, it was GH¢32.76. These expenditure values are higher than the national averages of GH¢16.96 for vegetables and GH¢2.47 for fruits (GLSS 4, 2000). The observed increases in household expenditures for the organic commodities may be attributed to increased media coverage on adopting healthy lifestyle through consumption of fruits and vegetables.

4.1.6 Consumer Perception on Organic Fruits and Vegetables

There is a link between attitudes and perceptions. Consumers' willingness to pay for products is influence largely by their attitudes, and as such consumers' perceptions are important in their demand decisions making. We investigated consumer's perception on the quality, benefit and environmental risk associated with the consumption of organic fruits and vegetables. Each perception response was measured on a five point likert scale with score from (-1 for "strongly disagree" to +1 for "strongly agreed"). The positive scores were 0.5 for agree, 1 for strongly agree, -1 for strongly disagree and -0.5 for disagree. As indicated in table 4.6, consumers' perception on organic fruits and vegetables were generally positive. About 70% of the consumers strongly agreed and 19.8% agreed that consumption of organic fruits and vegetables improves ones health. The average score for the health perception was 0.75. Most of them also strongly agreed (69.7%) and agreed (20.5%) that organic products are tastier and the average taste perception was 0.76. Averaging the two scores on benefits gave a benefit perception index (BPI) of 0.76. However, consumers who were aware of organic products had a lower benefit perception index.

Table 4.6 Consumers' attitude and perception on organic products

		Number of respondents					Mean score		
Perception of	Statement	Strongly disagree (score = -1)	Disagree (score = -0.5)	Neutral (score = 0)	Agree (score = 0.5)	Strongly agree (score = 1)	Consumers aware	Consumers not aware	Overall
Benefit	organic products are healthier	10	23	12	85	299	0.67	0.81	0.75
	organic products are tastier	9	15	18	88	299	0.69	0.83	0.76
	Benefit perception index (BPI)						0.68	0.82	0.76
Quality	organic products have no harmful effect	4	26	12	155	232	0.58	0.77	0.68
	organic products have superior quality	32	38	18	140	201	0.5	0.52	0.51
	Quality perception index (QPI)						0.54	0.65	0.60
Environmental risk	production of organic products make the environment safe	10	27	51	166	175	0.51	0.58	0.55
	Environmental perception index (EPI)						0.51	0.58	0.55

Source: Field Survey, 2008

Respondents' perception on harmful effect of consuming organic products was also positive. About 54% strongly agreed and 36.1% agreed that consumption of organic fruits and vegetable has no harmful effect. Also 46.9% strongly agreed and 32.6% agreed that compared to conventional products, organic products are of good quality. These gave mean scores of 0.68 and 0.51 respectively and averaging the mean scores gave a quality perception index (QPI) of 0.60. However consumers who were aware of organic fruits and vegetables (46.6%) had a lower QPI (0.54) than those who were not aware of organic fruits and vegetables (53.4%) with index of (0.65). More than half of the consumers were of the view that organic products have less or no environmental risk and the environmental risk perception index (EPI) was 0.55.

4.1.7 Information on price premium for Organic products

The prices of the five selected vegetables and the two fruits products were collected in Asafo Market and Central Market in the metropolis. These organic fruits and vegetables currently grown in Ghana were selected because consumers purchase them frequently on the market (IFOAM, 2003). Average price premium was calculated for each of the products. The aim of collecting this useful information was to obtain the premium price bids of the products to be used in the contingent valuation analysis. The selected products' description, the bid prices and their corresponding weights are presented in table 4.7. With the vegetables, a bid price of GH¢2.5/1Kg was used for green pepper WTP elicitation. Spring onions had a bid price of GH¢1 for a bunch weight of 1Kg in the contingent valuation. A bid price of GH¢1/1Kg and GH¢2/1Kg were utilize in the CV willingness to pay for fresh lettuce and green beans respectively. The bid price for a bunch of carrots used in the WTP contingent valuation was

GH¢2/1Kg. For the fruits, a bid price of 50Gp/1Kg and 50Gp/1Kg were employed for water melon and pineapple respectively in soliciting consumers WTP.

Table 4.7 Description of selected survey products and bidding price

Selected Products	Description	Hypothetical Bids (Prices in GH¢)	Weight of Products Corresponding the Bids
Vegetables			
Green Pepper	Whole fresh green pepper	2.50	1 Kg
Spring Onions	Bunch of fresh spring onions	1.00	1 Kg
Lettuce	Bunch of fresh lettuce	1.00	1 Kg
Green Beans	Bunch of fresh green beans	2.00	1 Kg
Carrot	Bunch of fresh carrot	2.00	1 Kg
Fruits			
Water Melon	Whole matured water melon	0.50	1 Kg
Pineapple	Whole matured pineapple	0.50	1 Kg

Note: 1 US Dollar ($) = 1.2141 Ghana New Cedi (GH¢) in 2008.
Source: Author's calculations, 2009

4.1.8 Distribution of Responses on Consumers' WTP

The distribution of responses on WTP was assessed to provide a fair idea on number of consumers and percentage premiums they were willing to pay for organic fruits and vegetables. The respondents were asked whether or not they are willing-to-pay a premium for organically grown produce. They were asked to indicate their WTP in monetary terms instead of percentage amounts so that we could have a fair idea of what pertains on the retail market. Table 4.8 shows that consumers exhibited varying WTP percentages. Around 71% to 87.7% of them indicated that their willingness to pay (WTP) premium for organic vegetables is more than 20% of the prices of the conventional vegetables on the markets. Also 0.2% to 19.6% admitted that they are WTP up to 20% more than the prices of vegetables on the markets. These results are in agreement with the study conducted on Swedish consumers by Ekelund (1990). His

finding was that around 81% of the consumers were WTP more than 20% price premium for organically grown vegetables. These findings however contrasts with the study in Sri Lanka by Piyasiri *et al*. (2002) who found 38% of consumers WTP more than 20% and 62% WTP up to 20% of the prices of vegetables. The contradiction could be attributed to the differences in structure of organic market in both countries. The Sri Lankan study used customers buying organic products from supermarkets as compare to this study which looks at consumers in general.

Table 4.8: Distribution of responses on WTP for organic products

	Not WTP	WTP 1 – 20% premium	WTP 21 – 40% premium	WTP 41 – 60% premium	WTP above 60% premium
Vegetables					
Green Pepper	14.2% (61)	13.3% (57)	19.6% (84)	28.7% (123)	24.2% (104)
Spring Onions	12.1% (52)	0.2% (1)	14.9% (64)	1.2% (5)	71.6% (307)
Lettuce	13.1% (56)	0.5% (2)	14.0% (60)	1.9% (8)	70.6% (303)
Green Beans	27.3% (117)	2.1% (9)	22.1% (95)	35.9% (154)	12.6% (54)
Carrot	13.3% (57)	0.2% (1)	21% (90)	34.0% (146)	31.5% (135)
Fruits					
Water Melon	13.52% (58)	19.8% (85)	62.2% (267)	(0)	4.4% (19)
Pineapple	13.3% (57)	0.9% (4)	20.0% (86)	36.6% (157)	29.1% (125)

Note: Figures in parentheses are frequencies
Source: Author's calculations, 2009

This study also found about 0.9% to 19.8% of consumers with AWTP for fruits of up to 20% while approximately 66% to 85.7% expressed their WTP more than 20% price premium over the conventional prices. This study finding is similar to that of Hack (1995), who found out that about 80% of Dutch consumers WTP is higher than

20% price premium over conventional fruits and vegetables. However, this study finding is different from Hutchins and Greenhalgh (1997), who found out that around 85% of UK consumers WTP is up to 20% price premium over conventional fruits and approximately 15% of consumers were WTP more than 20% price premium for organic fruits. Contrary to this empirical result, other studies found out that consumers WTP up to 20% price premium over conventional fruits and vegetables was higher than those WTP more than 20% (Govindasamy *et al*., 2001; Loureiro and Hine, 2002; Du Toit and Crafford, 2003; Radman,2005; Uratyan, 2007; Gonzalez, 2009).

4.1.9 Consumers Willingness to Pay for Organic Vegetables and Fruits

The distribution of consumers' willingness to pay for the selected fruits and vegetables are presented in figures 2 and 3 respectively. About 72% of the consumers were WTP a premium for pineapple while approximately 73% were also WTP a price premium for water melon (figure 2).

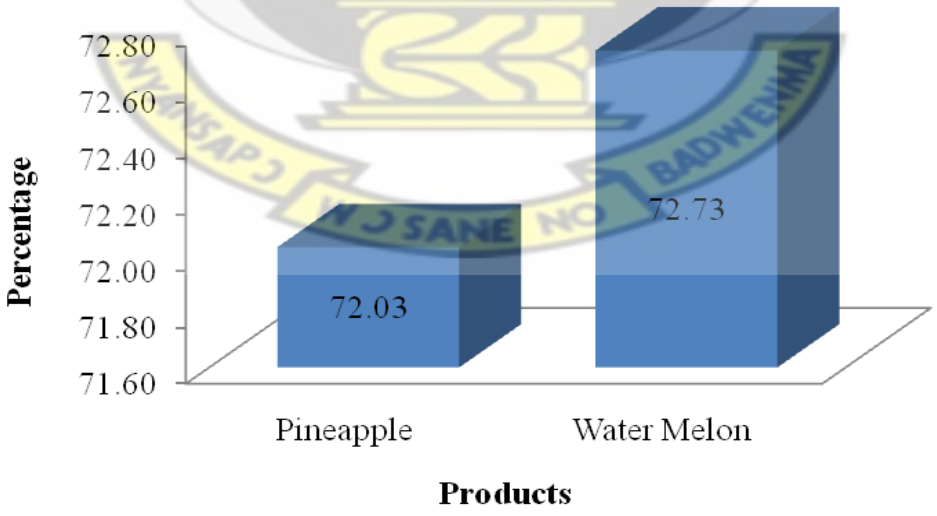

Figure 2. Distribution of respondents' WTP a premium for organic fruits
Source: Survey data, 2008

Figure 3 clearly shows consumers' eagerness to buy the various organic vegetables. Among the vegetables, green pepper recorded the highest (86%) WTP while both spring onions and green beans had the least responses. These findings are in agreement with Cranfield et al. (2003) whose study indicated 82% WTP among respondents. Boccaletti *et al*. (2000) also reported approximately 89% WTP for pesticides-free fresh fruit and vegetables. Similar findings obtained by Nouhoheflin *et al*. (2004) also indicated that 86% of the consumers in Ghana were WTP higher price premium for organic vegetables.

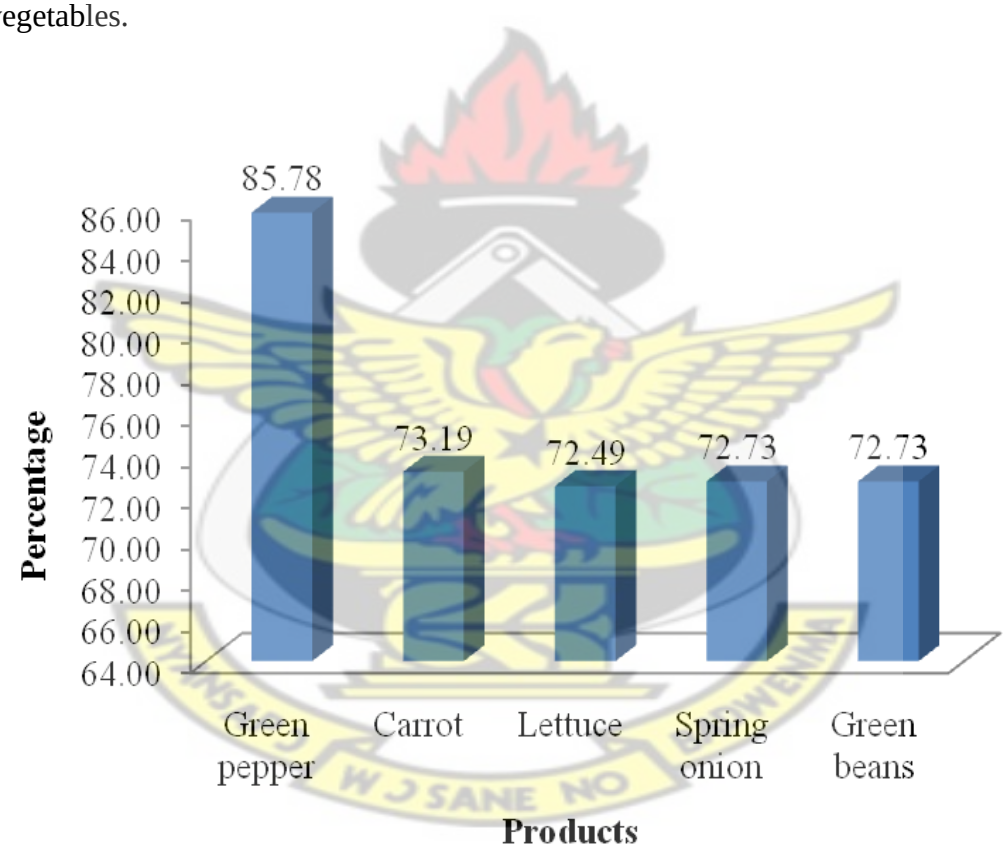

Figure 3 Distribution of respondents' WTP a premium for organic vegetables
Source: Survey data, 2008

4.2. Discussion of Empirical Results

In this section, WTP for organic fruits and vegetables without consumer characteristics, WTP for organic vegetables and fruits with consumer characteristics and estimation of market potential are presented.

4.2.1 WTP for Organic Fruits and Vegetables without Consumer Characteristics

To evaluate the mean WTP empirically, the logit model explaining WTP without consumer characteristics was estimated. The mean WTP was derived from the ratio α/ ρ, where α is the coefficient of the intercept term and ρ is the coefficient of the bid. Table 4.9 and 4.10 show estimated mean WTP for the organic fruits and vegetables considered in the study.

Table 4.9 Mean WTP estimates for organic vegetables without consumer characteristics

Variable	Green Pepper	Spring Onions	Lettuce	Green Beans	Carrot
Constant (α)	4.8092*** (8.05)	2.3141*** (5.61)	2.3117*** (5.65)	2.8939*** (6.58)	6.0425*** (8.10)
Bid (ρ)	1.5499*** (9.18)	1.6622*** (7.02)	1.6923*** (7.08)	1.3590*** (7.94)	2.2447*** (8.77)
Mean WTP (α/ ρ)	3.1029	1.3922	1.3660	2.1294	2.6919
Number of observations	429	429	429	429	429
Log-likelihood	201.65	250.94	250.10	239.96	218.44
LR chi2(1)	140.02	62.73	64.39	84.68	133.84
Pseudo R^2	0.2577	0.1111	0.1140	0.1500	0.2345

Note: *** indicates significant at 1%
Figures in parentheses are z-values
Source: Author's calculation, 2009

Average WTP for green pepper was GH¢ 3.1029/1Kg and spring onions recorded a mean WTP of GH¢ 1.3922/1Kg. The estimated average WTP for lettuce was GH¢ 1.3660/1Kg, while green beans and carrot had estimated mean WTP of GH¢ 2.1294/1Kg and GH¢ 2.6919/1Kg respectively. As shown in Table4.10, the consumers' average willingness to pay for fruits water melon and pineapple were GH¢0.5810/1Kg and GH¢0.6401/1Kg respectively.

Table 4.10 Mean WTP estimates for organic fruits without consumer characteristics

Variable	Water Melon	Pineapple
Constant (α)	8.5019***	5.2408***
	(7.56)	(7.58)
Bid (ρ)	14.6327***	8.1876***
	(8.11)	(8.32)
Mean WTP (α/ ρ)	0.5810	0.6401
Number of observations	429	429
Log – likelihood	214.81	226.02
LR chi2(1)	139.14	119.62
Pseudo R^2	0.2446	0.2092

Note: *** indicates significant at 1%
Figures in parentheses are z-values
Source: Author's calculation, 2009

Willingness to pay premium for different organic vegetables and fruits were derived by using the prevailing market prices of inorganic vegetables and fruits as the base values. As reported in Table 4.11, there are wide ranges of price variations, and the percentages of organic premiums over the conventional products also vary significantly. For organic vegetables for instance, premium varies from about GH¢0.13 (green beans) to about GH¢0.69 (carrots) and for organic fruit we observe premium variations from GH¢0.14 (pineapple) to GH¢0.08 (water melon). However, carrots and pineapple had the highest relative price premium. The percentages of organic premium relative to the

conventional prices ranged from 6.5% for green beans to 39.0% for spring onions. This finding is consistent with Smith *et al*. (2008), who found out that consumers were willing to pay price premium of 15% to 60% above the average conventional price for fruits and vegetables they considered in their study. Piyasiri *et al*. (2002) also found premium willingness to pay of about 18% to 30% above the conventional prices for vegetables. These results reflect a range of price premiums for organic produce that is noticeably lower than that observed by Thompson and Kidwell (1998). They reported organic price premiums of 40% to 175% above the conventional products. Also the percentages obtained in this study are relatively lower than that obtained by Nouhoheflin *et al*. (2004). These findings thus suggest that Ghanaian consumers are willing to pay more than 50% as price premium for organic vegetables and fruits.

Table 4.11 Comparisons of WTP prices for organic and conventional products

Selected Products	Bid prices (GH¢)	Empirical mean willingness to pay for organic product (GH¢)	Premium (GH¢)	Empirical mean Willingness to pay % change over bid prices
Vegetables				
Green Pepper	2.50	3.10	0.60	24.00
Spring Onions	1.00	1.39	0.39	39.00
Lettuce	1.00	1.37	0.37	37.00
Green Beans	2.00	2.13	0.13	6.50
Carrot	2.00	2.69	0.69	34.5
Fruits				
Water Melon	0.50	0.58	0.08	16.00
Pineapple	0.50	0.64	0.14	28.00

Source: Own calculations, 2009

4.2.2. WTP for Organic Vegetables and Fruits with Consumer Characteristics

The purpose of estimating the logit model with the inclusion of consumers' characteristics was to determine relevant attributes which influence consumers' WTP

for organic fruits and vegetables. Several specifications of the model were estimated, relating to WTP to different combinations of individual explanatory variables or interaction variables. The descriptive statistics of the variables used in the logit models have been provided in table 4.12.

Consumption of Organic Vegetables

The empirical results on WTP for organic vegetables are provided in table 4.13. The coefficient of AGE2 was positive and statistically significant at 10% in the WTP model for carrot. This estimated coefficient suggests that middle age (35 years and less than 55 years) consumers relative to young consumers (less than 35 years) and older consumers (55 years or older) are more WTP for organic carrots. Although this variable exhibited the correct hypothesized sign in the other WTP models, none of them was statistically significant even at 10%. This empirical finding agrees with Smith *et al*. (2008) for US consumers but contrast other health related studies, which indicated a negative relationship between age and WTP for organic products (Misra *et al*. 1991). The coefficient of the GENDER variable was positive and significant for spring onions and lettuce. This indicates that female consumers are more likely to purchase organic spring onions and lettuce than males. The results also indicate that females are more sensitive to food safety problems than their male counterparts (Arbindra *et al*, 2005). The household size variable (HHSIZE) had positive significant relationships with WTP for organic lettuce and carrots, suggesting that larger households probably have more home prepared meals, therefore the primary purchaser would be WTP for more of such organic products. Govindasamy and Italia (1998) also found a positive relationship between household size and consumers' WTP

Table 4.12: Variables used in the regression models

Variable	Definition of variable	Mean	Standard deviation
Dependent Variables			
WTPVEG	Willingness to pay higher premium price for organic vegetable		
WTPFRUIT	Willingness to pay higher premium price for organic fruit		
Independent Variables			
Demographic			
AGE	Age of the respondent	35.99	13.19
AGE 1	Respondents less than 35 years	0.51	0.50
AGE 2	Respondents between 35 – 55 years	0.33	0.47
AGE 3	Respondents above 55 years	0.16	0.37
GEND	Sex of the respondent	0.93	0.26
HHSIZE	Household size	5.39	3.12
CHILD	Number of children less than 15 years in a household	1.13	1.28
MARISTAT	Marital status of respondent	0.60	0.49
EDU	Number of years of formal education	8.55	4.22
RINCOME	Household average monthly income	262.59	314.97
INCOMELOW	Households with average monthly income up to Gh¢100	0.51	0.50
INCOMEMIDD	Households with average monthly income between Gh¢100 and Gh¢200	0.07	0.26
INCOMEHIGH	Households with average monthly income more than Gh¢200	0.42	0.49
OCCUPHH	Employment status of respondent	0.94	0.23
Knowledge and awareness			
ORINFO	Knowledge about organic products	1.53	0.50
KNOW	Knowledge about chemical residues in fruits and vegetables	0.85	0.35
HRISK	Knowledge about food related risk	0.93	0.26
PESTCONCERN	Concern about pesticides residue	0.89	0.32
ECONCERN	Concern about production risk to the environment	0.75	0.44
Product perception			
ENVIRPERC	Perception of organic production on the environment	4.09	0.99
TASTEPERC	Perception of organic products taste	4.52	0.89
HAMEFFPERC	Perception on organic products harmful effects	4.36	0.87
PRESERPERC	Perception on organic products preservation quality	4.02	1.24
TASHAM	Perception on organic products taste- harmful effects	4.47	0.96
ENVIHAM	Perception on organic products environmental-harmful effects	4.51	0.86
Product characteristics			
VEGCOLOUR	Vegetable colour	0.49	0.43
VEGFRESHNESS	Vegetable freshness	0.62	0.48
VEGSIZE	Vegetable size	0.40	0.24
VEGHARDNESS	Hardness of vegetable	0.29	0.11

VEGINDAF	Insect damage free of vegetable	0.44	0.27
VEGDFCLEAN	Cleanliness or dirty free of vegetable	0.32	0.22
FRUCOLOUR	Fruit colour	0.48	0.50
FRUFRESH	Fruit freshness	0.48	0.50
FRUSIZE	Fruit size	0.32	0.46
FRUINDAF	Insect damage free of fruit	0.24	0.43
FRUDFCLEAN	Cleanliness or dirty free of fruit	0.09	0.29

Source: Field Survey, 2008

for organic vegetables. The variable representing CHILD was negative and significantly related to consumers' WTP for organic lettuce and carrots. The empirical results thus indicate that consumers with fewer children (less than 16 years) are likely to pay a premium for organic lettuce and carrot. As Govindasamy and Italia (1998) noted, the presence of larger number of children in a household are likely to have a negative correlation with consumers' WTP. This is because, households with a larger number of children may have less money to spend per child, and cannot afford the organic produce premium. For this reason, these consumers may not believe there is a difference in quality between organic and conventional produce, at least not as much as a difference that would cause them to spend the extra money on the more expensive organic produce. The estimated coefficient for the education variable (EDU) was positive and significant in the WTP models for spring onions, lettuce and carrot. As Piyasiri *et al*. (2002) pointed out; highly educated consumers are more WTP for organically produced vegetables. The positive significant coefficient for (RINCOME) green beans also suggest that consumers with high income levels exhibit higher WTP for that organic product. Interestingly, our finding agrees with that of Piyasiri *et al*. (2002) for Sri Lankan consumers and Arbindra *et al*. (2005) for U.S.A consumers. The estimated coefficient of INCOMELOW was positive and significant for carrots, indicating that consumers in the lower income group were more WTP for higher price than consumers

in the higher income group. Similar finding by Govindasamy and Italia (1998) indicated that lower income consumers were willing to pay a price premium for vegetables.

Institutional variables like ORINFO, PESTCONCERN and HRISK which were investigated in the WTP models were all statistically significant. The variable ORINFO representing the degree of diffusion of general information on organic products carried a negative coefficient for WTP for lettuce and carrot. The results indicate that consumers who have read about organic products were less likely to purchase organic produce. It may be that consumers are either not well informed about organic produce or that they are not concerned with organic produce. Also, it may be that these consumers may not believe there is a difference in quality between organic and conventional produce. This finding is contrary to the study by Govindasamy *et al*. (2006) for U.S.A consumers. The coefficient of PESTCONCERN was positive and significant at 5% for spring onions, lettuce, green beans and at 1% for carrot. These empirical findings confirm the hypothesis that the probability to pay higher price premium for vegetables increases with increased consumer concerns for the use of inorganic pesticides in vegetable production, thus confirming what Misra *et al*. (1991) found for US vegetable consumers and Boccatti *et al*. (2000) for Italian vegetable consumers. Health risk concerns (HRISK) associated with consumption of chemically produced vegetables was also negatively associated with the WTP for carrots. The negative sign of the HRISK indicates that consumers with health risk concern were less likely to be willing to pay. This empirical finding however contrast with Nouhoheflin *et al*. (2004) who found a significant positive relationship between health risk and WTP

for organic vegetables with Ghanaian data. This contradiction could be due to difference in respondents as well as the products (cabbage and tomato) studied.

Table 4.13 Logit estimates on consumers' WTP for organic vegetables

Variable	Green Pepper	Spring Onions	Lettuce	Green Beans	Carrot
CONSTANT	-5.2801**	-6.1193***	-6.5432***	-6.4041***	-9.6163***
	(-2.28)	(-2.86)	(-3.08)	(-3.04)	(-4.27)
BID	14.7972***	10.7743***	10.4538***	13.8680***	11.6677***
	(8.78)	(6.61)	(8.12)	(7.81)	(8.82)
SOCIO-ECONOMIC					
AGE	0.0058	0.0078		0.0178	
	(0.52)	(0.77)		(1.39)	
AGE 1			0.0333		
			(0.09)		
AGE 2			0.3667		0.5832*
			(0.93)		(1.92)
AGE 3					0. 2976
					(0.75)
GENDER	0.0917	0.8727*	0.7960*	0.3151	0. 2019
	(0.17)	(1.85)	(1.66)	(0.68)	(0.40)
HHSIZE	0.0665	0.0681	0.1146**	0.0543	0. 0941*
	(1.24)	(1.52)	(2.17)	(1.15)	(1.90)
CHILD	-0.0267	-0.0937	-0.2467*	-0.1701	-0.1782*
	(-0.16)	(-1.11)	(-1.76)	(-1.17)	(-1.86)
MARISTAT	0.2343	0.2746	0.1076	0.2066	-0.0007
	(0.85)	(1.10)	(0.42)	(0.82)	(-0.00)
EDU	-0.0292	0.0576*	0.0525*	0.0362	0.0605*
	(-0.84)	(1.89)	(1.66)	(1.18)	(1.84)
RINCOME				0.0036*	
				(1.65)	
INCOMELOW	0.0228	0.0059	0.3247		0.6023**
	(0.07)	(0.02)	(1.17)		(1.97)
INCOMEMIDD	0.1274	0.4637	0.3781		0.2946
	(0.24)	(0.96)	(0.76)		(0.58)
OCCUPHH	0.2925	-0.7066	0.0298	0.2356	-0.3306
	(0.53)	(-1.26)	(0.05)	(0.46)	(-0.54)
INSTITUTIONAL					
ORINFO	-0.1615	-0.2611	-.4480017*	-0.0957	-0.8557***
	(-0.56)	(-1.03)	(-1.68)	(-0.38)	(-3.00)
KNOW	-0.1127	-0.0177	-0.2930	-0.1492	0.2245
	(-0.24)	(-0.04)	(-0.66)	(-0.35)	(0.49)
PESTCONCERN	0.1846	1.0455**	1.3193**	1.3436**	1.7770***
	(0.31)	(1.99)	(2.44)	(2.50)	(2.97)
HRISK	-0.2123	-0.6140	-0.4298	-0.5555	-0.8740*
	(-0.42)	(-1.33)	(-0.92)	(-1.20)	(-1.72)
ECONCERN	-0.1184	0.0952	0.2452	0.1690	0.1453
	(-0.36)	(0.31)	(0.79)	(0.57)	(0.45)

PERCEPTIONAL					
ENVIRPERC	-1.9161**	-2.0809***	-1.3128*	-1.3480*	-1.6542**
	(-2.40)	(-2.74)	(-1.75)	(-1.90)	(-2.19)
TASTEPERC	1.4466**	1.6611**	1.4097**	1.1237*	1.3639**
	(2.11)	(2.49)	(2.18)	(1.80)	(2.07)
HAMEFFPERC	0.1065	0.8741	1.0291*	0.4643	1.1955**
	(0.17)	(1.55)	(1.75)	(0.83)	(1.98)
PRESERPERC	0.0098		-0.0091	0.0170	-0.1787
	(0.07)		(-0.08)	(0.15)	(-1.45)
TASHAM	-0.3565**	-0.4764***	-0.4251**	-0.3084*	-0.4595***
	(-2.00)	(-2.76)	(-2.52)	(-1.90)	(-2.61)
ENVIHAM	0.4504**	0.4557***	0.2868*	0.2897*	0.3367**
	(2.53)	(2.70)	(1.72)	(1.82)	(1.98)
PRODUCT ATTRIBUTES					
VEGCOLOUR	-0.2444				0.5793*
	(-0.87)				(1.93)
VEGFRESHNESS	0.4820*	1.0278***	-0.3577	0.4407*	0.2369
	(1.70)	(3.86)	(-1.40)	(1.70)	(0.88)
VEGSIZE	-0.0823	0.5311*	-0.3333	0.7004	0.2423
	(-0.29)	(1.65)	(-0.76)	(1.37)	(0.87)
VEGHARDNESS	-	1.0875**	0.0565	0.0716	-0.2013
		(2.16)	(0.05)	(0.16)	(-0.58)
VEGINDAF	-0.3799	-0.5472*	0.6031**	-0.1094	0.6920**
	(-1.23)	(-1.90)	(2.16)	(-0.37)	(2.09)
VEGDFCLEAN	-0.6605*	0.9247**	0.1568	0.2387	
	(-1.71)	(1.98)	(0.38)	(0.52)	
Number of observations	429	429	429	429	429
Log - likelihood	-188.74	-224.01	-215.12	-226.39	-197.68
Chi-square	165.83	116.58	134.36	111.81	175.35
Pseudo R^2	0.3052	0.2065	0.2380	0.1980	0.3072

*** indicates significant at 1%
** indicates significant at 5%
* indicates significant at 10%
Figures in parentheses are z -values
Source: Author's calculations, 2009

The perception variables which were statistically significant were those which represented the environment (ENVIRPERC), taste (TASTEPERC), harmful effects (HAMEFFPERC) taste – harmful effect (TASHAM) and environment – harmful effect (ENVIHAM). The negative significant coefficient showed by ENVIRPERC and TASHAM indicate that relative to conventional crops, consumers who perceived organic products as less environmentally damaging and having low taste – harmful

effects were more WTP a higher premium for green pepper, spring onions, lettuce, green beans and carrot. The ENVIRPERC value means that a unit change in the respondents perception on the environment, leads to a negative change in their willingness to pay premium for organic green pepper, spring onions, lettuce, green beans and carrot by 1.9161, 2.0809, 1.3128, 1.3480 and 1.6542 respectively. The significant positive relationship between taste (TASTEPERC) and the WTP for all the organic vegetables considered in the study amply show that consumers perception on improved taste of organic vegetables could be considered as one of the relevant factors which influence their WTP over the conventional vegetables (Nouhoheflin *et al*.,2004). Also, the TASTEPERC value means that a unit change in the respondents taste perception, leads to a positive change in their willingness to pay premium for organic green pepper, spring onions, lettuce, green beans and carrot by 1.4466, 1.6611, 1.4097, 1.1237 and 1.3639 respectively pineapple and water melon by 1.2804 and 1.4861 respectively. The coefficient of HAMEFFPERC was positive and statistically significant for lettuce and carrot. These results suggest that consumers who perceive organic lettuce and carrot as less harmful are more likely to pay higher price premium. The environment – harmful effect perception variable had a positive significant influence on WTP for all the organic vegetables considered in the study.

On product characteristics, the variable representing vegetable colour (VEGCOLOUR) exhibited significant positive coefficient for organic carrot indicating that consumers who are WTP for this product attaches more importance to its colour. The estimated coefficient for vegetable freshness (VEGFRESHNESS) was also positive and significant for green pepper, spring onions and green beans. These significant

positive relationships suggest that consumers' WTP for organic vegetables depend on the freshness of the products. The coefficients of VEGSIZE and VEGHARDNESS were positive and significant for spring onions indicating that consumers would be WTP for higher price premium for organic spring onions if it meets their size and hardness criteria. The variable VEGINDAF which represent vegetable insect damage free showed a negative significant relationship for WTP for spring onions whiles for lettuce and carrot were positively related to WTP. The negative coefficient of the cleanliness variable (VEGDFCLEAN) in the WTP model for green pepper indicate that consumers who pay more attention to cleanliness of organic pepper are less likely to pay more for this vegetable. However the positive relationship between VEGDFCLEAN and WTP for spring onions suggests that consumers are more WTP a higher premium price for spring onions if they are dirt free.

Consumption of Organic Fruits

The empirical findings on WTP for organic fruits are presented in table 4.14. The coefficient of AGE2 was positive and statistically significant at 5% in the WTP model for water melon. This estimated coefficient suggests that middle age (35 years and less than 55 years) consumers are more likely to buy organic water melon relative to young consumers (less than 35 years) and older consumers (55 years or older). This empirical finding agrees with the studies by Smith *et al*. (2008) for US consumers and Akgüngör *et al*. (2007) for Turkish consumers. However, this finding contradicts other organic products studies which indicated a negative relationship between age and WTP for organic products (Misra *et al*. 1991; Loureiro and Hine, 2002). The coefficient of

Table 4.14 Logit estimates on consumers' WTP for organic fruits

Variable	WATER MELON		PINEAPPLE	
	Coefficient	z-value	Coefficient	z-value
CONSTANT	-11.87127***	-5.00	-7.9589***	-3.65
BID	4.194815***	8.06	4.9131***	8.16
SOCIO-ECONOMIC				
AGE			0.0066	0.66
AGE 2	0.6413**	2.08		
AGE 3	0.3465	0.92		
SEX	0.5822	1.18	0.6871	1.42
HHSIZE	0.0293	0.62	0.0073	0.16
CHILD	-0.0995	-0.65	0.0563	0.37
MARISTAT	-0.0663	-0.24	0.3158	1.23
EDU	0.0047	0.15	0.0537*	1.70
INCOMELOW	0.5381	1.03	0.3697	0.78
INCOMEMIDD	0.1751	0.61		
INCOMEHIGH			0.1075	0.22
OCCUPHH	-0.0610	-0.11	-0.3323	-0.58
INSTITUTIONAL				
ORINFO	-0.2309	-0.83	-0.0540	-0.21
KNOW	0.6477	1.47	-0.2062	-0.45
PESTCONCERN	0.4616	0.82	0.4283	0.78
HRISK	-0.6944	-1.44	-0.2931	-0.63
ECONCERN	0.3412	1.05	0.1237	0.40
PERCEPTIONAL				
ENVIRPERC	-1.5028*	-1.95	-1.3052*	-1.78
TASTEPERC	1.4861**	2.27	1.2804**	2.04
HAMEFFPERC	0.8447	1.35	0.6438	1.12
PRESERPERC	0.0789	0.65	0.0567	0.49
TASHAM	-0.4492**	-2.54	-0.3789**	-2.28
ENVIHAM	0.3329*	1.92	0.2903*	1.77
PRODUCT ATTRIBUTES				
FRUCOLOUR	0.1287	0.49	0.0762	0.30
FRUFRESH	0.4064	1.55	-0.1418	-0.56
FRUSIZE	0.3391	1.13	0.1888	0.64
FRUINDAF	-0.0842	-0.28	0.3118	1.00
FRUDFCLEAN	-0.3750	-0.95	-0.3760	-0.79
Number of observations	429		429	
Log-likelihood	-201.8783		-217.2273	
Chi- square	165.00		137.21	
Pseudo R^2	0.2901		0.2400	

*** indicates significant at 1%
** indicates significant at 5%
* indicates significant at 10%
Source: Author's calculations, 2008

education (EDU) variable was positive and statistically significant at 10% in WTP model for pineapple. This empirical finding indicates that consumers with higher levels

of education are more likely to purchase organic pineapple. Even though this variable exhibited the correct hypothesized sign in the water melon WTP model, it was not statistically significant even at 10% in the water melon model. This empirical result agrees with the studies conducted by Du Toit *et al*. (2003) for consumers in South Africa and Akgüngör *et al*. (2007) for Turkish consumers which showed a positive correlation between education and WTP for organic fruits. This empirical finding was however contrary to the study by Govindasamy and Italia (1998) for U.S consumers and Boccaletti and Nardella (2000) for Italian consumers. This research did not study the same profile of respondents and as such, the agreement and contractions with other studies are coincidental.

The perceptional variables such as environmental (ENVIRPERC), taste (TASTEPERC), taste-harmful effect (TASHAM) and environment-harmful effect (ENVIHAM) perceptions were all statistically significant in the WTP models analyzed. The negative coefficient of ENVIRPERC and TASHAM suggest that consumers who perceived organic products as less environmentally damaging and having low taste- harmful effects than conventional products were more WTP a higher premium for organic fruits (water melon and pineapple) considered in this study. The ENVIRPERC value means that a unit change in the respondents perception on the environment, leads to a negative change in their willingness to pay premium for organic pineapple and water melon by 1.3052 and 1.5028 respectively. The statistically significant positive association between taste (TASTEPERC) and WTP for organic fruits indicate that consumers perception on better taste of organic fruits could be deem as an important factor which influence their WTP relative to conventionally grown fruits. Also, the TASTEPERC

value means that a unit change in the respondents taste perception, leads to a positive change in their willingness to pay premium for organic pineapple and water melon by 1.2804 and 1.4861 respectively. The coefficient of ENVIHAM was positive and statistically significant at 10% for water melon and pineapple. None of the fruits products characteristics and the institutional variables was statistically significant even at 10% in both models.

4.3. Estimation of Market Potential

Table 4.15 presents some evidence on the estimated market potential for the organic fruits and vegetables considered in this study. The total market size for organic fruits and vegetables were estimated at about GH¢839,407,549(US$599,576,821) and GH¢3,714,112,152(US$2,652,937,251) respectively. The market potential of GH¢1,115,919,665(US$797,085,475) for spring onions was the highest amongst the organic vegetables investigated. Green beans on the other hand, had the minimum estimated market size of GH¢336,420,024(US$240,300,017) which can be attributed to its limited use in most diet in Ghana. For organic fruits, pineapple had the largest market potential of GH¢479,175,169 (US$342,267,977).

Table 4.15 Empirical estimation results of market potential

Income Category	Products	Average quantity purchased per year	Frequency of purchase per year	Potential buyers of products	Empirical mean WTP (GH¢)	Estimated market potential (GH¢)	Estimated market potential (US$)
	Vegetables						
High	Green Pepper	21.7814	67.8	44709	3.1033	204896473	146354623
Middle	Green Pepper	19.5659	66.12	69496	3.1945	287206821	205147729
Low	Green Pepper	16.0411	65.64	117448	3.0582	378193874	270138482
	Total					870297169	621640835
High	Spring Onions	52.9616	67.44	44709	1.2555	200489029	143206449
Middle	Spring Onions	39.6721	63.84	69496	1.4343	252451090	180322207
Low	Spring Onions	48.3354	82.68	117448	1.4125	662979545	473556818
	Total					1115919665	797085475
High	Lettuce	44.6137	52.56	44709	1.2758	133752354	95537395
Middle	Lettuce	29.1541	43.32	69496	1.4676	128811599	92008285
Low	Lettuce	21.1073	44.04	117448	1.3212	144242900	103030643
	Total					406806854	290576324
High	Green Beans	27.3933	57.12	44709	1.8848	131853925	94181375
Middle	Green Beans	12.8198	39.96	69496	2.2076	78593440	56138171
Low	Green Beans	12.3832	40.56	117448	2.1355	125972659	89980470
	Total					336420024	240300017
High	Carrot	41.5079	73.2	44709	2.4248	329391967	235279976
Middle	Carrot	22.0986	61.08	69496	2.2141	207692208	148351577
Low	Carrot	20.9147	68.16	117448	2.6733	447584262	319703044
	Total					984668438	703334598
	Fruits						
High	Water Melon	54.2568	61.32	44709	0.5697	84741818	60529870
Middle	Water Melon	31.8996	68.04	69496	0.5816	87726968	62662120
Low	Water Melon	37.122	73.68	117448	0.5845	187763593	134116852
	Total					360232380	257308843
High	Pineapple	36.4572	45.72	44709	0.6747	50280024	35914303
Middle	Pineapple	69.2601	45.12	69496	0.6444	139948072	99962908
Low	Pineapple	82.1648	48	117448	0.6238	288947072	206390765
	Total					479175169	342267977

Source: Author's calculations, 2009

CHAPTER FIVE

CONCLUSIONS

This chapter presents the main findings of the study as well as policy recommendations. The limitations of the study and suggestions for future research are also outlined.

5.1 Summary of Findings

This study investigated market potential and consumers' willingness to pay for organic fruits and vegetables. Consumers' general behaviour, knowledge and perceptions of organic products, and socio-economic variables were examined in relation to their impact on organic products purchase. Products characteristics as well as institutional and perception variables were also investigated in relation to willingness to pay for organic fruits and vegetables. The household-level data employed in the study were obtained from respondents in Kumasi metropolis in November, 2008. The descriptive data revealed that out of an average monthly income of GH¢262.59, the average expenditure on vegetables per month was GH¢2.37, and the average amount spend on fruits was GH¢2.73 per month per household.

About 96% of the respondents acknowledged the health benefits of organic fruits and vegetables. However, there were misconceptions among respondents about the types of diseases associated with conventional fruits and vegetables production like blood pressure, stroke and diabetes.

About 46.6% of the respondents were aware of organic products and their major source of information was through radio. Consumers purchase organic products because of health, taste, and environmental reasons. While most consumers (70.16%) preferred organic products to be sold by market retailers, 18.42% preferred buying from supermarkets and others (12.35%) at the farm gate. The study also revealed that consumers prefer organic products to be labelled (48.50%) and sold in designated markets or shops (35.90%).

Also, most consumers had positive perception on organic fruits and vegetables with benefit perception index (BPI) of 0.76, which indicates that 76% of the respondents agree to the statement that organic products have more health benefits than conventional products. The quality perception index (QPI) of 0.60 shows that 60% of the respondents agree to the statement that organic products have superior quality than conventional products, and environmental risk perception index (EPI) of 0.55 suggesting that 55% of the respondents are of the view that organic products production would make the environment safer than conventional products production.

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Consumer WTP for organic fruits and vegetables were also assessed. The respondents' willingness to pay (WTP) premium for organic fruits and vegetables were more than 20% of the prices of the conventional products. Also consumers were willing to pay 6.5% to 39% premium for organic fruits and vegetables in Kumasi. The estimated market potential for organic fruits and vegetables were GH¢839,407,549 (US$ 599,576,821) and GH¢ 3,714,112,152 (US$ 2,652,937,251) respectively. The empirical results also show that age, education, income, gender, and household size

significantly influence consumers' WTP for organic fruits and vegetables. Also product characteristics such as colour, size, hardness, freshness and cleanliness statistically influence consumers' WTP for organic fruits and vegetables.

5.2 Conclusions

Based on the study, it can be concluded that out of an average monthly income of GH¢262.59, consumers spend an average expenditure of GH¢2.37on vegetables per month, and the average amount spend on fruits was GH¢2.73 per month per household. It can be seen that consumers have misconceptions about the types of diseases associated with conventional fruits and vegetables production like blood pressure, stroke and diabetes. The study also concludes that consumers became aware of organic products generally through radio, and their motives for purchasing organic products are health and environmental reasons. The consumers generally preferred organic products to be sold by market retailers, and should be labelled and sold in designated markets or shops. Also, most consumers had positive benefit perception index (BPI), quality perception index (QPI), and environmental risk perception index (EPI) on organic fruits and vegetables. Furthermore, the study concludes that consumers were willing to pay 6.5% to 39% premium for organic fruits and vegetables in Kumasi. The study results indicate that there is a huge market potential for organic fruits and vegetables in Kumasi Metropolis. The study found out that socioeconomic factors such as age, education, income, gender, and household size significantly influence consumers' WTP premium for organic fruits and vegetables. It can be seen from the results that consumers really

rely on product characteristics such as colour, size, hardness, freshness when purchasing organic fruits and vegetables.

5.3 Policy Recommendations

Consumers currently attach more importance to organic products because of the health and environmental benefits. Some policy measures therefore need to be put in place by Non Governmental Organisations and other stakeholders to promote consumption of organic products. These include creating awareness on the relevance of consuming organic products through effective marketing and educational campaigns. Though most consumers were of the view that organic fruits and vegetables are good for health, their knowledge on the harmful effect of conventional fruits and vegetables that it causes blood pressure, stroke and diabetes must be corrected through educational programmes.

It is recommended that if producers of organic fruits and vegetables intend to sell through the various marketing channels (outlets), then the premium should not exceed 6.5% to 39% as consumers would not be willing to pay a premium which is higher. The consumers generally have a positive perception of the production enhancing characteristics of organic products. Unfortunately, these positive perceptions do not seem to matter much towards their misconceptions which are not based on scientific evidence. The scientific community, in collaboration with the media, therefore has a very important role in educating the public, so that consumers can distinguish between real and unsubstantiated diseases associated with conventional fruits and vegetables, and make a more informed decision. Since, age, education and income, significantly influence consumers' WTP a premium for organic fruits and vegetables, the marketing

of these products should be tailored towards the middle age consumers, highly educated consumers as well as those with high income. Also, marketing organic products should focus largely on household with few members.

Efforts should also be made to differentiate organic fruits and vegetables from the conventional products through labelling in order to assist consumers who are willing to pay realistic price premiums for organic fruits and vegetables on the market. Since market potential for organic products exist producers and retailers should be assisted and provided the technical expertise on how to maintain freshness and wholesomeness of their organic products so as attract the maximum price premium from consumers and also increase patronage.

5.4 Limitations and Suggestions for Future Research

The study encountered a couple of limitations. First, only five organic vegetables and two organic fruits were investigated due to time and budget constraints. Future studies should consider the WTP for other organic products. Second, since only Kumasi metropolis was examined, future studies should be replicated for other metropolis in the country to determine the overall market size and consumers' WTP for organic fruits and vegetables. Third, some of the variables tested in the WTP model were not statistically significant probably due to the sample size. To address this statistical limitation, future studies should consider a large sample size in order to increase the degree of freedom. Future research should focus on cost-benefit analysis of organic farming so that financial viability of organic farming in Ghana based on percentage willingness to pay could be explored.

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APPENDIX: QUESTIONNAIRE

CONSUMER SURVEY ON ASSESSING MARKET POTENTIAL AND MARKETING PROSPECTS FOR ORGANIC VEGETABLES AND FRUITS IN KUMASI METROPOLIS

SECTION A: Socio-Economic Characteristics

1.0 PERSONAL INFORMATION

1.1 Sex of respondent (Gender)

□Male

□Female

1.2 Age of respondent (specify in years)…….years (Age)

1.3 Household size (specify number) ……..

1.4 Number of children in the household (children less than 15 years).

(i) Number of children < 6 years

□0 □1 □ 2 □ 3 □ above 3

(ii) Number of children between 6 – 14 years

□0 □1 □ 2 □ 3 □ above 3

(iii) Number of children > 14 years

□0 □1 □ 2 □ 3 □ above 3

1.5 Educational level of respondent (EDU)

□Primary education

□Junior high school/middle education

□Senior high education

□ Teacher training/Nursing training school

□Vocational/Technical education

□Tertiary

□Others (specify)…….

1.6 Marital status (MARISTAT)

□Married

□Single

□Divorced/ Separated

□Other (specify)…….

1.7 Occupation of respondent (OCCUPR)……

1.8 Respondent average income/ month (RINCOME) …… (GH¢)

1.9 Spouse occupation SOCCUP)……

2.0 Spouse average income/month (SPINCOME)……(GH¢)

SECTION B: General questions about purchase of organic food.

2.1 Have you ever heard of the term "organic products?"(ORINFO)

□Yes □No (**if no go to question 2.4**)

2.2 If yes, where/how did you hear it? (INFOSOURCE)

□Radio

□Newspapers

□Television

□Through friends/family members

□Others (specify)……

2.3 Could you provide a definition of the term "organic product?" (ORDEFIN)

……

2.4 What characteristics would you look for in buying organic fruits? (FRUITXTIC)

(1) Colour/ripeness (2) Freshness (3) Size (4)Hardness (5) Insect damage free (6)Dirt free/cleanliness
Water Melon: Other (specify) ……..
Pineapple: Other (specify) ……..

2.5 What characteristics would you look for in buying organic vegetable? (VEGEXTIC)

(1)Greenish leaves (2)Freshness (3)Size (4)Hardness (5)ripeness (6)Insect damage free (7) Dirt free/cleanliness (8) Colour/ripeness
Green pepper: Other (specify) ……..
Spring onions: Other (specify) ……..
Lettuce: Other (specify) ……..
Green beans: Other (specify) ……..
Carrot: Other (specify) ……..

2.6 Where would you like to purchase your organic food products? (MKTPREF)

□Farm gate

□Market retailers

□Street hawkers

□Supermarkets

□Others (specify)……

2.7 Why do you purchase vegetables and fruits? Because it will be (PMOTIVE)
□Healthier
□Safer
□Taste better
□Better for the environment
□Other (specify) …….

2.8 Do you have any knowledge of chemical residues in vegetables and fruits you consume? (KNW)
□Yes □ No

2.9 Do you know any health risk (disease) associated with the consumption of chemically grown fruits and vegetables?(HRSK)
□Yes □ No

2.10 If yes, can you mention some of the health risks (diseases). (RISKDSE)
a ……
b ……

SECTION C: Market Potential
3. List the purchased frequency and average amount spent per purchase for the vegetables and fruits below.

Products	Number of times purchase/week	Average amount spent/purchase (GH¢)
Green pepper		
Spring onions		
Lettuce		
Green beans		
Carrot		
Water melon		
Pineapple		

SECTION D: Consumer Attitude and Perception on Organic Vegetables and Fruits
4.1 How often would you purchase organically grown vegetables and fruits (FPURCH)
□Always (every time)
□ Frequently (on many occasions)
□ Sometimes (on some occasions)
□ Very seldom (almost never)
□ Never

4.2.1 Do you think the use of synthetic chemical in agriculture has effect on the environment? (ECONCERN)

□ Yes □No

4.2.2 What effects as a consumer do you think synthetic chemicals have on the environment?

a ……

b ……

4.3.1 Do you think there is a pesticide/chemical residue in your fruits and vegetable products? (PCONCERN)

□Yes □ No

3.3.2 Give reason(s) for your answer above.

a……

b………

4.4 Researches have found out that organic products possess the following characteristics compared to conventional products. I would like to get your opinion from the levels below (PERCINDEX);

	strongly disagree	disagree	somewhat	agree	strongly agree
a). production of organic products make the environment safe	☐	☐	☐	☐	☐
b). Organic products are healthier	☐	☐	☐	☐	☐
c). Organic products are tastier	☐	☐	☐	☐	☐
d). Organic products have no harmful effects	☐	☐	☐	☐	☐
e).Organic products have superior quality	☐	☐	☐	☐	☐
f). Organic products are more expensive	☐	☐	☐	☐	☐

4.5 In your opinion, how would you like organic products to be differentiated from conventional? (HTODIFF)

□Labeling □ Selling in special markets/stores

□ others (specify)……..

SECTION E: WILLINGNESS TO PAY (WTP)

5.1 GREEN PEPPER

The price for a fruit of conventional green pepper is 25Gp. Would you pay more for the organic type of the same quantity?	
Yes □	No □
If yes, would you also pay □35Gp, □40Gp, □50? Yes □ No □	If no, would you be willing to pay 25Gp for it Yes □ No □

5.2 SPRING ONIONS

The price for a bunch of four conventional spring onions is 15Gp. Would you pay more for the organic type of the same quantity?	
Yes □	No □
If yes, would you also pay □20Gp, □30Gp, □35Gp? Yes □ No □	If no, would you be willing to pay 15Gp for it? Yes □ No □

5.3 LETTUCE

The price for a bunch of two conventional lettuce leaves (salad leaves) is 15Gp. Would you pay more for the organic type of the same quantity?	
Yes □	No □
If yes, would you also pay □20Gp, □30Gp, □35Gp? Yes □ No □	If no, would you be willing to pay 15Gp for it? Yes □ No □

5.4 GREEN BEANS

The price for a bunch of 15-25 pods of conventional green beans is 20Gp. Would you pay more for the organic type of the same quantity?	
Yes □	No □
If yes, would you also pay □25Gp, □30Gp, □35Gp? Yes □ No □	If no, would you be willing to pay 20Gp for it? Yes □ No □

5.5 CARROT FRUIT

The price for a bunch of three conventional carrot fruit is 40Gp. Would you pay more for the organic type of the same quantity?	
Yes □	No □
If yes, would you also pay □50Gp, □60Gp, □80Gp? Yes □ No □	If no, would you be willing to pay 40Gp for it? Yes □ No □

5.6 WATER MELON

The price for a fruit of conventional watermelon is GH¢1.80. Would you pay more for the organic type of the same quantity?

Yes □	No □
If yes, would you also pay □GH¢2, □GH¢2.3, □GH¢2.5? Yes □ No □	If no,would you be willing to pay GH¢1.80 for it? Yes □ No □

5.7 PINEAPPLE

The price for a head of conventional pineapple is GH¢0.80 Would you pay more for the organic type of the same quantity?

Yes □	No □
If yes, would you also pay □GH¢1, □GH¢1.30, □GH¢1.50? Yes □ No □	If no, would you be willing to pay GH¢0.80 for it? Yes □ No □

SECTION F: General WTP Evaluation Questions

1. Wound you be willing to pay a higher premium for any organic vegetables of interest?

Yes □ No □

2. Would you be willing to pay a higher premium for any organic fruits of interest?

Yes □ No □