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CONSUMERS' PREFERENCES AND WILLINGNESS TO PAY FOR CERTIFIED VEGETABLES IN OUAGADOUGOU, BURKINA FASO

BY

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DECLARATION

I, James Kunituo, do hereby declare that except for the references cited, which have been duly acknowledged, this dissertation is the result of my own original work and that no part of it has been presented for another degree in this University or elsewhere:

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/e hereby declare that the preparation and presentation of the dissertation were supervised in ccordance with the guidelines on supervision of dissertation laid down by the University for evelopment studies.

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ABSTRACT

The recent increase in consumers' concern about safe food, particularly, certified food, is fueled by a number of food scandals that have resulted in illness and many death cases. This study assessed consumers' perceptions and willingness to pay (WTP) for certified vegetables in Ouagadougou, Burkina Faso. A two stage random sampling method was employed to select 400 consumers from ten (10) sectors in Ouagadougou. A semi-structured questionnaire which contained contingent valuation questions was used to collect a cross-sectional data in September, 2016. The ordered probit model was used to analyse the factors influencing consumers' preferences and willingness to pay for certified vegetables. The Garrett ranking technique was used to rank the potential constraints consumers may face in accessing certified vegetables. The results indicated that consumers had no knowledge about the availability of certified vegetables in the market. Nonetheless, consumers perceived certified vegetables to be more nutritious, tastier and healthier than the conventional ones. The results also indicated that the most trusted vegetable certification institution was the national government scientific institution. Further, it was revealed that consumers preferred certified vegetables, especially those certified by national government institutions to the conventional ones. Consumers were willing to pay an average premium price of FCFA 381.96 (GH₵2.56) for 1kg of certified cabbage, FCFA375.27 (GH₵2.52) for, 1kg bundle of certified lettuce and FCFA 271.36 (GH₵1.82) for 1kg of certified tomatoes. These values represent 62.54%, 70.57% and 59.62% increment in the current market prices of the three vegetables, respectively. Also, the factors that significantly influenced consumers' preferences for vegetables were price, age and income. Similarly, consumers who were willing to take financial risks and had high trust in national and international certifiers preferred certified vegetables to conventional ones. In terms of the determinants of WTP, the significant variables were the initial bid price, age, education, income and knowledge. Moreover, consumers who were health-conscious and had a high level of trust in national government certification were willing to pay for certified vegetables compared to their counterparts who were not. Finally, higher prices of certified vegetables was ranked as the major potential constraint to accessing certified vegetables. The study concluded that even though consumers had no knowledge about the availability of certified vegetables, they perceived certified vegetables to be healthier than the conventional ones and thus, were willing to pay a premium price. It is recommended that policy makers and other stakeholders in the certified food industries should put in measures to supply certified vegetables and create consumers' awareness and sensitization through orientation and campaign programmes to help improve consumers' knowledge, perceptions and attitudes towards certified foods.

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DEDICATION

I dedicate this work to my late Uncle Kparu and to Uncle Albert. K. Ziem as well as my lovely parents, Mr and Mrs Kunituo.

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LIST OF ABBREVIATION

AGOA	African Growth and Opportunity Act
AOP	Agriculture organic Production
CE	Choice Experiment
CVM	Contingent Valuation Method
DBDC	Double Bounded Dichotomous
EFNs	Eco-Friendly nets
EU	European Union
FAPDA	Food and Agriculture Policy Decision Analysis
FAO	Food and Agriculture Organization
GDP	Gross Domestic Product
IPM	Integrated Pest Management
INSD	Institute de National Statistical Department
NGOs	Non-Governmental Organizations
PUPA	Urban and Peri-urban Areas
UNDP	United Nations Development Programmed
USDA	United State Department of Agriculture
WTP	Willingness to Pay

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CHAPTER ONE

INTRODUCTION

1.1. Background

The rising incidence of health risks and food poisoning through the consumption of contaminated food as well as changing consumer behavior due to increasing affluence have led to increase in the demand for safer food. High value certified crops such as fruits, vegetables and horticultural crops are usually in high demand due to their actual or perceived safety attributes. Certified vegetables are those that are planted, maintained, harvested, transported, sorted and sold under verified and approved conditions (Sangkumchaliang and Huang, 2012). The principal goal of vegetable certification is to ensure that the production and sale of such vegetables comply with national and international protocols and standards. Such protocols provide evidence of the safety of the vegetables involved. For instance, the United States Department of Agriculture (USDA) guarantees the safety of vegetables to stakeholders by furnishing information about a vegetable and channels of production processes. This assures the consumer of buying healthy vegetables for consumption.

Vegetable certification helps to avoid food poisoning arising from synthetic pesticides, heavy metals and other solvents normally associated with vegetables produced by conventional means. Blair (2012) reported that conventional crops are four times more likely to contain pesticide residues than certified crops such as organically grown crops. Similar observations were made by Smith *et al*. (2012), who noted that the consumption of certified vegetables, particularly organic vegetables may reduce the risk of pesticide residues and antibiotic-resistant bacteria. Again, Sangkumchaliang and Huang (2012) noted that the consumption of certified vegetables protects

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consumers from toxins and carcinogens. Recently, vegetable certification has become necessary globally because of the bad practices used by farmers for vegetable cultivation.

In the urban and peri-urban areas (UPA) of developing countries, such practices include the misapplication of agrochemicals (Lund *et al.,* 2010) and the use of sewage and polluted water by farmers for vegetable cultivation. It is estimated that over 20 million hectares of vegetables are ıltivated with polluted or contaminated water globally (Nabulo *et al.,* 2008). These practices may ıad to negative environmental and health risks. For example, studies reveal that nearly 75% of very 200,000 deaths in developing countries are linked to pesticide poisoning, even though they se only 15% of global pesticide supply (Darko and Akoto, 2008; Armah, 2011). The inappropriate se of agrochemicals (e.g. Pesticide and fertilizer) for food production often leaves residues which ontaminate the food (Okello and Swinton, 2010). Research highlights the alarming threat that lies ıead as both large and small-scale vegetable producers in Africa now depend heavily on ısecticides for pest control (Martin *et al.*, 2006; De Bon *et al.*, 2014; Probst, 2012).

ı Ouagadougou, the capital city of Burkina Faso, the use of pesticides for agricultural production very prominent. Reports indicate that from 1997 to 2001, over 13 million liters of liquid esticides and 900 tonnes of solid pesticides were imported to Burkina Faso (Moustapha *et al*., 011). By the beginning of the 2000's the annual growth rate of pesticide consumption in Burkina aso was estimated at about 11% (Toe & Kinane, 2004). While the chemicals used for vegetable production are poisonous (Coulibaly *et al.,* 2002), reports also indicate that most small-scale farmers in Burkina Faso abuse the pesticides (De Bon *et al*., 2014), which leave chemical residues in vegetables. Besides the use of agrochemicals, a study conducted in Ghana and Burkina Faso (Ouagadougou) indicates that microbial contamination levels of irrigation water and irrigated

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vegetables are high (Amoah *et al*., 2011; Cissé, 1997). This creates high risks of infection to consumers (Seidu *et al*., 2008; Drechsel and Seidu, 2011).

However, in many instances, consumers and producers are unaware of the risks associated with the use of agrochemicals in vegetable production, especially, in Sub-Saharan Africa (De Bon *et al*., 2014). Even where consumers are aware, it is difficult, if not impossible, for them to ifferentiate between contaminated and safe vegetables. One way to prevent the consumption of ontaminated vegetables is to ensure that vegetables are certified. This idea is supported by anabhat (2008), who suggested that certification can help a consumer to distinguish between onventional and certified products. Sangkumchaliang and Huang (2012), also noted that ertification informs the consumer of undesirable and unobserved pesticides that may or may not ave been used in the production of food. Certification and labeling systems therefore serve as ols to promote distribution and market development, create trust, and foster confidence Hamzaoui-Essoussi and Zahaf, 2012). It is against this background that government agencies, on-Governmental Organizations (NGOs), policy makers and other stakeholders are promoting rganic production and certification.

urkina Faso has also adopted various measures to promote organic production and certification Probst *et al.*, 2012). For example, the country has adopted an Integrated Pest Management (IPM) rogramme, and cooperates with partners such as the Food and Agriculture Organization (FAO) to help address various food contaminated issues including plant protection in urban farming systems (Nacro, 2008). Also in 2012, the Turner Foundation financed a project to train 375 farmers in ten villages of Burkina Faso to organically produce ‘’Niebe’’ (a native type of pulse with high market value). Moreover, various efforts are put in place in Africa to develop opportunities for

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trade of organic products and their certification, supported by the African Growth and Opportunity Act (AGOA).

Notwithstanding these measures, organic production, certification and marketing are still inadequately established in developing countries such as Burkina Faso, Benin and Ghana (Willer and Yussefi, 2006) unlike in the developed countries. For example, in 2012 the total size of the rganic food market in the United States was about $30 billion (Daniel, 2013; Carl, 2013). But, ood certification is still unpopular in most West African countries, especially in Ouagadougou, as ndicated by Keraita and Drechsel (2015) who reported that only 12.5% of consumers actually ook at food labels and, only 14% of organic farmers were aware of related national codes and egulations.

.2. Problem Statement

here is high public belief that certified foods such as organic foods are safer, more nutritious and f better taste than conventional foods (White *et al*., 2013). However, markets for certified and rganic foods, especially for vegetables, are largely undeveloped in West Africa in general and urkina Faso in particular. Where such markets exist, they are relatively scanty, highly informal nd consists of many unregistered mobile individuals. Due to the nature of these markets, Probst 2012) stipulated that the safety of vegetables is currently "ungoverned" in urban West Africa. urthermore, the few African vegetable certifications target the export market, but not the domestic market. Other certified foods are only accessible to the wealthy populace and, as a result, are beyond the reach of the local population that consumes over 90% of vegetables grown in UPA (Keraita, 2015).

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Notwithstanding government policies and regulations, NGOs and other stakeholders' efforts to promote organic farming and product or producer certification (especially for vegetables and fruits) are still understudied in Burkina Faso, particularly in Ouagadougou. According to Global Good Agricultural Practice (GLOBALGAP) (2012), the number of certified fruits and vegetable producers in Burkina Faso was only 0.135% compared to 16.350% certified farmers in a developed country like Spain. Even within Africa, Burkina Faso still lags behind other countries like Ghana and Egypt, where the numbers stood at 0.841% and 0.578% respectively. These statistics highlight the need to promote vegetable certification in Burkina Faso. But to develop a sustainable market for certified vegetables requires that a number of important questions are addressed. For example, what is the level of consumer knowledge on certification, or how do they perceive vegetable certification in Ouagadougou? These issues can influence consumers' attitudes and therefore the demand for certified vegetables. Little is known in relation to these questions, a knowledge gap which this study sought to fill.

Besides knowledge and perceptions, trust is another key determinant of the success of a certified food market (Leila and Mehdi, 2012; Rittenhofer and Povlsen, 2015). Trust influences consumer demand (Smed *et al.*, (2013) and WTP (Pivato *et al.*, 2008) for certified food. Of particular relevance is the institution that undertakes the certification. Many consumers have different perceptions and trust in different institutions, especially in relation to vegetable certification. While some may trust international certification agencies, others might prefer local institutions to undertake the certification. In the case of Ouagadougou, it is unclear as to which certification institution would have high trust among consumers should they decide to establish certified vegetable markets.

Also, the successes of any certified vegetable market will to a large extend depend on whether certified vegetable is preferred and consumed in significant quantities by consumers. Thus, consumers' preference for certified food in general may influence their demand for certified vegetables. There is, therefore, the need to have information on consumers' preference for certified vegetables as well as the factors that influence their preference. This study seeks to provide that information.

his study distinguishes itself by being based on consumers' perceptions and willingness to pay *W*TP) for certified vegetables. Most of the studies on the willingness to pay for certified egetables are done in developed countries. In developing countries, studies done (e.g., Keraita *et l.*, 2015; Owusu and Anifori, 2013; Probst *et al.*, 2012; Faustin *et al.*, 2015; Phillip and Dipeolu, 010) are mainly on organic vegetables and not necessarily certified vegetables. However, this resents only a narrow view of assessing consumers' willingness to pay for certified foods. rganic foods are only a subset of certified foods, and without accounting for certification of onventional, but safe foods make prior studies incomplete.

his study used cabbage, lettuce and tomatoes, because they are the vegetables that are commonly roduced and consumed in Ouagadougou. For instance, Bellwood-Howard *et al.*, (2015) noted that ıe dry season production of cabbage is about 29.1% and that of lettuce is about 51.4% in the two easons. Tomato on the other hand, is the main market oriented vegetable in Burkina Faso (Mathieu *et al.*, 2006). But the cultivation of these vegetables involves the use of pesticides (Gerken, 2001; Lund *et al.*, 2010; Williamson et al., 2008; Amadu *et al.*, 2014) and unsafe irrigation water (Amadu *et al.*, 2014). These practices may lead to vegetable contamination and hence the need for certification to make them safe for consumption. Moreover, some studies in some parts of Africa have revealed that there is high demand for the three vegetables (Aryal *et al.*,

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2009, Owusu and Anifori, 2013, Fustina *et al., 2015, Coulibaly et al., 2013*). For example, Arytal *et al.,* (2009) noted that there is high demand for lettuce and tomato for salad purposes and this notion may not be different in Ouagadougou as revealed by Bellwood-Howard *et al.,* (2015) that salad is a common food for the French speaking countries. Finally, during the pilot study, the researcher and his assistant (enumerator) visited markets that were close to the study area and found that cabbage, lettuce and tomatoes were the common vegetables sold in the market. The roblems and gaps left unresolved by previous studies inform the objectives of this study, specially in the context of Ouagadougou.

.3. Research Questions

he main research question for this study is, what are consumers' knowledge level, perceptions, references and willingness to pay for certified vegetables, and what factors drive these in uagadougou? The broad research question is reduced to the following specific research uestions:

1. What is the level of knowledge, perceptions and attitude of consumers toward certified vegetables?
2. What level of trust do consumers have in vegetables certification agencies?
3. What types of vegetables (in terms of safety) do consumers prefer and what factors influence their choice?
4. Are consumers' willing to pay for certified vegetables, and if so, how much?
5. What factors influence consumers' willingness to pay (WTP) for certified vegetables?
6. What are the potential constraints that consumers may face in accessing certified vegetables in Ouagadougou?

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1.4. Research Objectives

The overall research objective of this study was to identify consumers' knowledge level, perceptions, preferences and willingness to pay for certified vegetables, and determine the factors that drive these in Ouagadougou.

The specific research objectives are to:

1. Investigate consumers' level of knowledge, perceptions and attitudes toward certified vegetables.
2. Analyze the level of trust consumers have in vegetable certification agencies.
3. Explore the types of vegetables (in terms safety) consumers prefer and the factors influencing their choice.
4. Determine whether consumers are willing to pay for certified vegetables, and if so, by how much.
5. Assess the factors influencing consumers' willingness to pay (WTP) for certified vegetables.
6. Explore the potential constraints consumers may face in accessing certified vegetables in Ouagadougou.

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.5. Justification of the Study

he recent increase in consumers' concern about quality food is fueled by a number of food scandals that have resulted in illness and many death cases (Bhavsar *et al.*, 2016). The importance of healthy food for healthy life has been highlighted (Drechel *et al.*, 2015).

Underpinning a successful and sustainable market for certified vegetables is consumers' willingness to pay (WTP) for certified vegetables. Potential investors need knowledge on how

much consumers will be willing to offer for certified vegetables, and also factors that influence consumers' willingness to pay a price premium. The reason is that certification involves extra cost through labeling and quality assurance. Such costs must be (partly) borne by consumers. This study will provide information on whether vegetable consumers in Ouagadougou are willing to pay extra for vegetable certification and the amount they are willing to offer. Again, factors that condition consumer willingness to pay a premium price will be known. Some of these factors that may pose s constraints to hinder accessibility and sustainability of certified vegetable markets in uagadougou will also be known. This study provides important knowledge that could be useful or the local people, national and international organizations, policy makers, researchers and other akeholders in Burkina Faso. Specifically, government and policy makers will be provided with iformation on the level of consumers' knowledge, perceptions and attitudes towards certified egetables, which may help in the formulation of future policies on certified and organic farming the national and regional or sector levels, in order to address the current problems and future risis. Thus, the results will provide some useful recommendations to the government who may ant to expand the certified and organic market share.

For producers and marketers, determining the level of trust that consumers have in various egetables certifiers would help them know the certification institutions consumers have high trust n. This may enable producers and marketers to engage those certification institutions to certify heir products and promote their businesses. Also, identifying the kind of vegetables that consumers prefer and, the factors that influence these preferences may help producers and marketers to target specific vegetables for efficiency gains and higher profits. Similarly, the estimate of average price premiums that consumers are willing to pay for certified vegetables can guide and promote investment decisions and efficient fund allocation.

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Furthermore, knowledge of the exact factors that influence consumers' willingness to pay for certified vegetables is useful for assessing the feasibility and profitability of certified vegetable production in Ouagadougou. This could promote organic farming and their certification at the national and regional level. For marketers and retailers, the identification of potential constraints to the accessibility of certified vegetables in Ouagadougou could provide important signals. For example, retailers may increase their share of the certified food market by putting in measures to make certified vegetables easily accessible to consumers by opening new shops, attracting new customers through old customers who have already purchased certified food and also by providing clear label with full information about certified vegetables to consumers.

This study has the potential to contribute to the literature on consumers' willingness to pay for certified and safe fresh food product in developing countries. Specifically, the findings of this study will add to knowledge on consumers' perceptions, knowledge level and attitudes towards certified vegetables, consumers' preferences for vegetables and the factors influencing their choice, the mean amount consumers' are willing to pay for certified vegetables as well as the drivers of willingness to pay and finally the constraints in accessing certified vegetables in Ouagadougou.

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1.6. Organization of the Thesis

The remaining part of the thesis is organized as follows: Chapter Two documents both theoretical and empirical literature on consumers' willingness to pay for certified food, but with specific focus on vegetable certification. In Chapter Three, the methodology employed in the study is outlined, while Chapter Four presents the results and discusses, the findings of the study. Finally, Chapter Five summarizes the major findings, conclusions and policy recommendations of the study.

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CHAPTER TWO

LITERATURE REVIEW

2.1. Chapter Outline

This chapter presents a brief review of the Burkina Faso economy, the concept of urban and peri-urban vegetable production, the concept and history of certification, the concept of measuring WTP using the contingent valuation method (CVM), empirical review of consumers' knowledge, perceptions and attitudes toward certified foods and empirical review of consumers trust on certification institutions. Furthermore, the chapter contains a review of consumer preference for food products and the factors influencing their preference, empirical review of consumers' willingness to pay (WTP) and the factors influencing their WTP and the challenges consumers face in accessing certified foods.

2.2. A brief Review of the Economy of Burkina Faso

Burkina Faso is a low-income country with an annual average growth rate of over 6 percent between 2000 and 2012 (FAPDA, 2014). Agriculture dominates the economy and employs more than 90% of the total population (FAPDA, 2014). The main crops cultivated in Burkina Faso are sorghum, millet, maize and cotton. Also, common vegetables and fruits such as tomatoes, onions, lettuce, cabbage, okra, green beans, potatoes, mangoes, citrus and bananas are cultivated.

Burkina Faso ranked 181st out of 187 poor countries on the United Nations Development Programme (UNDP) Human Development Index (UNDP, 2014) with a gross per capita income of $690 and a poverty rate estimated at 40.1% in 2014. Its population, which grows at an average annual rate of 3%, was estimated at almost 18.11 million inhabitants in 2015 (World Bank, 2015). Food insecurity and malnutrition rates are still high as the number of people undernourished

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increased from 3.8 million in 2008 to 2010 to 4.4 million in 2011 to 2013, which approximates a quarter of the total population (FAPDA, 2014).

2.3. Urban and Peri-urban Vegetable Production in Burkina Faso

Urban and Peri urban Agriculture (UPA) denotes the act of cultivating plants and the rearing of animals within and around major towns and cities. It consists of horticulture, floriculture, forestry, aquaculture and livestock production. It is also linked with activities of input delivery as well as ıe processing and marketing of products (Mougeot, 2000; Drescher, 2003). UPA could be in the ɔrm of a backyard garden or open space farming. According to the Resource Center on Urban .griculture and Food Security (RUAF, 2012), UPA provides about 15-20% of the world's food in eneral and about 60% or more of vegetables. It is growing significantly in Ouagadougou (Burkina aso) and employed about 36% percent of urban households as at 2002. As at 2005, UPA was stimated to provide about 50% of the food consumed by the urban poor in Ouagadougou (Argenti ıd Marocchino, 2005), and supplied a significant amount of the vegetables consumed in many ıb-Saharan African cities (Tixier and de Bon, 2006). It was revealed that irrigated UPA vegetable roduction provides urban vegetables with about US$ 25-100 monthly income (RUAF, 2012).

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'egetable production in UPA plays a very important role in West African economies. It ɔntributes towards major continental priorities, including eradicating poverty and hunger, ɔosting intra-African trade and investments, rapid industrialization and economic diversification, ıstainable resource and environmental management, creating jobs, human security and shared prosperity. For example, the UPA was seen as an important primary or secondary source of income for large numbers of poor urban people in 2012 (RUAF, FAO, 2012). In Africa, most of the carbohydrate diets are usually either accompanied by soup or sauces which are produced from vegetables (Smith and Pablo, 2007).

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2.4. The Concept and Overview of Certification

The idea of certification has been in existence for more than two decades ago, beginning in the year that the U.S. Congress passed its 1990 Farm Bill. This farm bill was a congressional requirement which was included in the bill (Title 21) instructing the U. S. Departments of Agriculture (USDA) to create a national legal definition of "organic" that would provide reliable, uniform and enforceable standards for any food bearing the term "organic." The development of ertification standards was to provide consumers with a food labeling process that they could trust reflect high-quality standards in food production. Certification refers to the process whereby the onsumer is assured that a product marketed as "certified" is in compliance with the production nd handling requirements set forth by the certifier regulations.

enerally, there exist four (4) main different kinds of labels on certified food, particularly certified rganic food in the market. The first kind of certified food label is the claim "100% organic" label n the package of any certified organic food. This label means that all the ingredients used in the roduction of the food in question are in compliance with the organic regulations. According to eorge Mateljan Foundation, this kind of certified food is less common in the marketplace.

he second kind of certified food labels is 95% with the USDA logo on them. This means that the ood in question contains at least 95% approved ingredients and only up to 5% of the food may ontain prohibited ingredients, because, such ingredient was not available in their organic forms. For instance, the producer of the food in question may use an ingredient containing a synthetic pesticide residue as long as that ingredient does not exceed 5% of the total weight of the food product in question and as long as the producer could not obtain that ingredient in its organic form. However, there is one important caveat to this "5%" rule for certified organic foods bearing the

USDA logo: even in the 5% "non-organic" portion of the food, ingredients are not allowed to be genetically engineered, fertilized with sewage sludge or irradiated.

The third way to identify certified foods is where at least 70% of all the ingredients (by weight or fluid volume, excluding water and salt) must comply with the organic regulations. This means, the remaining 30% may contain prohibited ingredients, provided that those ingredients are not vailable in their organic form. With this kind of certified food too, the 30% "non-organic" portion f the food ingredients is not allowed to be genetically engineered, fertilized with sewage sludge r irradiated.

he fourth and final way to identify certified foods is where the individual ingredient entries used ı the production of the food in question are listed on the ingredients side or the back of the ackaging. If a food contains less than 70% of its ingredients (by weight or fluid volume, excluding ater and salt) as organic, no labeling claims are permitted on the front of the packaging. However, ıdividual organic ingredients that comply with USDA regulations may be listed on the side or the ack of the packaging in the product's ingredients list.

.5. Measuring WTP using the Contingent Valuation Method (CVM)

he contingent valuation method (CVM) was proposed and used by Siegfried von Ciriacy-Vantrup, a German Environmental and Resource Economist in 1947. The approach involves the se of field survey to elicit market valuation of non-market goods based on the theory of utility maximization. Before then, non-market goods were difficult to be priced. However, with the evolution of CVM, economists are now able to assign monetary values for non-market goods. CVM is still one of the widely used methods to determine whether consumers will be willing to purchase a non-market good and the amount such consumers will be willing to pay for that good.

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The two broad classes of CVM used for measuring willingness to pay (WTP) include the stated and revealed preference methods. The revealed preference method is a method by which it is possible to infer the ways in which a non-marketed good or service influences real markets for some other good or service on the basis of actual consumer behavior (Samuelson, 1948). This method consists of determining the price that people will pay for goods in various markets or observing individual expenditures to obtain goods or to avoid their loss. The stated preference ıethod, on the other hand, is based on asking consumers to directly state their values, rather than ıferring values from actual choices, as the revealed preference methods do (King *et al.,* 2000). he stated preference approach seeks to reveal how respondents' value goods presented to them ı different hypothetical scenarios (MacKerron *et al.,* 2009). The stated preference method uses irect and indirect surveys while revealed preferences use market data and experiments. Direct ırveys consist of asking for expert points of view or judgments or conducting customer surveys. he indirect survey consists of conducting a discrete choice analysis or a conjoint analysis.

very economic resource like certified vegetable has both use and non-use values (Pearce *et al.,* 993). The use values can easily be calculated; however, this is not the same with the non-use alues. Implicitly, the non-use value is not zero. It is possible for a consumer to actually assign ıonetary value to the fact that he or she has certified vegetables but not conventional vegetables. ome consumers may not lose in monetary terms when they consume conventional vegetables, ut they may lose some satisfaction of not enjoying certified vegetables. One can determine the use value through the use of both revealed and stated preference approaches. On the other hand, one can determine the non-use value by using only the stated preference approach and this will involve the construction of a hypothetical market. As shown in Fig.2.1, the choice modelling and CVM can be used to estimate the use and non-use values of resources by constructing a

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hypothetical market (Devicienti et *al.*, 2004). The travel cost method, hedonic pricing method, averting expenditure approach and market pricing methods were developed from the revealed preference approach. Twerefou (2014) has grouped the valuation methods into two, which are pecuniary and non-pecuniary methods. While the pecuniary method assigns a monetary value to resources, the non-pecuniary valuation method does not. From Fig. 2.1, CVM can be used to find the use and the non-use values of a resource. According to Twerefou (2014) this is a major advantage of CVM over the other methods.

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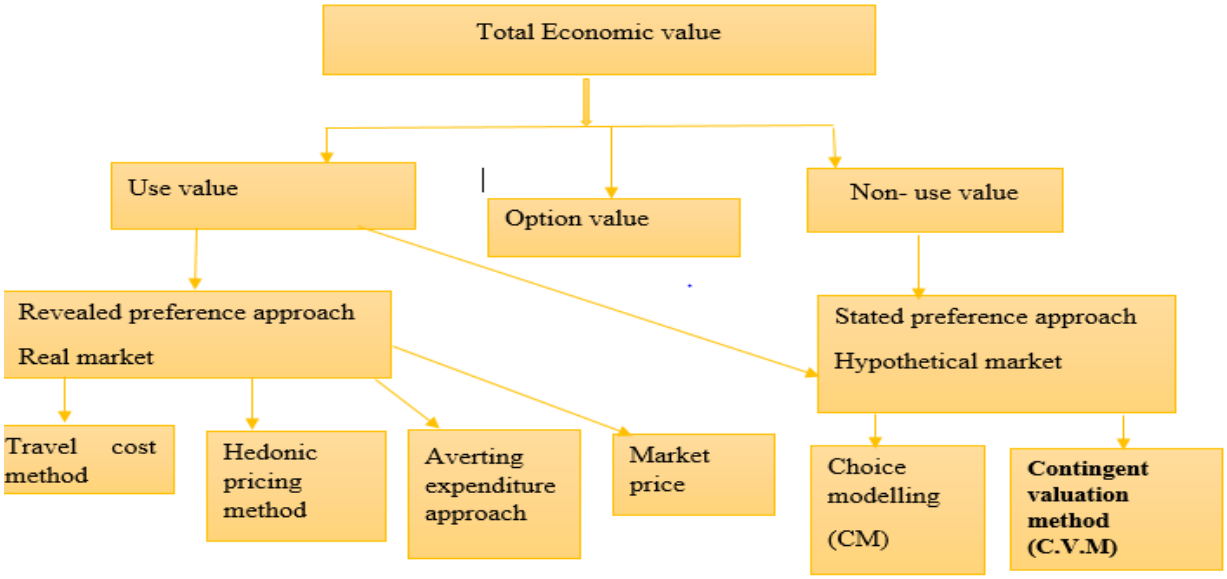

igure.2.1: The concept and methods of measuring total Economic Value (WTP)

ource: Adopted from Tietenberg and Lewis (2012).

This study has used the CVM because of its suitability to the study setting. It is able to evaluate a good in its totality unlike the Choice Experiment method which focuses on the 'bundle of attributes' of the good (Lancaster, 1991). Furthermore, Stefano *et al.* (2000) noted that the CVM method is more flexible with relatively low cost to implement, unlike the other methods that try to

replicate real purchasing situations, such as the experimental markets method. According to Hanley *et al.,* (2001) the major drawback of the choice methods is the cognitive burden the individual faces. This may lead to a potential increase in the random error compared to the CVM. Another drawback of the choice method is that respondents may use assumptions to answer the questions if the product being valued is new and uncommon to the respondents and this may lead to problems in estimating the WTP (Brown, 2003). Moreover, complex choice alternatives may also lead to the choice of satisfying rather than utility-maximizing options (Hanley *et al.,* 2001).

Another drawback of the choice method is that unlike the CVM, choice experiments assume that different food quality attributes are independent of attributes that are not provided to respondents in the survey or experiment (Gao and Schroeder, 2009). Some have argued that the use of choice methods may not lead to a hypothetical bias. For instance, Bateman *et al.,* (2003) indicated that the problem of hypothetical bias may be seen as being less important for choice experiments unlike CVM. However, MacKerron *et al.,* (2009), reported that hypothetical bias may be associated with the choice method, if the respondents have less knowledge about the choices or if the monetary values are large. Also, respondents may answer strategically and this may lead to biases of the resulting coefficients (Brown, 2003).

The researcher is aware of the debate on the credibility of the CVM. For instance, Murphy *et al.* (2005), List and Gallet (2001), and Loomis *et al.* (2014) noted that a hypothetical bias could lead to an overestimation of WTP results. This bias is mainly important for public goods, but the effect is much smaller for private goods such as certified vegetables (Murphy *et al.,* 2005 and, List and Gallet, 2001). Thus, the hypothetical bias will be less as the consumers state their willingness to pay for private goods (certified vegetables). Furthermore, according to Murphy *et al.* (2005) and Loomis *et al.* (2014), when stating their WTP for private goods (certified vegetables), consumers

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will not be misled by free-riding problems and positive sentiments. For private goods, Loomis *et al.* (2000) revealed that respondents usually understate their WTP to avoid higher payments in real cases. Moreover, there could be bias in stating the correct WTP when respondents lack the complete knowledge about the good in question (List and Gallet, 2011). This source of bias is reduced by interviewing only consumers who have previously purchased cabbage, lettuce and tomatoes.

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ı addition, a hypothetical bias may occur if there is an apparent lack of the consequences ssociated with a respondent's response (Murphy *et al.*, 2005 and Carson *et al.*, 2007). This is educed in this study because the issues are consequential to respondents own health and well-eing and thus this research expects that no hypothetical bias should occur (Landry *et al.*, 2007 ıd Vosseller *et al.*, 2009). As a result, this study does not need to apply methods such as cheap lk scripts and certainty adjustments for calibration of WTP which aim at minimizing hypothetical ias (Loomis, 2014). Finally, the use of the dichotomous choice question format will help to reduce ypothetical bias (Little, 2004).

ı summary, there are several approaches used today for assessing consumer WTP for a new roduct (Breidert, 2005). But, the CVM appears to be the most appropriate for measuring WTP or high-quality-credential food such as certified vegetables (Stefano *et al.*, 2001).

.6. Review of Empirical Studies on Consumers' Knowledge, Perceptions and Attitudes towards Certified Foods

The high demand for certified foods has led to significant research in relation to consumers' knowledge, perceptions and attitudes toward certified (especially organic) food in recent times. These variables, in addition to consumers' awareness of available product, influence their

decisions to purchase that product (Aryal *et al.*, 2009). Studies also reveal that increased consumer knowledge on certified (organic) food are vital and positively influences consumers' attitudes towards certified food products (Briz and Ward, 2009; Gil and Soler, 2006).

Various studies have reported different findings on consumer knowledge about certified foods. For example, Aryal *et al.,* (2009) conducted a study titled 'consumers' willingness to pay for organic roducts: a case from Kathmandu valley' and, reported that almost all of the respondents indicated ıey had knowledge of certified organic products. Rajabi *et al.,* (2011) performed an analysis of ɔnsumers' knowledge and willingness to pay for organic products and, revealed that consumers' nowledge of certified organic products was moderate. Phillip and Dipeolu (2010) investigated ɔnsumers' WTP for certified organic vegetable in Abeokuta, Nigeria, using a sample of one undred and fifty-two (152) respondents and, reported that 88.8% of the respondents had nowledge of certified organic vegetables. In contrast, Liu *et al.* (2013) in China, noted that ɔnsumers had low knowledge about the concept of safe food as well as low recognition of the ɛlevant labels and limited ability to identify safe food.

.brams *et al.,* (2010) focused on two groups to explore consumers' attitudes toward all-natural ıd organic pork and to examine their reactions to the USDA organic standards for meat and ɔncluded that participants had knowledge of the terms ''organic'' and ''all-natural'' even though ɔnsumers lack trust on the all-natural claims.

On consumers' perceptions of certified food, Makatouni (2002) has noted that consumers perceive certified organic food to be healthier than the conventional alternatives. Supporting, Makatouni's finding, Midmore *et al.,* (2005) also concluded that consumers subjectively perceived safer foods to be more superior to conventional food. According to White *et al.,* (2013), there is high public

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belief that certified foods (e.g. certified organic foods) are safer, more nutritious and tastier than conventional foods. However, other studies (e.g. Williamson, 2007; Hoefkens *et al.* 2009) have also argued that there are no clear conclusions that organic foods are scientifically superior to conventional foods.

Owusu *et al.* (2013) conducted an empirical study in Ghana using perception indices to measure ɔnsumers' knowledge and perceptions of certified organic food products and concluded that over alf of the consumers strongly agree that certified organic lettuce and watermelons were healthier ɪd tastier with no harmful effects compared to conventional counterparts. Other studies also ɔnclude that consumer perceives health risk–free foods to be more expensive than the ɔnventional ones (Radman, 2005 and Abrams *et al.*, 2009).

nvironmental-wise, the production of certified organic foods have been recommended (e.g. sakiridou *et al.* 2008; Lea and Worsley 2005; Roitner-Schobesberger *et al.* 2008; Magistris and ·racia 2008). Specifically, Dabbert, (2006) reported that consumers' perception of environmental ıctors such as ground and surface water, climate and air, farm input and output, animal health and ·elfare were the primary consideration influencing their preference for certified food (organic ɔods). Sangkumchalian and Huang (2012) used 390 consumers to study consumers' perceptions ɪd attitudes towards organic food products, and reported that consumers perceived organic ɾoduction methods as more environmentally friendly than the conventional methods. In relation to consumers' attitudes towards certified food, Michaelidou and Hassan (2008) revealed that consumers were more likely to develop positive attitudes toward certified food because of the health enhancing ability of certified organic food.

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In summary, consumers' knowledge and awareness about certified products such as certified vegetables differ among consumers (Pouratashi, 2012). From the review, it becomes quite evident that consumers have differing knowledge levels regarding certified or safe food, particularly in developed countries. Consumers perceive that certified foods are better than the conventional types and this creates positive attitudes towards certified foods.

.7. Review of Empirical Studies on Trust in Certification Institutions

rust is important to the success of food certification (Leila and Mehdi, 2012; Rittenhofer and ovlsen, 2015). Trust influences consumer demand for certified foods (Smed *et al.,* 2013) and /TP (Pivato *et al.,* 2008). Consumers may not consume certified foods if they lack trust on the ertifiers (Velčovska and Chiappa 2015). Trust could be built through branding and labeling a roduct (Leila and Mehdi, 2012). In order to ensure consumers have trust in third party certifiers' bels, the media could be used as a means (Rittenhofer and Povlsen, 2015).

onsumers' level of trust in certified organic labels varies among countries and among labels anssen and Hamm 2011; Zagata and Lostak 2012). For instance, Janssen and Hamm (2011) stablished that while consumers' in Czech Republic, Denmark and Turkey had a higher level of ust in national government certification logo than the international certifier logo (EU logo) and iat of the local association of farmers (Demeter) logo, in Germany, Switzerland and the United ingdom, consumers had a higher level of trust in local association of farmers' logo. Italians, however, had a higher level of trust in the international certification logo (EU log). In contrast, Leila and Mehdi (2012) found that Canadian consumers do not have trust in certification by international certifiers because they perceive that other countries do not meet the certification requirements as Canada does.

Similarly, Velčovska and Chiappa (2015) showed that consumers had higher trust in national quality labels. Janssen and Hamm (2011) measured consumers' level of trust in EU certification, government certification and private certification and concluded that consumers had a higher level of trust on national government certification than private and EU certification. However, the findings of some studies have contradicted that of Janssen and Hamm indicating that consumers have higher trust in private (Perrini *et al.* 2010) or independent certifiers (Padel and Foster 2005) ıan government certifiers. For instance, Leila and Mehdi (2012) found that consumers had higher ust in private institutions and consumer organizations such as consumer protection agency, citing ıem as the most reliable sources of information on food safety issues than government institutions. öhr *et al,* (2005) reported that German consumers trusted that food safety information provided y private institutions such as environmental organizations, nutritionists or physicians are more edible than information from the national government institution such as agriculture ministry, ɔod producers or the media.

.8. Consumers' Preferences for Certified Foods

ood preference is directly related to consumer health and therefore, it is not surprising that many udies exist on consumer food preferences and quality perception (Gyau *et al.,* 2014). The issue f which food product consumers prefer is still an on-going debate, and many different findings xist in the literature. While some studies claim that consumers prefer local foods to foreign foods r vice versa (e.g. Akaeze, 2010; Gyau *et al.,* 2014; Wang *et al.,* 2010; Musa *et al.,* 2011; Velčovska and Chiappa, 2015), others find consumers' to prefer certified (organic) foods to conventional food (e.g. Wang *et al.,* 2010; Janssen and Hamm, 2011).

Other studies have reported that consumers' have preferences for some food products because, they believe those food products are safer and healthier than the others. For instance, Deliana

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(2012) found that consumers have preferences for safer vegetables, particularly, certified organic vegetables over conventional vegetables, based on their belief that certified organic vegetables were safer and healthier than conventional vegetables.

2.9. Empirical Review of Factors Influencing Consumers' Preference for Food Products

It must be noted that consumer food preference behaviour cannot be explained by a single model Marreiros and Ness, 2009). According to Miskolc, (2011), consumer preference for food is a unction of sensorial attributes and non-sensorial factors consisting of expectations and attitudes, ealth aspects, price, ethical consideration and inner state. Ali *et al.* (2009) on the other hand, eported that consumer preference for food is composed of tangible and intangible features ncluding both physical and non-physical attributes. The physical attributes (e.g. size, type, brand, olour, packaging, price, taste) describe the features of the product (James *et al.*, 2004). The non-hysical features describe the subjective characteristics of the product based on consumer erceptions (Showing *et al.* 2004). However, according to Allen and Goddard (2011), consumers' reference for a food product is a function of static internal factors, dynamic internal factors, roduct factors and external factors.

/ith respect to the food attribute affecting consumers' food preferences, Rodríguez *et al.* (2006), ndicated that health issues, nutritional content, origin, and production methods are the key factors nfluencing consumers' preferences for certified organic food in Argentina. It was also reported in Portugal that the origin of wine significantly influences consumer preference for wine (Freitas and Cadima, 2008). Furthermore, Jiménez-Guerrero *et al*. (2012) concluded that consumers consider price, origin and variety to be more important than the colour and flavour of the olive oil. Musa *et al. (*2011) on the other hand, reported that food product attributes such as flavour, taste and price are the factors influencing consumers' preference for rice. A related conclusion was drawn by

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Gyau *et al.* (2014) that price, colour and packaging of honey are the key determinants of consumer preferences for honey. Kwakwa (2013) studied consumer preferences and WTP for local rice in Ghana, and noted that price and quality of rice influenced consumer preferences for local rice. Thus, price and quality of food products are the major concerns of consumers when they are purchasing food products (Diako *et al.*, 2010).

he effects of demographic and socioeconomic factors on consumers' food preferences have been ell discussed (Musa *et al.*, 2011; Ogundele, 2014; Danso-Abbeam *et al.* 2014; Kassali *et al.*, 010). These studies agree to different extents that factors such as sex, marital status, age, ducation, food expenditure, income, occupational status and household size are important factors ıfluencing consumers' preferences for food products. However, contradictory findings exist on ıe effect of these factors on consumers' food preference. Some studies found positive elationships between consumer characteristics and food preferences (Deliana, 2012; Kohansal ıd Firoozare, 2013; Gyau *et al*., 2014), while others reported of negative relationships (e.g. Allen ıd Ellen, 2011). The effect of food purchase frequency on consumers' food choices has also been utlined (Kassali *et al.*, 2010). For instance, Ogundele (2014) conducted a study in Nigeria and ound that frequency of purchase significantly influenced consumers' preference for rice.

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.10. Consumers' WTP for Certified Food

. review of the literature shows that generally, consumers are willing to pay a price premium for fruits and vegetables with eco-labels, organic labels, pesticide-free labels and safety labels (Loureiro *et al.*, 2001; Boccaletti and Nardella, 2000; Botonaki *et al.*, 2006). Consumers' WTP for certified food reflects the "true" value of certified food. Consumers' expect credential foods to have higher premium (Probst 2008) even though it is still unclear as to whether credential foods and the conventional ones should be priced differently (Danso *et al.*, 2002; Osei-Asare, 2009).

In the literature, researchers use different models to analyze consumers' WTP. Empirically, these studies have confirmed a broad WTP for certified foods, particularly certified organic foods. For instance, Coulibaly *et al.* (2011) conducted a study in Benin and Ghana on consumers' perceptions and willingness to pay for certified organic vegetables using the hedonic-pricing method and, concluded that consumers in Benin and Ghana were willing to pay a premium higher than 50% for certified organic vegetables. Nouhoheflin *et al.* (2004) showed that consumers in Ghana and Benin were willing to pay premium more than 50% for contaminant-free vegetables. With choice experiment, Rotaries and Danielis (2011) reported that Italian households were willing to pay a premium of about 2.2 Euros for a 250g packet of Fair Trade coffee.

Using CVM, Faustin *et al.* (2015) employed the ordered probit model to conclude that all consumers in their sample were willing to pay a price premium for cabbage of minimal pesticide residues compared to conventional cabbage. The average premium was 38%. Hai *et al.* (2013) also used the double bounded dichotomous CVM on a sample of 185 consumers in Hanoi and, reported that consumers were willing to pay an average price of about 70% higher than the conventional rice. Again, Phillip and Dipeolu (2010) combined the CVM and logit model to establish that consumers were willing to pay a price premium for certified vegetables organic vegetables. Similarly, Wang and Huo (2016) employed the CVM and a probit model in their studies to show that consumers in China were willing to pay a price premium for certified apple.

Furthermore, Owusu and Anifori (2013) also employed CVM and a bivariate Tobit model to conclude that consumers were willing to pay an average premium of GH¢0.5554 (US$ 0.4575) and GH¢1.2579 (US$1.0361) for one kilogram of organic watermelon and organic lettuce, respectively. Also, using the CVM and Heckman two-stage model, an average willingness to pay for organic rice of 13.6% higher was reported in a study by Kavoosi-Kalashami *et al.* (2014) in

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Hashemi. A study in Ghana reported that about 97% of urban consumers were willing to pay twice the current price for safer vegetables (Yahaya, 2009). In Spain, Gil *et al.,* (2000) used the CVM and revealed that consumers were willing to pay high prices for certified fruits and vegetables particularly organic fruits and vegetables. It was reported in Beijing that consumers were willing to pay 5.80 Yuan more for safer Moon cake (Liu *et al.* 2009). In the same vein, Muhammad *et al.* (2015) conducted their studies in United Arab Emirates on consumers' willingness to pay for certified organic food using the CVM and linear regression model, where they concluded that majority of respondents were willing to pay more for certified organic food. Roselyne and Frode (2012) on the other hand, employed the Becker–DeGroot–Marschak method to elicit consumers' WTP a premium for tomatoes, certified by the Tanzania Bureau of Standard and concluded that on average, consumers in Tanzania were willing to pay a premium for certified organic tomatoes. In conclusion, consumers' WTP varies from country to country (Pouratashi, 2012).

2.11. Factors Influencing Consumer Willingness to Pay a Price Premium

In the empirical literature, many factors have been identified to affect consumer WTP for certified vegetables. These factors can be classified into commodity related (i.e. certified vegetables factors) and consumer related (Mahtab Pouratashi 2012; Muhammad *et al.,* 2015).

Commodity related factors include price (Aryal *et al.,* 2009; Michaelidou and Hassan 2010; Sudran 2014), quality (Bhatta *et al.,* 2009), variety and origin of production (Gil *et al.,* 2001), knowledge of the commodity (Coulibaly *et al.,* 2011; Haghjou *et al.,* 2013), labeling (Pinna *et al.* 2014) and availability (Coulibaly *et al.* 2011). Consumer related factors include demographic and socioeconomic characteristics of consumers such as sex (Williams and Hammitt 2000; Williams and Hammitt 2001; Karagianni *et al.* 2003; Liu *et al.,* 2009; Wahida *et al.*2012 ; Wang and Huo, 2016), age (Ara 2002; Liu *et al.,* 2009; Van *et al.* 2011; Faustin *et al.,* 2015; Obayelu *et*

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al.,2015), household size (Xia and Zeng, 2008; Twerefou, 2014; Muhammad *et al.*,2015), education (Darby *et al.,* 2008; Liu *et al.,* 2009; Muhammad *et al.*,2015; Kavoosi-Kalashami *et al.,* 2014; Wang and Huo, 2016) , income (Rodríguez *et al.*,2007; Dettmann & Dimitri 2007; Roitner – Schobesberger *et al.,* 2008; Akgüngör *et al.,* 2010 ; Somsak *et al.,* 2012 ; Kalashami *et al.,* 2012; Hai *et al.*,2013; Muhammad *et al.,* 2015 and Wang and Huo, 2016) . Other factors such as peer opinion, attitudes (Basarir and Gheblawi, 2012) and socio-cultural factors (Haghjou *et al.,* 013) are found to influence Consumers WTP for a product.

ı terms of commodity related factors influencing WTP price premium, Wang and Huo (2016) ɔinted out that fruit quality and frequency of purchase were important factors in China. Similarly, ɔo and Zee-Sun (2015) and Xia and Zeng (2008) reported in their respective studies that ɔnsumers' perceptions of nutritional value, environmental welfare, sensory appeal features, ware ness, and prices of organic foods affect their WTP for certified organic foods. Ngigi *et al.,* ?011) used product quality attributes such as safety, nutrition, price, sensory, convenience, ıvironmental friendliness, hygiene and ethics to study urban consumers' WTP for quality leafy egetables. They reported that consumers' confidence and consistency, subjective knowledge and ference point were the factors influencing their WTP.

arlier studies had concluded on appearance features such as freshness, size, brightness, eanliness and free from insect damage (Coulibaly *et al.* (2011) to influence consumers' WTP for certified organic cabbage and tomatoes in Ghana and Benin. Owusu and Anifori (2013) argued that product-quality such as the vegetable size negatively influences consumer WTP whereas, less insect damage to vegetable positively influences consumer WTP premium for organic lettuce. In terms of consumers' knowledge, Karagianni *et al.,* (2003) and Liu *et al.* (2009) revealed that consumers' knowledge on food safety directly influences their WTP. Also, Wang and Huo (2016)

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identified that high knowledge and confidence directly influence consumers' WTP a price premium for certified fruits. However, Obayelu *et al.* (2015) disagreed by establishing a negative relationship between consumer knowledge and WTP for certified Moringa products in Nigeria.

On consumer related factors influencing consumers WTP for certified food, various empirical studies have contradictory findings. For example, with sex, some studies have concluded that females were more likely to have higher WTP for certified food (safer foods) than males (Liu *et al.*, 2009; Wahida *et al.*, 2012). However, Wang and Huo (2016) reported that males were more likely to be willing to pay for certified fruits (apple) than females. With age, Ara (2002) revealed a negative correlation between age and WTP for organic rice in Naga. Contrary to this finding, Khan *et al.*,(2011), Faustin *et al.*, (2015) and Obayelu *et al.*, (2015) have reported in their respective studies that age positively influence consumer WTP for high quality food. Other studies (e.g., Basarir and Gheblawi, 2012; Wahida *et al.*, 2012; Hai *et a*l., 2013) have concluded that age does not influence consumers WTP for certified (organic) foods.

Household size is reported as a determinant of consumers WTP (Twerefou, 2014; Muhammad *et al.*, 2015). However, studies by Coulibaly *et al*., (2011), Basarir and Gheblawi (2012) and Hai *et al.*, (2013) have revealed that household size does not influence consumers' WTP for certified vegetables particularly certified organic vegetables. Furthermore, Darby *et al*., (2008) and Liu *et al.*, (2009) concluded that education has a positive influence on consumers' WTP for food products. However, Basarir and Gheblawi (2012) reported that education has negative influence on consumers' WTP. But, Obayelu *et al.*, (2015) has noted that education did not influence consumers' willingness to pay for labelled and certified Moringa products.

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With income, studies (e.g Yu and Abler, 2009; Akgüngör *et al.,* 2010; Kalashami *et al.,* 2012; Somsak *et al.,* 2012 and Hai *et al.,* 2013) have reported a positive influence on consumers' WTP for certified (organic) food. Other studies (e.g., Li *et al.,* 2007; Darby *et al.,* 2008 and Voon *et al.,* 2011) have reported no relationship between income and consumers' WTP for safe foods. Michaelidou and Hassan (2010) and Phillip and Dipeolu (2010) have also reported that consumers' ethnic backgrounds influence their WTP for safe food products.

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imilarly, Basarir and Gheblawi (2012) have reported that consumers who have higher weekly xpenditure on safe fruits and vegetables are more likely to pay for certified organic vegetables nd fruits. Obayelu *et al.*(2015) found that consumers' attitudes towards Moringa products, articularly labelling and certification (i.e. frequency of purchase of Moringa products) gnificantly influences their WTP for certified moringa products. Many other studies have eported trust as a major determinant of consumers' WTP for foods. For example, Rostam-Abadi 2014) investigated the relationship between consumer knowledge, attitude, trust and willingness consume genetically modified crops among food industry staff in Khuzestan province by mploying a Likert scale and linear regression and concluded that, trust was the key factor nfluencing consumers' WTP.

.12. Constraints to Accessing Certified Foods

ven though certified foods are generally considered to be safe, they are not easily accessible, particularly in developing countries. This is partly because there are constraints on the development of domestic and regional markets for certified vegetables, in developing countries (Saxena, 2007), which impede the ability of consumers to access certified vegetables. For example, Garibay and Jyoti (2003) and Hai *et al.,* (2013) noted that the lack of information about organic markets, inconvenience to buy as well as lack of knowledge on certified products and other factors

were the major reasons impeding the consumption of certified organic food. Other studies have revealed that the main reasons that prevent consumers from buying certified organic foods were high prices, limited availability, unsatisfactory quality, lack of trust, lack of perceived value and misunderstanding of certified food production processes (Fotopoulos and Krystallis, 2002a, 2002b; Verdurme *et al.,* 2002 and Larue *et al.,* 2004)

urthermore, Taylor (2006) reported that the major constraints limiting the consumption of ertified organic vegetables were poor infrastructure, a lack of technical support and inadequate ıformation. However, Hamzaoui and Zahaf (2012) have reported that the constraints that the rganic food sector was facing was a knowledge gap in the marketing system in place, the value ıain, and the value delivery network in the organic food system.

ther studies have concluded that higher production costs and certification procedures hinder most ırmers from producing certified vegetables. For example, Veldstera *et al.,* (2014) concluded that ertification process discourages most farmers from certifying their food products. Stefano *et al.,* 001) and Hai *et a*l., (2013) reported that lack of knowledge and information on production chniques and scarce product differentiation could be the factors that limit the demand for certified ood. Finally, Velčovska and Giacomo (2015) indicated that the major challenges hindering the onsumption of certified food were poor information on quality labels and lack of trust in the ertifiers.

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CHAPTER THREE

RESEARCH METHODOLOGY

3.1. Chapter Outline

This chapter outlines the methodology of the study in six sub-sections: the first sub-section (3.2) contains the study area. Sub-section 3.3 is about the research design. Sub-sections 3.4 and 3.5 comprise the conceptual and theoretical frameworks of the study respectively. The last sub-section, 3.6, is devoted to data analysis and presentation methods.

3.2. Study Area

The study was carried out in Ouagadougou, the capital city of Burkina Faso. Burkina Faso is a landlocked country in West Africa, covering about 274,200 square kilometers of land surface. It lies at altitude ranging from 150 to 750 m above sea level, and located between latitudes 9° and 15°N and longitudes 6°W and 3°E. It is located in the transitional areas between the Sahel in the north and the Sudano-Guinean zone in the south. As in most developing countries, agriculture dominates the economy of Burkina Faso, employing more than 90% of the total population (FAPDA, 2014).

Ouagadougou, is located on the central plateau (12.4° N 1.5° W), growing around the imperial palace of the Mogho Naaba. The city is divided into five arrondissements, consisting of 50 sectors, which are further subdivided into districts. The districts of Ouagadougou surveyed include Koulouba, Paspanga, Kologh-naba, Dapoya, Cite Anivb, Pissi, Boassa, Tangueu, Wayalgueu and Kapala. Seventeen villages comprise the Ouagadougou metropolitan area, which is about 219.3 square kilometers (84.7 sq. Miles). It is also the country's largest city, with a population of approximately 1.8 million, according to the World Population Review (2015). Ouagadougou falls

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under the Sudano-Sahelian climatic zone with an annual rainfall of about 800 mm. The rainy season runs from May to October, but heavy rains are usually experienced during the months of July and August (Ouédraogo *et al*., 2007).

Agriculture in Burkina Faso is dominated by the rain fed system. About 24,000ha of arable lands are irrigated out of an irrigable potential of 160,000ha including 130,000ha under partial water control and 30,000ha under full water control. The irrigated crops are rice, sugar cane and vegetables. The common vegetables and fruits cultivated in Burkina Faso include tomatoes, onions, lettuce, cabbage, okra, green beans, potatoes, mangoes, citrus and bananas. Tomato still remains the primary market-oriented vegetable, but its production is hampered by post-harvest challenges related to packaging, stocking and transport (Mathieu *et al.*, 2006). However, the cultivation of these vegetables, particularly cabbage, lettuce and tomatoes involve the use of pesticides (Gerken, 2001; Lund *et al*., 2010; Williamson *et al.*, 2008; Amadu *et al.*, 2014) and unsafe irrigation water (Amadu *et al*., 2014). Burkina Faso being a developing country and with many development challenges, particularly in the agriculture sector, development agents may want to bring interventions into the country and one of such interventions is the production of safer and certified vegetables. Below is the map of the study area.

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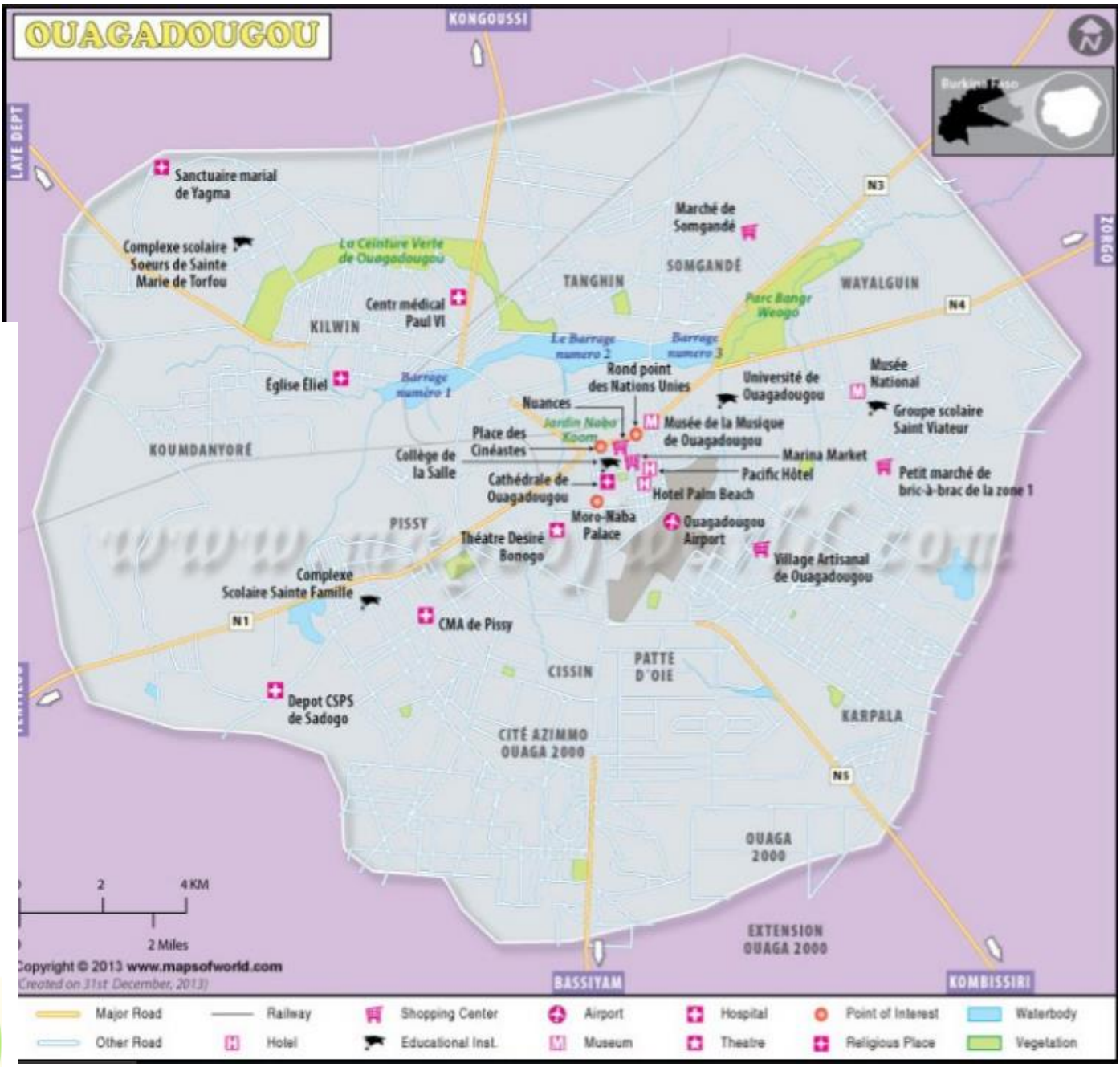

igure 3. 1: Map of Ouagadougou

3.3. Research Design

3.3.1. Source of Data and Survey Instrument

During the period of September to November, 2016, a cross-sectional survey was undertaken in Ouagadougou. The field study sought to gather primary data from consumers of cabbage, lettuce and tomatoes. A semi-structured questionnaire (see appendix 1 for details) that contains contingent valuation (CV) questions was used to generate the data from households through face to face interviews. The face to face interview approach was used because it has the capacity of yielding higher response rate and higher quality responses than other approaches (Miller *et al.*, 2007).

In addition to the CV questions, the questionnaire was also designed to collect data on consumers' knowledge, perceptions and attitudes towards certified vegetables, their level of trust in certification institutions, their preferences for vegetables and the potential constraints they may face in accessing certified vegetables. Further, socioeconomic and demographic characteristics of consumers were captured. More importantly, the modified double-bounded dichotomous choice CVM was used to elicit the amounts that vegetable consumers in Ouagadougou were willing to pay for certified vegetables. A translator/enumerator was employed and trained (to translate French, Mossi, lobi and Juala to English and vice versa) to assist the researcher in the data collection exercise.

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3.3.2. Sample Size and Sampling Approach

The target population for the study was consumers of cabbage, lettuce and tomatoes in Ouagadougou. With the rate of consumption of vegetables in sub-Saharan African countries being 40% (Ruel *et al,* 2004), this study used the formula suggested by the Creative Research systems (CRS, 1982), as shown below to calculate the appropriate sample size.

$$n = \frac{t^2 xp(1-p)}{m^2} \quad \ldots\ldots\ldots\ldots\ldots (3.1),$$

where, n = required sample size, t =confidence level at 95%, p =estimated prevalence rate of consumption of vegetables (40%), m = margin of error at 5%

$$= \frac{1.96^2 x0.4(1-0.4)}{0.05^2}$$

$$= \frac{0.9213}{0.0025} = 368.5 \approx 369$$

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owever, the study approximated the sample size to 400 respondents because, Stephen (2010) as noted that the minimum recommended sample size for CVM studies especially, marketing udies is about 400 respondents with the argument that it represents a reasonable balance between obustness of results and the cost of fieldwork. Thus, 400 consumers were interviewed to generate ata for the study. This sample size compares well with other WTP studies (Hai *et al.*, 2013; oulibal *et al.*, 2011; Combris *et al.*, 2012; Vidogbèna *et al.*, 2015).

multi-stage (2-stage) sampling method was used in the study. In the first stage, a simple random ampling was used to select 10 out of the 50 sectors in Ouagadougou. In the second stage, 40 ouseholds were selected from each of the 10 sectors. The sampled households in each sector was elected by a simple, systematic random sampling; selecting every 5th household by the main road that divides the sector into two. If a household is sampled and it turns out that no adult is around, the household is dropped and the next household immediately after that is selected as an alternative. Table 3.1 below shows the sampled sectors (districts) and number of households in each sector.

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Table.3 1: Sample Sectors (Districts) and Sample households

Sector (District) Number	Sector (District) Name	Sample House Holds
3	Koulouba	40
9	Kologh-naba	40
10	Paspanga	40
11	Dapoya	40
12	Cite Anivb	40
17	Tangueu	40
27	Pissi	40
32	Boassa	40
42	Wayalguen	40
50	Kpala	40
Total		400

ource; Field Survey, 2016.

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.3.3. Description of Survey Instrument and Data Collection

he questionnaire for the study composed of seven parts. Part I was used to collect data on the eneral consumption habits and food-related attitudes of households in Ouagadougou. Data on the verage amounts household spent on food items per week, information on the features that consumers consider important when buying vegetables in the market, such as appearance (e.g. freshness, size, insect damage, cleanliness, smell, colour, etc.), the nutritional value of the vegetable, source of irrigation water for vegetable production and use of agrochemicals in vegetable production were captured.

Part II of the questionnaire sought to collect data on consumers' knowledge, perceptions and attitudes towards certified vegetables. With knowledge, consumers were asked to indicate whether they had any knowledge on the availability of certified vegetables in common markets, supermarkets or at farm gates. In relation to consumer perceptions on certified vegetables, respondents were provided with statements about certified vegetables, where they were required to choose an option on a three-point Likert scale with perception indices comprising of disagree 1), 2 (neutral) and 3 (agree) statements. With consumers' attitudes towards certified vegetables, respondents were asked to indicate whether they had ever purchased certified vegetables in common markets, supermarkets or at farm gates.

In Part III of the questionnaire, questions bordering on consumers' level of trust on certification organizations or institutions were solicited. Respondents were provided with a list of food certification organizations or institutions, and were asked to use a five-point Likert scale with trust indices comprising: do not trust at all (1), do not trust very much (2), neutral (3), trust somewhat (4) and high trust (5), to rank those food certification organizations.

Part IV of the questionnaire was used to collect data on consumers' preference for vegetables with specific characteristics at a fixed price. Consumers' were told to assume that they could buy four different types of vegetables, which were produced with different production methods and which have different properties at a fixed price. Respondents were required to choose from four types of vegetables, which included (i) conventional vegetables, sold at the average market price, (ii) safer vegetables, sold at 125% of the average market price, (iii) vegetable certified by a national government certifier (Burkina Faso certification institution), sold at 150% of the average market price and (iv) vegetable certified by an international government certifier (European Certification institution), sold at 175% of the average market price.

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The Part V of the questionnaire was used to elicit consumers' willingness to pay for certified vegetables using the contingent valuation method. The next Part of the questionnaire was used to gather information on the potential constraints consumers may face in accessing certified vegetables in Ouagadougou. The last part of the questionnaire contained information relating to consumers' socioeconomic and demographic characteristics such as sex, age, household size, education level, monthly income, etc.

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.3.3.1. Contingent Valuation Method

)ata on consumers' WTP for certified vegetables was elicited by first creating a hypothetical ertified vegetable market. Respondents were provided with detailed information on the roduction methods of conventional and certified vegetables, highlighting their health nplications. Also, respondents were told about the health implications of consuming conventional egetables compared to certified vegetables. The importance of consuming certified vegetables as also explained to the respondents.

fter the hypothetical market was created, a modified double-bounded dichotomous choice ıethod (Hanemann, 1991) was used to elicit information on whether or not consumers were illing to pay for certified vegetables and by how much. This study used the modified double ounded dichotomous choice CVM (DBDC CVM) because the method has the advantage of being ıore efficient and time saving in conducting surveys as well as giving more information than the single bounded approach (Hanemann *et al*., 1991).

The current market prices of the three vegetables (i.e. Cabbage, lettuce and tomatoes) were randomly topped up by 125%, 150%, 175% or 200% and used as the start-up prices for elicitation. Thus, the study randomly adopted 25% increase of the current market prices of cabbage, tomatoes

and lettuces as the lowest bid and 100% increase as the highest bid. The adoption of the 25% increase of the current market prices as the lowest bid is backed by existing literature. For example, Winter *et al.* (2006) noted that, the cost of producing organic product is 10 to 40% higher than the price of a similar conventionally produced product. However, Vidogbèna *et al.,* (2015) used 10% as their lowest bid with a reason that the production cost of cabbage using eco-friendly net (EFNs) is 10% more than the production cost of conventional cabbage.

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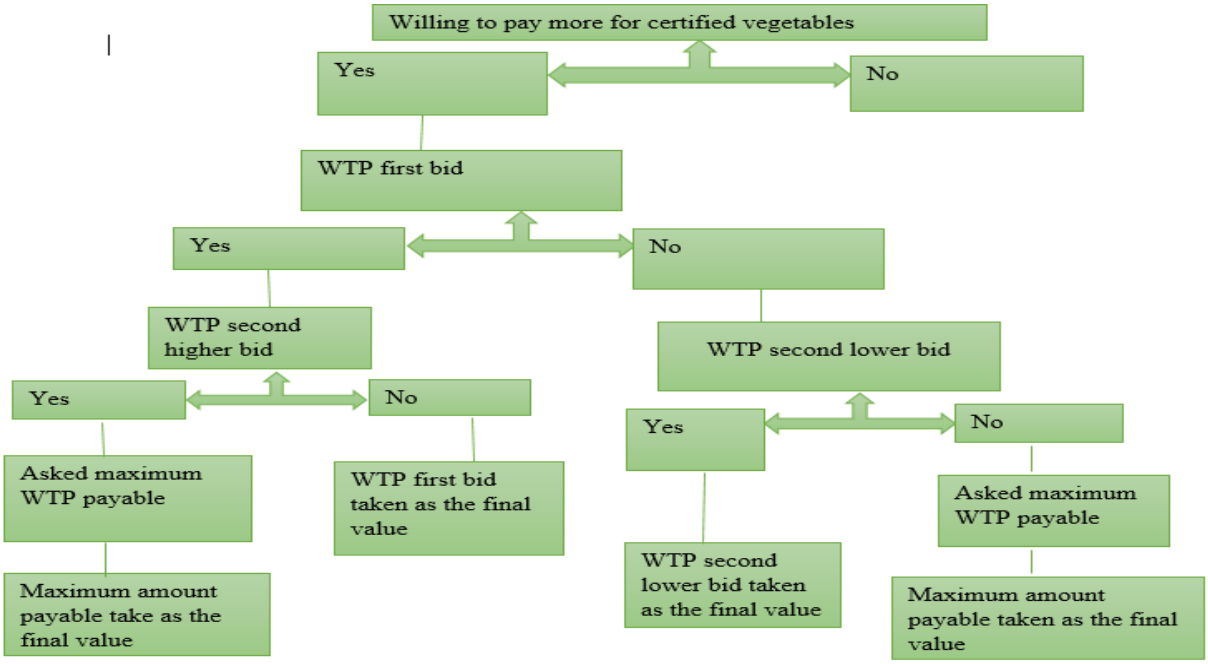
ı the double bound approach, respondents were asked two questions successively after an initial uestion. The initial question format was "would you be willing to pay more for vegetables that e guaranteed to be safe through certification and thus not harmful to your health?" Each question ad two choices: "yes" or "no". If a respondent says "yes" to the first question, the current market rices of each of the three vegetables were randomly topped up by 125%, 150%, 175% or 200% get the first bids. If the respondent answers "yes" to the first bid, the second bid was set higher y randomly assigning a price premium (10%, 20%, 30%, 40% or 50%). Otherwise, if a respondent ıswers "no" to the first bid, the second bid was set lower by randomly assigning the respondent discount (10%, 20%, 30%, 40% or 50%). Therefore, possible combinations of responses were ıo-no", "no-yes", "yes-no" and "yes-yes".

he double-bounded dichotomous approach assumes that respondents' answers to both bids are riven by the same underlying WTP value and therefore the second bid can increase the information about the respondents' true WTP (Albertini, 1995). The bidding procedure is illustrated in Figure 3.2 below. Note the only modification that has been done in Figure 3.2 is that "willing to pay more for certified vegetables" has been used in place "willing to join" as used in the Figure.



igure 3.2: The bidding procedure

ource: Modified from Janani (2012)

.4. Conceptual Framework

he study on consumers' preferences for vegetables with specific characteristics is conceptualized the framework presented in Figure 3.3 below. According to Allen and Goddard (2011), factors at influence consumers' preference for a food product could be grouped into static internal ctors, dynamic internal factors, product factors and external factors. The static internal factors mprise of demographic and socioeconomic factors as well as cultural factors. The dynamic ternal factors on the other hand, include personal preferences, nutritional knowledge, product perceptions, health status, health attitude, food attitudes or motivation, technological attitude and consumer experience. The product factors include information on package, product attributes, convenience and product price. Finally, the external factors include available choices, environment and context. This study however, concentrated on the influence of only the product (price) and

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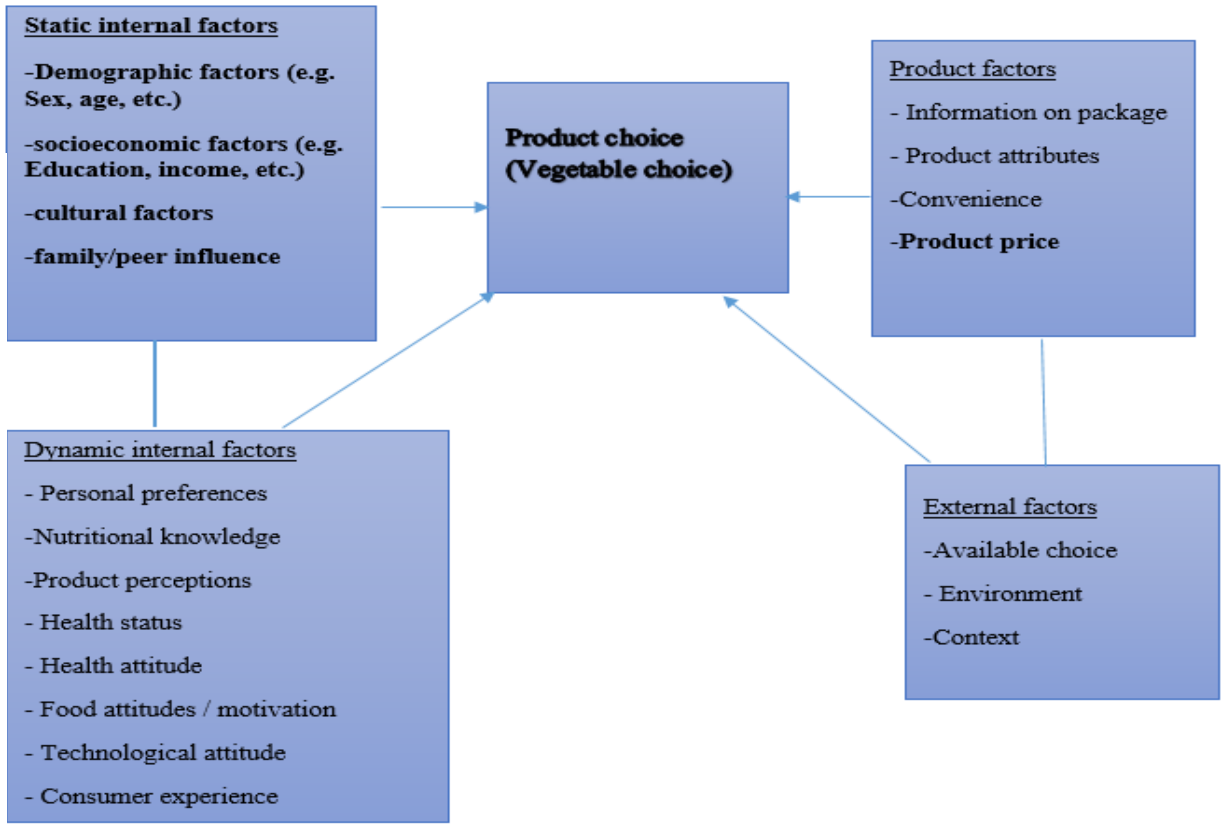
static internal factors (i.e. demographic, socioeconomic and cultural factors) on consumer food preference which are highlighted in Figure 3.3 below. Note the key modification in Figure 3.3 is "vegetable choice"



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igure 3.3: Conceptual framework of the factors influencing consumers' food preference

ource: Modified from Allen and Goddard (2011).

onsumers' WTP for certified vegetables is conceptualized in the framework presented in Figure 3.4. According to Aryal *et al.* (2009), WTP for a given certified vegetable is a function of knowledge, attitude and intention. This is because consumers' knowledge and perceptions about certified vegetables and their benefits influence their WTP for the certified vegetables. Knowledge and perceptions in turn depend on the type and quality of information about certified vegetables

that is available to consumers. Furthermore, knowledge and perceptions can be enriched through advertisement, quality packaging, labeling and certification. Once the consumer is ready to purchase a certified vegetable, one can now determine how much the consumer will be willing to pay. Moreover, consumers' purchase behaviors are influenced by market characteristics such as accessibility and prices and ultimately WTP. These factors influence consumers' demand (Aryal *et al.*, 2009). In addition to the above, socioeconomic and demographic characteristics such as age, ender, income, among others, also influence a consumer's WTP, because those characteristics ffect the consumer's attitude towards certified vegetables.

n the light of the above, the framework presented in figure 3.4 reflects the factors influencing onsumers' attitude and WTP. External factors such as production, packaging, certification and abeling as well as consumers' knowledge and awareness about the product influence their illingness to buy certified vegetables. If a consumer cannot clearly differentiate between two ternative products (i.e. certified and uncertified vegetables) a price premium on the certified egetables may confuse and/or influence the consumer's decision to buy. Consumers' attitudes nd preferences to purchase certified vegetables are influenced by education, occupation, ousehold size as well as the attributes of the certified vegetable. These factors also depend on onsumers' household income and the price of the product. The key modifications in Figure 3.4 that certified vegetable is used in place of organic food as in the original Figure.

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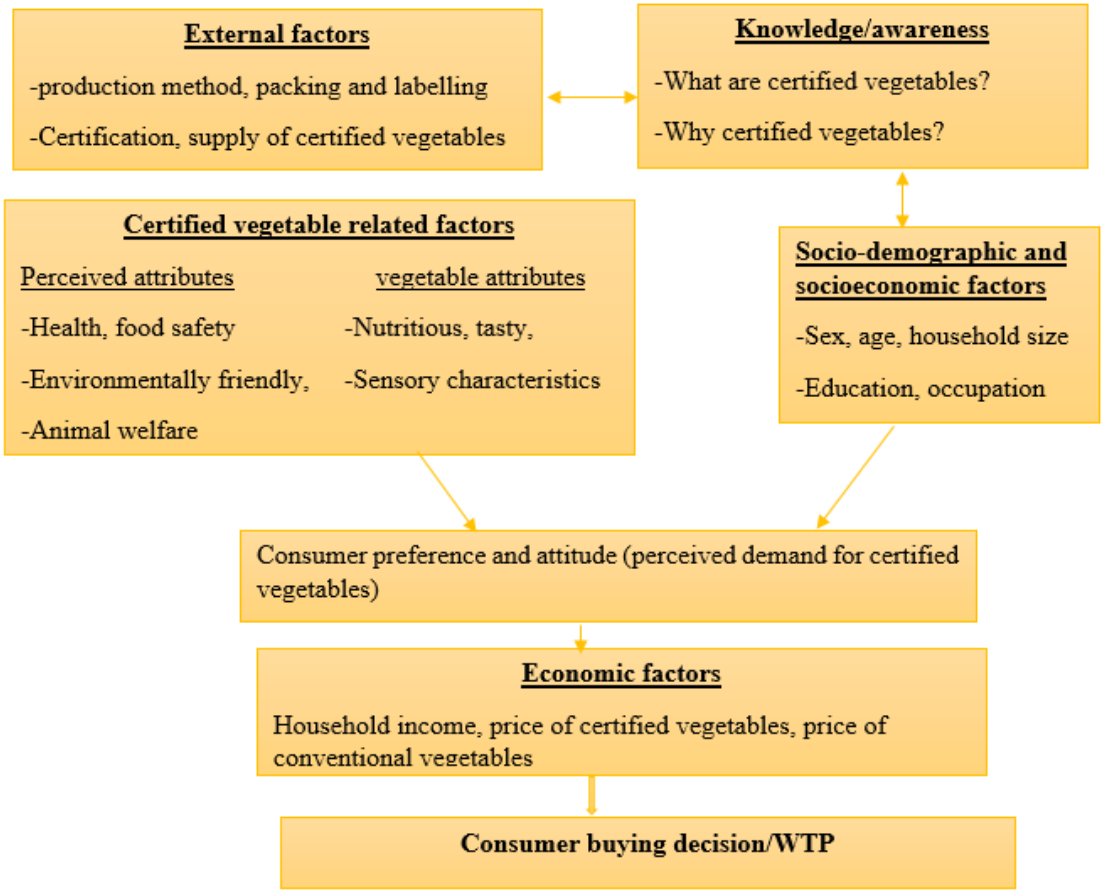

igure 3.4. Conceptual framework of factors influencing consumers' attitudes and willingness to ay for certified vegetables

ource: modified from Aryal *et al.* (2009).

.5. Theoretical Framework of the Study

he theoretical underpinning of this study is the utility maximization theory, where a rational consumer generally faces a two-fold choice decision (i.e. the decision to consume either a conventional vegetable or certified vegetable). According to McFadden (1981), there is a change in utility, assuming that utility is comprised of both a deterministic component, which is stated by a consumer or can be observed by a consumer's actions or choices, and a random, unobservable

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component. This random, unobservable component of the change in utility has made Yu and Abler (2009) to consider the normally used expenditure function for deriving consumers' WTP for resource as being difficult and laborious because utility levels are not easily measurable. Therefore, in order to derive consumers' WTP and the factors influencing WTP, this study used the indirect utility function approach which is derived from the theory of consumer behavior. This framework was used by Khuc, (2013) for deriving willingness to pay for safe water in Vietnam. Also, hiakpor *et al.* (2015) and Tanko *et al. (2016)*, used this framework in their respective studies.

he indirect utility function of a consumer who consumes conventional vegetable can be modified nd specified as

$$\lambda = A\ \ P, Q_0^C, Y_0 \quad \ldots\ldots\ldots\ldots \text{(3.2)},$$

here A is the expenditure on a conventional vegetable. P is the exogenous price vector, Q_0^C is ıe quantity of conventional vegetables consumed, Y is the income of the consumer in CFA.

Now, consider a consumer who is willing to pay CFA K for X quantity of certified vegetables. er indirect utility function is:

$$\lambda^* = A^*\left(P, Q_0^C + X, Y_0 - K\right) \ldots\ldots\ldots\ldots\ldots\ldots \text{(3.3)}$$

At equilibrium, the utility functions of a consumer consuming conventional vegetables and certified vegetable would be equivalent. This is specified as

$$A = A\left(P, Q_0^C, Y_0\right) \approx A^* = A^*\left(P, Q_0^C + X, Y_0 - K\right) \ldots\ldots\ldots\ldots\ldots \text{(3.4)}$$

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Moreover, it is further assumed that the improvement in the quality (safety) of certified vegetables and the change in income resulting from the demand for certified vegetables is insignificant. Thus the first order approximation of $A^* = A^*\left(P, Q_0^C + X, Y_0 - K\right)$ (i.e. certified vegetables utility function) is given as;

$$\text{l} = A\left(P, Q_0^C, Y_0\right) \approx A^* = A^*\left(P, Q_0^C + X, Y_0 - K\right) - \frac{\partial A\left(P, Q_0^C, Y_0\right)K}{\partial Y_0} + \frac{\partial A\left(P, Q_0^C, Y_0\right)X}{\partial Q_0^C} \text{ .. (3.5)}$$

ifferentiating equations (3.4) and (3.5) will yield.

$$\cdot \frac{\partial A\left(P, Q_0^C, Y_0\right)K}{\partial Y_0} + \frac{\partial A\left(P, Q_0^C, Y_0\right)X}{\partial Q_0^C} = 0 \text{ …….. (3.6)}$$

Iaking K the subject in equation (3.6) gives the WTP bids as:

$$WTP = K = \frac{\dfrac{\partial A\left(P, Q_0^C, Y_0\right)}{\partial Q_0^C}}{\dfrac{\partial A\left(P, Q_0^C, Y_0\right)}{\partial Y_0}} X \text{ ……. (3.7)}$$

where, $\dfrac{\partial A\left(P, Q_0^C, Y_0\right)}{\partial Q_0^C}$ represents the marginal utility a consumer derives from consuming certified vegetables. So, when a consumer does not have marginal utility for certified vegetable, it means that the left-hand side of equation (3.7) will be zero.

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Also, $\frac{\partial A\left(P, Q_0^c, Y_0\right)}{\partial Y_0}$ measures the marginal utility for money. Hence, consumers with large marginal utility for money will have zero WTP.

Finally, the natural log of equation 3.7 gives equation 3.8

$$\ln WTP = \ln\left[\frac{\partial A\left(P, Q_O^c, Y_0\right)}{\partial Q_0^c}\right] - \ln\left[\frac{\partial A\left(P, Q_0^c, Y_0\right)}{\partial Y_0}\right] + \ln X \quad \ldots\ldots\ldots (3.8)$$

quation 3.8 means that WTP is influenced by the marginal utility a consumer derives from onsuming certified vegetable, marginal utility for money and the quality of the certified vegetable. hus, a consumer would be willing to accept change if the utility she would derive from that ange is positive. To analyze this consumer choice behavior, the double-bounded dichotomous oice framework (Hanemann *et al.,* 1991) was used to elicit the WTP. This approach proposes vo consecutive bids to a consumer. The second bid is contingent upon the response to the first id. A consumer who responds "yes" to the first bid P_i^1 will be presented with a second higher id P_i^{2h} (where $P_i^{2h} > P_i^1$). If a consumer responds to the first bid is ''no'' the consumer will be resented with a second lower bid P_i^{2l} (where, $P_i^{2l} < P_i^1$).

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3.6. Data Analysis

Microsoft excel was used for data entry and editing. The stata version13 package was used for the estimation of the two ordered probit models. Objective one, which aimed at determining consumers' knowledge, perceptions and attitudes toward certified vegetables was presented descriptively in percentages and means. To determine the level of trust consumers' have in vegetable certification institution, the study used descriptive statistics (i.e. percentages and means).

.6.1. Econometric Analysis of Factors Influencing Consumers' Preferences for Vegetable ·ith Specific Characteristics at a Fixed Price.

o identify the factors influencing consumers' preferences for vegetables (i.e. cabbage, lettuce and)matoes) with specific characteristics at a fixed price, each of the three vegetables was assumed) have these four characteristics, (i) conventional vegetables, sold at the average market price, (ii) ıfer vegetables, sold at 125% of the average market price, (iii) vegetable certified by a national)vernment certifier (Burkina Faso certification institution), sold at 150% of the average market rice and (iv) vegetable certified by an international government certifier (European Certification ıstitution), sold at 175% of the average market price. Since, each of the three vegetables was ssumed to have four discrete choices which was ordinal using the binary probit or logit or ıultinomial logit would not be appropriate (Gujarati, 2003). The study used the ordered probit ecause the dependent variable is ordinal. In terms of food safety standards, a conventional egetable is considered to be less safe than a safer vegetable, in the same way that a safer vegetable is considered less safe than a vegetable with national certification (Burkina Faso certification). Finally, a vegetable with national certification (Burkina certification) is considered to be less safe than a vegetable with international certification (European certification). Thus, there is a natural ordering in terms of the price at which the four vegetables are sold in the market. Mathematically,

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in terms of food safety standards, a conventional vegetable < safer vegetable < vegetable with national certification < vegetable with international certification.

An ordered probit model is built on a latent regression in almost the same way as the binomial logit model (Greene, 2002), where the utility of a choice consists of a deterministic component $\left(\beta' X_i\right)$ and an error term $\left(\varepsilon_i\right)$ which is independent of the deterministic components and follows predetermined distribution. The ordered probit model is given as

$$_i^* = \beta' X_i + \varepsilon_i \ldots\ldots\ldots (3.9)$$

here, X_i is the vector of explanatory variables influencing consumer choices (i.e. abbage/lettuce/tomatoes with specific characteristics), β' is a vector of parameters to be etermined, ε_i is the random error term that assumes a standard normal distribution (Green, 2002), * is a vector of consumers' utilities derived from consuming a vegetable which is unobserved. his leads to the following classes:

=0 if a consumer prefers a conventional vegetable $Y_i^* \le \pi_1 \ldots\ldots\ldots$ (3.10)

=1 if a consumer prefers a safer vegetable $\pi_1 < Y_i^* \le \pi_2 \ldots\ldots\ldots\ldots$ (3.11)

=2 if a consumer prefers a vegetable with national certification (Burkina Faso certification) $\pi_2 < Y_i^* \le \pi_3 \ldots\ldots\ldots\ldots\ldots$ (3.12)

P=3 if a consumer prefers a vegetable with international certification (European certification) $\pi_3 < Y_i^* \ldots\ldots\ldots\ldots\ldots$ (3.13),

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where π_1, π_2 and π_3 are the classified threshold values.

The probabilities are shown below.

$$pr(Y = 1/X, \beta) = \phi\left(\pi_1 - X'\beta\right) \ldots\ldots\ldots \text{(3.14)},$$

if a consumer prefers conventional cabbage/lettuce/tomatoes

$$pr(Y = 2/X, \beta) = \phi\left(\pi_2 - X'\beta\right) - \phi\left(\pi_1 - X'\beta\right) \ldots\ldots\ldots \text{(3.15)},$$

a consumer prefers safer cabbage/lettuce/tomatoes

$$pr(Y = 3/X, \beta) = \phi\left(\pi_3 - X'\beta\right) - \phi\left(\pi_2 - X'\beta\right) \ldots\ldots\ldots\ldots \text{(3.16)},$$

a consumer prefers vegetable with national certification (Burkina Faso certification)

$$pr(Y = 4/X, \beta) = 1 - \phi\left(\pi_3 - X'\beta\right) \ldots\ldots\ldots \text{(3.17)},$$

a consumer prefers vegetable with international certification (European certification). ϕ is the andard normal cumulative distribution function which ensures that the predicted outcome of the odel always lies between 0 and 1 (Greene, 2002).

he empirical model of the factors influencing consumers' preferences for vegetable with specific characteristic can be expressed as:

$$VEG-CHOICE = \beta_0 + \beta_1 SEX + \beta_2 AGE + \beta_3 HHSIZE + \beta_4 EDUC + \beta_5 INCOME + \beta_6 AWASV + \beta_7 PRICE$$

$$\beta_8 FINRIS + \beta_9 CTNG + \beta_{10} CTING + \varepsilon \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \text{(3.18)}$$

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Equation 3.18 is used to estimate the factors influencing consumers' preferences for 1kg of cabbage, 1kg of a buddle of lettuce and 1kg of tomatoes with specific characteristics, respectively. The variables are described in Table 3.2 below. These variables are derived from related studies such as Rodríguez *et al.* (2006), Kassali *et al.* (2010), Allen and Ellen (2011), Deliana (2012), Ogundele (2014) Velčovska and Chiappa (2015).

.6.2. Description of Explanatory Variables and *a priori* Expectations of Variables used for 'egetable preference model

he *a priori* expectations of the variables in Table 3.2 below are presented below.

rice of vegetables was measured as a continuous variable (i.e. the price at which the vegetable 'as assumed to be sold in the market) and is expected to negatively affect consumers' food reference. This is because, basic economics theory suggests that at a higher price less is bought nd the vice versa. Besides, since consumers have unlimited wants with limited resources, they ıay prefer goods and services with low prices to those with high prices.

he sex of the respondent which was dummied could have either a positive or negative impact on onsumers' preference for certified vegetables. This is because, it unknown which sex category .e. females or males) will prefer certified vegetable most. This unclear issue has meant that sex ariable has an infinite expectation.

he age variable which was measured in years also has a positive/negative expectation because it could have either negative or positive influences on consumer preference. For instance, if the older consumers are more health-conscious or have a high level of trust on vegetables certifiers than the younger ones, this will render the age variable to a positive sign and the vice versa will render the age variable to a negative sign. Kohansal and Firoozzare (2013) and Gyau *et al*. (2014) reported

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that age positively influence consumer food preference. Allen and Ellen (2011) on the other hand, reported that age has a negative influence on consumer food preference.

Household size was measured as a continuous variable and is expected to negatively correlate with the quantity of vegetables consumed and for that matter, consumers' preference. This is not surprising as we all know that, when many consumers depend on a limited resource, it becomes ıcreasingly difficult to maximised satisfy. Another possible reason that may result into household ze influencing vegetable preference negatively is the fact that larger households may generally ave many households' commitments to fulfil and thus, may face higher budget constraint which ıay result to their lesser preference for certified vegetables compare to smaller households, *ceteris aribus.* This Household size influences consumers' food preference (Musa *et al.,* 2011; Danso-bbeam *et al.,* 2014).

Education was also measured as a continuous variable in this study and has been reported to have positive influence on consumer food preferences (Deliana, 2012; Kohansal and Firoozzare, 013). Education, is expected to have a positive impact on consumers' preferences for certified egetables because, it is generally believed that consumers who have higher education have higher nowledge and purchasing power than their counterparts who have lower education or no ducation.

ıcome level was measured in CFA and use in the model because, the level of a consumer's income affects his/her preference for food. Income is expected to have a positive influence on consumers' preference for certified vegetable. This is because, certified vegetables are expected to have a higher price than the conventional ones because of the cost of certification and it may only be consumers who have higher income that may be able to purchase it. Kassali *et al.* (2010) and

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Kohansal and Firoozzare, (2013) have been reported in their respective studies that income directly affects consumer food preferences.

The amount spent on vegetables per week was measured in CFA and is expected to have a positive influence on consumers' vegetable preferences. According to Danso-Abbeam *et al*., (2014) amount spent on food product directly influence consumer, food preference. This is because, onsumers will not hesitate to spend more on a safer food product that constitute a major omponent of their household food expenditure.

inancial risk was also dummied (1, if the respondent is willing to take financial risk (i.e. consumer a financial risk lover), 0, if the consumer is unwilling to take financial risk (consumer is nancially risk averse). It is hypothesized that consumers' who are willing to take a financial risk inancial risk lovers') may have preferences for certified vegetables, particularly, the ones with ıternational certification (European certification) which are sold at a higher price than their ounterparts who are not willing to take financial risk (financial risk adverse).

onsumers' level of trust in national government certification institution was dummied (1 if a onsumer has some trust, 0 if a consumer does not trust all). This variable was used in both models ecause it also influences consumer consumption preference (Smed *et al.*, 2013) for certified food. onsumers' level of trust of national certifiers is expected to have a positive influence on onsumers' vegetable preference. This is because, it expected that consumers who have trust in national certifiers should prefer and be willing to pay a price premium for certified vegetables compared to their counterparts who do not have trust at all in national certifiers.

Finally, consumers' level of trust in international certification institution was also binary (1 if a consumer has some trust, 0 if the consumer does not have trust at all) and is expected to have a

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positive influence on consumers' vegetable preference for certified vegetables, particularly, the ones certified by international certifiers. It is also hypothesized that consumers' who have a high level of trust in international certifiers' should be willing to pay a higher price premium than their counterparts who have no trust at all in international certifiers. These variables are further summarized in Table 3.2, below.

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Table 3.2. Description, Measurements and Expected signs of the Variables used for the two ordered probit models

Variable	Description	Measurement	Expected sign	*Model
PRI(	Price of the vegetables	Amount in CFA	-	OPP
INB(	Starting bid	Amount in CFA	-	OPWTP
SEX	Sex of respondent	Dummy, 1 if male, 0 if female	+/-	OPP/OPWTP
AGE	Age of the respondent	Number of years	+/-	OPP/OPWTP
HHS	Household size of the respondent	Number people who eat from the same pot.	-	OPP/OPWTP
EDU	Education level of the consumer	Number of years a respondent spend in school	+	OPP/OPWTP
INC(	Average monthly income of the consumer	Amount in CFA	+	OPP/OPWTP
KW(	Consumer knowledge on the availability of certified vegetables at farm gate	Dummy, 1 if yes, 0 if no	+/-	OPWTP
AW/	Amount spent on vegetables per week	Amount in CFA	+	OPP

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HRISK	Consumer willingness to take health risk	Indicator, 1 if consumer is not willing to take health risk (health-conscious), 0 if consumer is willing to take health risk (health- unconscious)	+	OPWTP
FINI	Consumer willingness to take financial risk	Indicator, 1 if consumer is willing to take financial risk (financial risk lover), 0 if consumer is not willing to take financial risk (financial risk adverse)	+	OPP
CTN	Consumer level of trust on national government certification	1 if consumer has very high trust, 0 if consumer do not trust at all.	+	OPP/OPWTP
CTII	Consumer level of trust on international government certification	1 if consumer has high trust, 0 if consumer do not have trust at all.	+	OPP/OPWTP

NO1 ***: the model in which variable is applied: OPP is ordered probit model for preference ,OPWTP is Ordered probit model for WTP***

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3.6.3 Econometric Analysis of Factors Influencing Consumers' WTP a Price Premium for Certified Vegetables

Since the dependent variable WTP for certified vegetables is likely to have some zero values, it will be inappropriate to use the ordinary least squares (OLS) for the analysis because, that would yield biased and inconsistent results (Greene, 2003). Similarly, using the Tobit model or Heckman selection will not be appropriate because, Ricker-Gilbert *et al.* (2011) noted that the Tobit or Heckman selection model is designed for incidental truncation, where the zeros are unobserved values. However, in this study, a zero value in the data would reflect consumers' optimal choice if not willing to pay a premium for certified vegetables rather than a missing value (Reyes *et al.*, 2012). It would be misleading to assume missing observations to be same as zeros (Olwande and Mathenge, 2012). Thus, the study used the ordered probit model to estimate the factors influencing consumers' WTP for certified vegetables. The ordered probit model was used because, the dependent variable WTP was multiple and ordinal. This argument is supported by Cranfield and Magnusson (2003), who noted that the ordered probit model should be used when the WTP takes the form of a multiple response variable that has an intrinsic order. The dependent variable, willingness to pay (WTP), was categorical and coded 0 to 4 : (0) when the respondent is definitely not willing to pay a premium for certified vegetable (no premium), (1) when the respondent is willing to pay above the market price (i.e. when both the initial and lowest bids are rejected) (low premium), (2) when the respondent is rather willing to pay a price premium (i.e. when the respondent rejected the first bid and accepted the second bid, which is lower) (medium premium), (3) when the respondent is willing to pay a price premium (i.e. when the respondent accepted the first bid and rejected the second bid which is higher (high premium), and (4) the WTP is higher, when the respondent is definitely willing to pay a price premium (i.e. when both bids are accepted)

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(very high premium). The willingness to pay (WTP) model can be formulated as (Murphy *et al.*, 2005).

$$WTP^{*} = X^{'}\beta + \varepsilon \quad \ldots\ldots\ldots\ldots (3.19)$$

where, WTP^{*} is the consumer's latent (unobserved) WTP for certified vegetable, X is a vector f variables affecting the WTP, β is a vector of parameters reflecting the relationship between illingness to pay (WTP) and variables in X, and ε is the error term, normally distributed with ean of zero and variance of one. If a consumer's unobserved WTP^{*} falls within a predetermined nge, their WTP is assigned a numerical value that reflects the category within which lies their nobserved WTP. If $\gamma_{j\ 1} < WTP \leq \gamma_{j}$ then $WTP = j - 1$ for all $j = 1,\ldots,j$ where, j is the illingness to pay (WTP) category selected by the respondent and γk are the category parameters. s the dependent variable has five categories, four unobserved thresholds are expected:

/TP=0, if a respondent is definitely not willing to price premium (no premium)

$$WTP^{*} \leq \gamma 1\Big] \ldots\ldots\ldots\ldots\ldots (3.20)$$

/TP=1, if a respondent is willing to pay above the market price (lower premium)

$$\gamma 1 < WTP^{*} \leq \gamma 2\Big] \ldots\ldots\ldots\ldots\ldots (3.21)$$

WTP=2, if a consumer is rather willing to pay a price premium (Medium premium)

$$\Big[\gamma 2 < WTP^{*} \leq \gamma 3\Big] \ldots\ldots\ldots\ldots\ldots (3.22)$$

WTP= 3, if a respondent is willing to pay a price premium (High premium)

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$$\left[\gamma 3 < WTP^{*} \leq \gamma 4\right] \ldots\ldots\ldots\ldots\ldots \ (3.23)$$

WTP=4, if a respondent is definitely willing to pay a price premium (Very high premium)

$$\left[\gamma 4 < WTP^{*}\right] \ldots\ldots\ldots\ldots\ldots \ (3.24)$$

The probability (P) of a willingness to pay (WTP) being in one of the four finite categories can be written as:

$$P(WTP = j - 1) = \Phi(\gamma j - X'\beta) - \Phi(\gamma j - 1 - X'\beta) \forall j \in j$$

where, Φ is the cumulative density function measuring the probability of WTP being less than the respective threshold level. The probability of each outcome is modelled as follows;

$$Pi0 = pr(Yi = 0) = F(\gamma 1 - Xi'B) \ldots\ldots\ldots\ldots\ldots \ (3.25)$$

$$P_i 1 = pr(Yi = 1) = F\left(\gamma 2 - X_i'\beta\right) - F\left(\gamma 1 - X_i'\beta\right) \ldots\ldots\ldots\ldots\ldots \ (3.26)$$

$$Pi2 = pr(Yi = 2) = F\left(\gamma 3 - X_i'\beta\right) - F\left(\gamma 2 - X'_i\beta\right) \ldots\ldots\ldots\ldots\ldots \ (3.27)$$

$$pi3 = pr(Yi = 3) = F\left(\gamma 4 - X'_i\beta\right) - \left(\gamma 3 - X_i'\beta\right) \ldots\ldots\ldots\ldots\ldots \ (3.28)$$

$$pi4 = pr(Yi = 4) = 1 - F\left(\gamma 4 - X'_i\beta\right) \ldots\ldots\ldots\ldots\ldots \ (3.29)$$

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The empirical model used for estimating the factors influencing consumers' willingness to pay is specified below:

$$WTP = \beta_0 + \beta_1 INB(P) + \beta_2 SEX + \beta_3 AGE + \beta_4 HHSIZE + \beta_5 EDUC + \beta_6 INCOME + \beta_7 KNOWVF + \beta_8 HRISK$$

$$+ \beta_9 CTNG + \beta_{10} CTING + \varepsilon \text{ .... } (3.30)$$

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Vhere equation 3.30 is used to estimate the factors influencing consumers' willingness to pay kg of certified cabbage, lettuce and tomatoes, respectively. The variables are described in Table .2. These variables are derived from previous studies on consumers' WTP for certified foods :.g. Stefano *et a*l., 2001; Rodríguez *et al*., 2007; Dettmann & Dimitri, 2007; Roitner – chobesberger *et al.*, 2008; Yu and Abler, 2009; Akgüngör *et al.*,2010; Kalashami *et al.*, 2012; omsak *et al.*, 2012 ; Hai *et al.*, 2013; Faustin *et al.*, 2015; Obayelu *et al*., 2015; Wang and :uo, 2016 and so on).

.6.4. Description of Explanatory Variables and *a priori* Expectations of Variables used for VTP Model

he *a priori* expectations of the variables in Table 3.2 above are presented below.

:he initial bid (price), could indirectly influence WTP price premium for certified vegetables. For ıstance, higher initial bid (price) may prevent consumers from being willing to pay a price remium while a lower initial bid may encourage consumers to pay more, (Zhang *et al.* 2010; Bekta *et al.* 2011; Janani 2012) have argued that the initial bid (price) has negative influence on consumers' WTP.

The sex of the respondent which was dummied could have either a positive or negative impact on consumers' WTP for certified vegetables. This is because, it unknown which sex category (i.e.

females or males) will be more willing to pay a premium for certified vegetable. For example, some consumer studies have argued that females are more likely to have higher WTP for certified food (safe foods) than males (Williams and Hammitt 2000; Williams and Hammitt 2001; Liu *et al.,* 2009 Wahida *et al.,* 2012). However, Wang and Huo (2016) reported that males were more likely to be willing to pay for certified fruits (apple) than females. These contradictory findings have meant that sex variable has an infinite expectation.

he age variable which was measured in years also has a positive/negative expectation because it ɔuld have either negative or positive influences on consumer preference. For instance, if the older ɔnsumers are more health-conscious or have a high level of trust on vegetables certifiers than the ɔunger ones, this will render the age variable to a positive sign and the vice versa will render the ge variable to a negative sign. For instance, Ara (2002) revealed a negative correlation between ge and WTP for organic rice in Naga. Contrary to this finding, Van *et al.*,(2011), Faustin *et al.*, 2015) and Obayelu *et al*., (2015) reported in their respective studies that age positively influence ɔnsumer WTP for high quality food.

ousehold size was measured as a continuous variable and is expected to negatively correlate with ıe quantity of vegetables consumed and for that matter, consumers' WTP for certified vegetables. his is not surprising, as it is expected that, when many consumers depend on a limited resource, becomes increasingly difficult to maximised satisfy. Another possible reason that may result into household size influencing vegetable preference negatively is the fact that larger households may generally have many households' commitments to fulfil and thus, may face higher budget constraint which may result to their lesser preference for certified vegetables compare to smaller households, *ceteris paribus.* Thus, household size influences consumers' WTP negatively (Xia and Zeng, 2008; Twerefou 2014 and Muhammad *et al.,* 2015).

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Education was also measured as a continuous variable in this study and has been reported to have a positive influence on consumers' WTP (Darby *et al*., 2008; Liu *et al*., 2009) for food products. Education, is expected to have a positive impact on consumers' WTP for certified vegetables because, it is generally believed that consumers who have higher education have higher knowledge and purchasing power than their counterparts who have lower education or no education.

ıcome level was measured in CFA and use in the model because, the level of a consumer's income ffects his/her WTP for food. Income is expected to have a positive influence on consumers' WTP ɔr certified vegetable. This is because, certified vegetables are expected to have higher prices than ıe conventional ones because of the cost of certification and it may only be consumers who have igher income that may be able to purchase it. Various studies have reported that income has a ɔsitive influence on consumers' WTP for certified food particularly certified organic food. Stefano *et a*l., 2001; Rodríguez *et al*., 2007; Dettmann & Dimitri, 2007; Roitner – Schobesberger *et al.,* 2008; Yu and Abler, 2009; Akgüngör *et al.,* 2010; Kalashami *et al.,* 2012; Somsak *et al.,* 012 and Hai *et al.,* 2013) .

Consumers' knowledge on the availability of safer vegetables at farm gate was measured as a inary variable and is expected to have either a negative or positive impact on their WTP. It is xpected that consumers who have knowledge on the availability of certified vegetable at farm ate may know the importance of certified vegetable to their health and thus may not hesitate to pay a premium for certified vegetables than their counterpart who have no knowledge on the availability. For example, Obayelu *et al.* (2015) postulated a negative relationship between consumer knowledge and WTP for certified Moringa products in Nigeria. On the other, Wang and Huo (2016) reported that high knowledge and confidence directly influence consumers WTP a price premium for certified fruits.

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Health risk was dummied, 1 assigned to consumers who were health conscious and 0 to those who were not health conscious. The variable is expected to have a positive influence on consumers' WTP for certified vegetables. Consumers' who are health-conscious may be more likely to pay a price premium for certified vegetables than those who are not health conscious (Obayelu *et al.* 2015).

inancial risk was also dummied (1, if the respondent is willing to take financial risk (i.e. consumer a financial risk lover), 0, if the consumer is unwilling to take financial risk (consumer is nancially risk averse). It is hypothesized that consumers' who are willing to take a financial risk inancial risk lovers') may have preferences for certified vegetables, particularly, the ones with ıternational certification (European certification) which are sold at a higher price than their ɔunterparts who are not willing to take financial risk (financial risk adverse).

onsumers' level of trust in national government certification institution was dummied (1 if a ɔnsumer has some trust, 0 if a consumer does not trust all). This variable was used in both models ecause it also influences consumer consumption preference (Smed *et al.,* (2013) and WTP (Pivato *al.,* 2008) for certified food. Consumers' level of trust of national certifiers is expected to have positive influence on consumers' vegetable preference and WTP for certified vegetables. This is ecause, it expected that consumers who have trust in national certifiers should prefer and be illing to pay a price premium for certified vegetables compared to their counterparts who do not have trust at all in national certifiers.

Finally, Consumers' level of trust in international certification institution was also binary (1 if a consumer has some trust, 0 if the consumer does not have trust at all) and is expected to have a positive influence on consumers' vegetable preference for certified vegetables, particularly, the

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ones certified by international certifiers. It is also hypothesized that consumers' who have a high level of trust in international certifiers' should be willing to pay a higher price premium than their counterparts who have no trust at all in international certifiers. These variables are further summarized in Table 3.2, above

3.6.5. An Estimate of the Mean Willingness to Pay

he mean willingness to pay was estimated using the Open- ended WTP amounts elicited and by dopting the formula:

$$MWTP = \frac{1}{n}\sum_{i=1}^{n} y_i \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (3.31)$$

vhere, n is the sample size and each y is a reported willingness to pay (WTP) amount. This was one because the ordered probit model cannot lead to the estimation of a mean WTP; it can only ead to what is associated with being in one of the WTP categories (Owusu and Anifori, 2013).

.6.6. Analyzing the Potential Constraints Consumers' May Faced in Accessing Certified 'egetables

he Henry Garrett ranking technique was used to analyze the consumers' responses to the potential onstraints they may face in accessing certified vegetables. The Garrett method works by resenting a number of factors for respondents to rank in the order of their importance. The ranks ssigned to the factors are then quantified into percentage positions using the Garrett formula. After calculating for the percentage, mean scores are computed. The mean scores are used to show which of the factors is most important or predominant. The criterion is that the factor with the highest mean score is predominant in terms of importance and in that order. The reason for the use

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of the Garrett technique over the Kendall's coefficient of concordance is that, the Garrett is suitably applicable to cases of heterogeneous groups.

The empirical model for analyzing the constraints using the Garrett method is specified below.

$$\text{Percentage position} = \frac{100(Rij \quad 0.5)}{Nij} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \text{(3.32)},$$

'here Rij is the rank given for the ith factor by the jth individual and Nij is the number of ıctors ranked by the jth individual.

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CHAPTER FOUR

RESULTS AND DISCUSSIONS

4.1. Chapter Outline

This chapter presents the results and findings of the study. The results are summarized as means, percentages, coefficients and marginal effects. There are eight subsections. Subsection 4.2, gives a detailed description of the demographic and socioeconomic characteristics of the 400 sampled households in Ouagadougou. The next subsection 4.3, looks at consumers' general purchasing behaviour of vegetables. The third subsection 4.4, presents consumers' knowledge, perceptions and attitudes towards certified vegetables. Furthermore, the result of consumers' levels of trust in various vegetable certifiers is presented in subsection 4.5. The other subsection, 4.6 presents findings on consumers' preference for vegetables with specific characteristics and the factors influencing their choices for those vegetables. Moreover, results on consumers WTP and the factors influencing their WTP as well as the potential constraints, consumers face in accessing certified vegetables are presented in the last two subsections 4.7 and 4.8, respectively.

4.2. Demographic and Socioeconomic Characteristics of Surveyed Households

In order to place this study in the correct framework, it is necessary to understand the demographic and socioeconomic characteristics of the consumers in the study area. This is because identifying and understanding those characteristics may help throw more light on their consumption and preference for certified vegetables. According to Campiche *et al.* (2004), socioeconomic characteristics are very vital in consumer studies because they influence consumption patterns and WTP. The demographic characteristics are jointly presented in Table 4.1, while, the socioeconomic characteristics are jointly presented in Table 4.2.

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4.2.1. Demographic Characteristics of Surveyed Households

Age Distribution of the Respondents

Table 4.1 indicates that the mean age was about 33 years. This implies that majority of the respondents are within the working class and are more likely to have some disposable income for their household expenditure. This could also mean that consumers in the study area are active and) meet their daily required energy, there is the need for them to consume certified vegetables and ther foods to enable them meet their daily balanced diet. This result confirms the findings of other onsumer studies such as Juliano (1985) and Kwakwa (2013) who both concluded that an active dult population requires food to meet their daily carbohydrate and protein needs for sustenance. bout 28.8% of the respondents were within the age category of 18-24years while, majority 51.8%) of the respondents were within the age category of 25-54 years. Only 6.7% and 2.7% of ıe households were within the age brackets of 55-64 years and, 65 years and above, respectively. enerally, about 90.6% of the sampled households were within the economically active age ıtegory.

ex of Respondents

he results in Table 4.1 below show that the greater proportion (96.7%) of the sample were females hile 3.3% were males. The sample was biased in favour of the females because women are sually considered as the "principal home makers" as they usually purchase foodstuff especially, vegetables.

Furthermore, in Africa, it is generally believed that women are responsible for cooking in the household. Also, it has been noted that women are responsible in most African households to decide on the kind of foodstuff they will purchase and the form in which they are prepared for

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consumption in a household (Isife and Emodi, 2000). This finding confirms that of Kwakwa (2013), whose sample was also biased in favour of the females.

Marital Status

In Table 4.1 it can be seen that majority (69.5%) of the respondents' were married while the remaining (30.5%) were single. It is agreed, that all other things being equal, consumers who are ıarried, especially women, should purchase more vegetables than consumers who are single. This because according to Basorun (2008), cooking is the major role of married women.

ousehold Size

ousehold size, to some extent, informs the frequency and quantity of food to purchase. ractically, *ceteris parabius*, there is a positive correlation between household size and the quantity f vegetables to be consumed. From Table 4.1 below, the mean household size in Ougadouguo as 7. The highest percentage of respondents (41.7%) had 1 to 5 people in their households while out 41% of the households had 6 to 10 people in their households. Furthermore, about 14% and .3% of the sample had 11 to 15 and 16 and above people in their households, respectively. The ırger household size revealed from the study area may be seen as a prospect to high demand for od since Al-Hassan (2008) noted that larger families usually earn additional income from non-ırming activities. Also, according to Stewart, et *al.* (2004), household size and many dependants ometimes influence food preferences.

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Table 4.1. Socio- Demographic Characteristics of Respondents

Characteristic	**Mean**	**Frequency**(n=400)	**Percentage**
Age:	33.294		
• 18-24years	-	115	28.8
• 25-54years	-	247	61.8
• 55-64years	-	27	6.7
• 65 years and above	-	11	2.7
Sex:	-		
• Female	-	387	96.7
• Male	-	13	3.3
Marital status:	-		
• Single	-	122	30.5
• Married	-	278	69.5
Household size:	6.95		
• 1-5 persons	-	167	41.7
• 6-10 persons	-	164	41.0
• 11-15 persons	-	56	14.0
• 16 and above persons	-	13	3.3
Religion:	-	-	-
• Traditionalist	-	5	1.3
• Muslim	-	207	51.7
• Christian	-	188	47.0
Ethnicity:	-		
• Mossi	-	288	72.0
• Peul	-	16	4.0
• Lobi	-	6	1.5
• Bobo	-	16	4.0
• Senufo	-	4	1.0
• Gurunsi	-	18	4.5
• Bissa	-	11	2.8
• Samo	-	15	3.8
• Grumachi	-	8	2.0
• Dafi	-	9	2.2
• Others	-	9	2.2

Source: Computed from field data ,2016

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Religion and Ethnicity

Muslim constituted majority (51.7%) of the survey sample. This was followed by Christians who were 47% and the remaining (1.3%) of the consumers were traditionalists. In terms of ethnicity, 72% of the respondents were Mossi. This is not surprising because other studies in Ougadougou had similar findings where the Mossi ethnic group dominates. For instance, Chagomoka *et al.* 2015) reported in their studies that about 88% of the sampled population were mossi. Also, the rger representation of the Mossi group was expected because they occupy larger part of uguaduoguo. The second largest ethnic group was Gurunsi who were 4.5% of the sample, with eul and Bobo being the third lager ethnic groups with 4.0% each. The other ethnic groups were amo, Bissa, Dafi and others forming 2.2% of the respondents.

.2.2. Socioeconomic Characteristics of Surveyed Households

ducational Status of the Sampled Households

espondents' educational status was measured categorically. Results from Table 4.2 below idicates that 13.3% of the respondents had never been to school, 1.7% had attended a Arabic chool while as low as 0.5% of the respondents had non-formal education. Furthermore, 25.7% of ie respondents had primary education, 13% had Junior High School education, 14.3% had tertiary ducation and the highest percentage (31.5%) of the sampled population had Senior High School ducation. From this result, it may be concluded that majority of the respondents were educated. This result is not surprising because, there have been a significant increase in the gross primary school enrolment from 57% in 2005 to 81% in 2013 while access to secondary education had risen from 25.6% in 2005 to 51% in 2013 (World Bank, 2016). It is expected that educated consumers should be more willing to pay for certified vegetables than those who are uneducated.

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Table 4.2 Socioeconomic Characteristics Of The Respondents

Characteristic	Mean	Frequency	Percentage
Education:	-	-	-
• No schooling	-	53	13.3
• Koranic school	-	7	1.7
• Non formal	-	2	0.5
• Primary school	-	103	25.7
• Junior High school	-	52	13.0
• Senior High school	-	126	31.5
• Tertiary	-	57	14.3
Monthly income	8662.54	-	-
Occupation:	-	-	-
• Unemployed	-	93	23.3
• Own farm	-	6	1.5
• Dialy wage labour	-	1	0.3
• Salaried worker	-	68	17.0
• Petty trading	-	86	21.5
• Craftsman	-	39	9.7
• Student	-	91	22.7
• Others	-	16	4.0

ource: Computed from field data, 2016.

ıcome

he average monthly household income was CFA 8,662.54. This is not surprising because the per ıpita GDP and poverty rate in Burkinafaso in 2014 were $690 and 40.1%, respectively (World ank , 2016). Another possible reason for the low household income is because majority (23.25%) of the sample population were unemployed as shown in Table 4.2. This lower mean household income may negatively affect their WTP for certified vegetables because of budget constraints. It is expected that income should positively correlate with WTP for certified vegetables.

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Occupation

The highest percentage of respondents (23.3%) were unemployed while 1.5% were employed in their own farms. Furthermore, as low as 0.3% and 17% of the respondents were a daily wage labourers and salaried workers, respectively. Similarly, 21.5% of the sampled population were into petty trading while 9.7% of the consumers were into craftsmanship. Finally, 22.7% were students hile 4% were into other activities.

urkina Faso is a low-income country and hence the high rate of unemployed population is not rprising. Salary workers are expected to be more willing to pay for certified vegetables than the ther occupational groups such as students since salary workers have a regular source of income.

3. Consumers General Purchasing Behaviour of Vegetables

3.1 Frequency of Purchase of Vegetables

he study assessed consumers' frequency of purchase of vegetables in general. From Table 4.3, it as found that a higher percentage of the sampled population (91%) usually purchased vegetables n a daily basis, while 5.3% purchased vegetables on a weekly basis. The remaining 3% and 0.7% sually purchased vegetables on a fortnightly and a monthly basis, respectively. This result is lausible because most vegetables such as tomatoes are very perishable and thus, most consumers refer to consume them fresh and as a result they tend to buy them on a daily basis. This finding similar to that of Coulibaly *et al.* (2011) which showed that consumers in Ghana and Benin usually purchased vegetables on a daily basis.

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Table 4.3. Consumers' Frequency of Purchased of Vegetables

Frequency of Purchase of Vegetables	Frequency (400)	Percentage
Daily	364	91.00
Weekly	21	5.3
Fortnightly	12	3.00
Monthly	3	0.7

ource: Computed from field data ,2016

.3.2. Features of Vegetables Considered before Purchases are Made

onsumers generally have some features of the vegetables they consider before buying them. This udy presented features such as the appearance (e.g. freshness, color, cleanliness, texture and size) f the vegetable, the nutritional value of the vegetable, the source of irrigating the vegetable and ıe excess use of agrochemical in vegetable production. The results are presented in Figure 4.1 elow.

rom the figure, as many as 93.3% of the consumers indicated that the appearance of the egetables positively influenced their purchasing decisions. The remaining 6.7% of the consumers ıid the appearance of vegetables did not positively influence their buying decision. An bservation from the result shows that the appearance of the vegetables positively influenced urkinabe consumers' buying decisions. This result is not surprising as many consumer studies such as Balamatti (2000), Osei-Asare (2009), Probst *et al*.(2012) and Obuobie *et al.* (2014) have concluded that vegetables are considered healthy and of good quality if their appearance (e.g. freshness, color, cleanliness, texture, size) is good.

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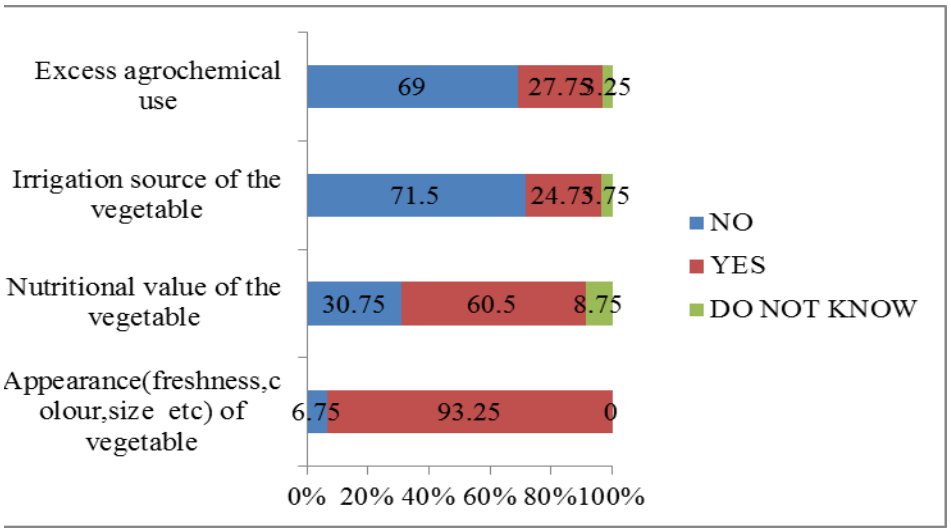
When asked whether the nutritional value of the vegetable positively influenced their buying decisions, 60.5% of the sampled population noted that the nutritional value of the vegetables positively influences their buying decision while 30.7% of the consumers indicated that they do not consider the nutritional value of the vegetables when buying vegetables, and 8.7% could not tell whether or not they consider the nutritional value of the vegetable before purchases. The finding that 60.5% of the sample stated that the nutritional value of the vegetables positively ıfluenced their buying decisions makes sense as Probst (2008) postulated that consumers usually ɔnsider the health value of the vegetables which is positively correlated with the nutritive health alue. This finding is also similar to the finding of Wang and Huo (2016) who indicated that a ɯmber of consumers are so concerned with the nutritional value of the fruit they buy.

igure 4.1. Features of vegetables considered before purchases are made



Source: Drawn from field data, 2016.

Furthermore, from figure 4.1, as many as 71.5% of the respondents indicated that the source of irrigation water used in the vegetable production did not influence their buying decisions. This was

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followed by 24.7% of the sampled population who answered in the affirmative. However, 3.7% could not tell whether or not the irrigation water used in vegetable production influenced their buying decisions of vegetables. It is possible that the 71.5% of the consumers in Ouagadougou who do not consider the source of irrigation water may not see the use of irrigation water in vegetable production as a risk (Keraita and Drechsel, 2015). Another reason for this result could be that consumers often find it very difficult to differentiate between vegetables from good rigation source and those from bad irrigation sources by themselves.

.s the excessive use of agrochemicals for vegetable production might lead to health hazards, onsumers were asked whether or not they were concerned about using agrochemicals in roducing vegetables. Of the 400 sampled households, 69% indicated they were not concerned bout the use of agrochemical for vegetable production while 27.7% indicated they were oncerned. Only 3.3% stated they did not know. From the result, the fact that the majority of the onsumers' were not concerned about the use of agrochemicals in vegetable production may mean iat consumers are not aware of the health hazards associated with agrochemical residues in food. . similar observation was made by Probst *et al.* (2012) in their study of the marketing potential of rganic vegetables in the food vending sector of Cotonou (Benin), Accra (Ghana) and uagadougou (Burkina Faso), where they concluded that consumers' awareness level of chemical ontamination risks was generally low. However, this finding contradicts a study by Ocoulibaly *et l.* (2011) which revealed that consumers' awareness of the health hazards of agrochemical is high in Ghana and Benin.

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4.4. Consumers' Knowledge, Perceptions and Attitudes towards Certified Vegetables

Consumers' Knowledge on the Availability of Certified Vegetables

Respondents were asked whether they had knowledge on the availability of safer and certified vegetables in the market, supermarket and at the farm gate. From Table 4.4 the highest percentage of respondents (95.3%) indicated they had knowledge on the availability of safer vegetables in ıarket while 14.5% and 13.5% noted that they had knowledge of the availability of safer egetables in the supermarket and at the farm gate, respectively. Nonetheless, none of the sampled opulation had knowledge on the availability of certified vegetables in the three market outlets Table 4.4).

able 4.4. Consumers' Knowledge on the Availability of Safer and Certified Vegetables in the Iarket, Supermarket and Farm gate.

Statement	**Safer vegetables**		**Certified vegetables**	
	% of respondents		**% of respondents**	
	Yes	**No**	**Yes**	**No**
Knowledge of the availability of safer/certified vegetables in the market	95.3	4.7	0.0	100
Knowledge of the availability of safer/ certified vegetables in the supermarket	14.5	85.5	0.0	100
Knowledge of safer/certified vegetables at the farm gate	13.5	86.5	0.0	100

ource: Computed from field data, 2016

hus, it may be said that consumers generally have some knowledge of safer vegetables, but no knowledge on the availability of certified vegetables. This is not surprising as some studies (Aryal *et al.*, 2009; Hamzaoui-Essoussi and Zahaf, 2012) have confirmed that consumers have some knowledge on the availability of safer (organic) food. Consumers indicating they had no knowledge on the availability of certified vegetables is not surprising as Probst (2012) stipulated

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that the safety of vegetables as food is currently "ungoverned" in urban West Africa and that the few African vegetable certifications target the export market, but not the domestic market. Moreover, Keraita and Drechsel (2015) have noted the issue of certified food is still unpopular in most West African countries, especially in Ouagadougou, when they reported that only 12.5% of consumers actually looked out for food labels and only 14% of organic farmers were aware of related national codes and regulations.

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'onsumers' Perceptions of Certified Vegetables

Iajority of the sampled households (89%) agreed that prices of certified vegetables were higher ıan that of conventional vegetables while 10.3% did not think so. However, the remaining 0.7% f the consumers were not sure. This result confirms studies by Radman (2005) and Abrams *et al*. 2009) which both concluded that consumers perceived certified vegetables to be more expensive ıan conventional vegetables. It is generally expected that the price of certified vegetables should e higher than conventional vegetables because of the extra cost (including cost of certification) roducers may incur in producing certified vegetables.

Vhen asked whether they perceived certified vegetables to be more nutritious than conventional egetables, 91.2% of the consumers agreed that certified vegetables were more nutritious than onventional vegetables while only 6.3% revealed they disagree with the statement. The remaining .5% were not sure about the statement. The findings are in sync with that of White *et al.*, (2013) which revealed that there is high public belief that certified food (organic food) is safer, more nutritious, and better tasting than conventional food.

Table 4.5. Consumers' Perceptions of Certified Vegetables

Statement	Disagree (%)	Neutral (%)	Agree (%)
Prices of certified vegetables are more expensive than conventional vegetables	10.3	0.7	89.0
Certified vegetables are more nutritious than conventional vegetables	6.3	2.5	91.2
Certified vegetables are tastier than conventional vegetables	28.5	5.3	66.2
Certified vegetables are healthier for me and my family than conventional vegetables	1.3	1.5	97.2

ource: Computed from field data, 2016

f the 400 sampled households, more than half (66.2%) of the respondents agreed with the atement that certified vegetables are tastier than conventional vegetables. However, while 28.5% isagreed that certified vegetables were tastier than conventional vegetables, 5.3% indicated that ey were unsure about the statement. Thus, consumers fairly perceived certified vegetables to be stier than conventional vegetables. Owusu *et al.,* (2013) also observed that consumers perceived rtified organic lettuce and watermelon to be tastier and less harmful than the conventional ones.

rom Table 4.5 above, as many as 97.2% of the respondents perceived certified vegetables to be ealthier than conventional vegetables. Out of the remaining, 1.3% of the respondents disagreed ith the statement, while 1.5% were not sure about the statement. This finding is not surprising as rtified vegetables are generally considered to be safer and more nutritious than conventional nes. This result confirms the findings of Makatouni (2002), Lea and Worsley (2008), Roitner-Schobesberger *et al*., (2008), Tsakiridou *et al.* (2008), Sangkumchalian and Huang (2012), Owusu *et al.* (2013) and White *et al*. (2013).

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Consumers' Purchasing Behavior of Safer and Certified Vegetables

Results from Table 4.6 below indicate that 96.0%, 10.7% and 8.7% of the respondents have ever purchased safer vegetables on the market, supermarket and farm gate, respectively. It is however, unsurprising to realise that no consumer had ever purchased certified vegetables in the three market outlets. As indicated earlier in this study, none of the consumers have knowledge on the availability f certified vegetables on the market, supermarket and at the farm gate, respectively. During the ilot studies the researcher and the enumerators did not see or hear about the availability of ertified vegetables in Ouagadougou.

able 4.6. Consumers' Purchasing Behaviours of Safer and Certified Vegetables

Question	**Safer vegetables % of respondents**		**Certified vegetables % of respondents**	
	Yes	**No**	**Yes**	**No**
Have you ever purchased safer/certified vegetables on the market?	96.0	4.00	0.0	100
Have you ever purchased safer/certified vegetables in the supermarket?	10.7	89.3	0.0	100
Have you ever purchased safer/certified vegetables at the farm gate?	8.7	91.3	0.0	100

ource: Computed from field data, 2016

'onsumers' preferred choice of outlets for certified vegetables

/hen asked about where they would prefer to purchase certified vegetables, 72.3% of the espondents stated that they would prefer to purchase certified vegetables from the open market while 30.5% and 9.5% would prefer to buy from the supermarket and farm gate, respectively. In developing Africa, most consumers buy their food products from the open market. Only the relatively affluent consumers purchase from supermarkets. Therefore, this finding is consistent with the general purchasing outlets for the average income consumer. This result is similar to the

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findings of Wang and Huo (2016) that, majority of the consumers in China, mainly purchased certified fruits (apple) from the open market and supermarkets. Furthermore, Hai *et al.* (2013) noted that to assist consumers to access certified (organic) food, it is necessary to make them available in the open market and supermarkets. However, this result contradicts that of Sedef *et al.* (2007) which indicates that majority of the respondents prefer to buy their fresh vegetables at the farm gates in urban Turkey.

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Table 4.7: Consumers' Preferred Choice of Outlets for Certified Vegetables

Statement	**No (%)**	**Yes (%)**
Prefer to purchase certified vegetables in the market	26.7	72.3
Prefer to purchase certified vegetables in the supermarket	69.5	30.5
Prefer to purchase certified vegetables at the farm gate	90.5	9.5

Source: Computed from field data, 2016.

4.5. Consumers Level of Trust in Certification Organizations/Institutions

Trust influences consumers' demand for certified (organic) foods (Leila and Mehdi 2012). It is therefore important to assess consumers' level of trust in certification institutions (Certifiers), because their level of trust on the certifiers is directly linked with their WTP for certified vegetables. Thus, respondents were asked to indicate their level of trust in some vegetables certification institutions (i.e. Local Association of vegetable farmers and Traders, Local public certification agency, National government authority, National association for consumer protection, National scientific institution (e.g. Higher education), International organization (e.g. USDA or

EU certified organic) and International non-government certifiers) using a Likert scale of 1 (do not trust at all) to 5 (high trust).

The most trusted certification agency among the seven certifiers was national scientific institutions (e.g. higher education) with a mean score of 4.2 (Table4.8). Janssen and Hamm (2011) made similar conclusions in Czech Republic, Denmark and Turkey that consumers' have a high level of ust in National government logo.

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Table 4.8: Consumers' Level of Trust on Various Certification Institutions/Organizations

Food certification/ organization(certifiers)	**Do not trust at all**	**Do not trust very much**	**Neutral**	**Trust somewhat**	**High trust**	**Mean Score**
National Scientific Institution (example: Higher Education Institution)	29 (7.3)	37 (9.2)	35 (8.7)	12 (3.0)	287 (71.8)	4.2[1st]
International Organization (EU Certified Organic or USDA) (governmental)	47 (11.8)	39 (9.7)	50 (12.5)	15 (3.7)	249 (62.3)	3.9[2nd]
International Non-Governmental Certifier	70 (17.5)	49 (12.3)	48 (12.0)	19 (4.7)	214 (53.5)	3.6[3rd]
National Government Authority	68 (17.0)	78 (19.5)	32 (8.0)	20 (5.0)	202 (50.5)	3.5[4th]
National Association for Consumers Protection (non-governmental)	87 (21.7)	50 (12.5)	57 (14.3)	11 (2.7)	195 (48.8)	3.4[5th]
Local Public Certification Agency (governmental)	88 (22.0)	71 (17.7)	36 (9.0)	23 (5.8)	182 (45.5)	3.3[6th]
Local Association of Vegetable Farmers and Traders (non-governmental)	145 (36.3)	105 (26.2)	38 (9.5)	8 (2.0)	104 (26.0)	2.5[7th]

Source: Computed from field data ,2016. *Note: figures in brackets are in percentages*

The second most trusted vegetables certifier was an international organization (e.g. USDA or EU certified organic) which had a mean score of 3.9. These results are consistent with that of Emily (2014), who argued that consumers may not be familiar with the complexity of organic farming but they have trust on certification and USDA seal. Similarly, Janssen and Hamm (2011) noted that consumers in Italy have a higher level of trust in the EU logo than the other certifiers. On the other hand, this finding contradicts that of Velčovska and Chiappa (2015) who concluded that consumers do not have higher credibility in European and international certifiers.

Furthermore, International Non-Government Certifier and National Government Authority were ranked as the third and fourth most trusted vegetable certifiers with average scores of 3.6 and 3.5, respectively. The least trusted vegetable certifiers was Local Association for vegetable farmers and traders with a mean score of 2.5. On the contrary, Emily (2014) noted that consumers' inherently have trust in their local farmers. Similarly, Janssen and Hamm (2011) also indicated that consumers in Germany, Switzerland and the United Kingdom have a higher level of trust in local association of farmers' certification.

4.6.1: Consumers' Preferences for Vegetables with Specific Characteristics at a Fixed Price

Consumers were asked to assume that they could buy four different types of vegetables, which were produced with different production methods and which have different properties as described in section 3.6.1 of chapter three.

Results from Table 4.9 indicates that the most preferred vegetable was one with national certification as the highest percentage of the respondents (46.5% for cabbage, 49.7% for tomato and 47.2% for lettuce) revealed they preferred those certified by national certification institution (Burkina Faso certifiers).

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Table 4.9: Consumers' Preferences for Vegetables (i.e. cabbage, lettuce and tomatoes) with Different Properties

VEGETABLE CHARACTERISTIC/CERTIFICATION AND PRICE	PERCENTAGE OF RESPONDENTS'		
	1kg of Cabbage	**1kg of a bundle Lettuce**	**1kg of Tomato**
Conventional ((vegetables from unknown production method, unsafe, no certification) at current market price	14.8	11.8	14.8
Safer (vegetable from unknown production method, safe, no certification) at 125% of current market price	6.0	5.7	7.0
Certified (vegetable from known production method, safe, Burkina Faso Certification) at 150% of market price	46.5	49.7	47.2
Certified (vegetable from known production method, safe, European certification) at 175% of current market price	32.7	32.8	31.0
Total	100	100	100

Source: Computed from field data,2016.

The second most preferred vegetable choice for each of the three vegetables (i.e. cabbage, lettuce and tomatoes) was the one with international government certification (European certification institution). Furthermore, 14.8%, 11.8% and 14.8% of the Burkinabe consumers prefer conventional cabbage, conventional lettuce and conventional tomatoes respectively, with the least preferred vegetable being safer cabbage (6%), safer lettuce (5.7%) and safer tomatoes (7%) (Table 4.9).

In summary, it could be concluded that consumers in Burkina Faso prefer certified vegetables, particularly, those certified by their National government certifiers (Burkina Faso certification institution) followed by vegetable with international certification (European certification). Similar findings exist in the literature. For example, Morkbak *et al*. (2011) noted that consumers prefer

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certified food because of safety reasons. Also, the Burkinabe consumers' preference for certified vegetables over conventional and uncertified safer vegetables could be due to environmentally friendly reasons as noted by Dabbert (2006) and Rousseau and Vranken, (2013) in their respective studies that environmentally friendly reasons are the major reasons consumers prefer certified organic food over conventional food.

.6.2: Factors Influencing Consumers' Preferences for Vegetables with Specific haracteristics

he ordered probit model was used to estimate the factors influencing consumers' preferences for egetables (i.e. cabbage, lettuce, tomatoes) with specific characteristics. The pseudo R-square for ıe three vegetables were found to be 0.53, 0.27 and 0.24 for cabbage, lettuce and tomato models ı Table 4.10, respectively. This means that the explanatory variables included in the models could xplain 53%, 27% and 24% of the variations in the dependent variable (consumer preference for abbage/ lettuce/ tomatoes with specific characteristics) respectively. Talking about the joint gnificance (LR chi-square) of the three models, the cabbage model had 498.31, while the lettuce ıd tomato models had 240.16 and 230.75, respectively. These values were all highly significant : 1% level of significance in Table 4.10.

ut of the 10 explanatory variables hypothesized to influence consumers' preferences for the three egetables, 4 were statistically significant in the case of cabbage and lettuce, while 5 were significant for tomatoes. The coefficients for the three vegetables are jointly presented in Table 4.10 below while, the marginal effects are also jointly presented in Table 4.11. Discussions are done on both the coefficients which only show the directions (signs) and effects of the explanatory variables on consumers WTP and the marginal effects which show the rate of change in vegetables

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preferences if there is a unit change in any of the explanatory variables, *ceteris paribus*. The emphasis is on the marginal effects (Green 2003).

From Table 4.10 below, the price coefficient was positive and significant at 1% for the cabbage, lettuce and tomatoes models. This result did not meet the expectations as price was expected to negatively influence consumers' vegetable preference. Nonetheless, this makes sense as the ɔnormal demand curve in basic economics theory suggests that consumers will demand more of igh valued commodity (prestigious or snob appeal goods and services) as the price goes up.

ɲ the marginal effects from Table 4.11, price had a negative marginal effect for the conventional egetables, safer vegetables and vegetables with national certification (Burkina Faso certification) ut, a positive sign for each of the three vegetables with European certification. This means that l other things being equal, an increase in the prices in any of the three vegetables will result in a .66%, 0.42% and 0.41% increase in the probability of consumers preferring the three vegetables ith international certification over those with national certification, safer and the conventional nes, respectively. A possible reason for this result is that in selecting the type of vegetables to be ɔnsumed, consumers are more concerned about their health and food safety than price and, once ıey perceive vegetables with international certification to be safer than the other three varieties ıey may prefer to buy cabbage, lettuce and tomatoes with international certification even at a igher price. This result contradicts the findings of other studies (e.g. Diako *et al.*, 2010, Musa *et al.* 2011; Jiménez-Guerrero *et al*. 2012; Kwakwa 2013; Gyau *et al.* 2014) who concluded in their respective studies that price influences consumers' food preferences negatively.

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Table 4.10. Factors influencing consumers' preference for Vegetables with specific characteristic at a fixed price

	Preference model for Cabbage Coefficient	**Preference model for lettuce Coefficient**	**Preference model for tomato Coefficient**
Variable			
Price	.03***(0.00)	.01*** (0.00)	.01*** (0.00)
Sex	-.27(0.47)	.16 (0.39)	.14 (0.35)
Age	-.00 (0.01)	-.01** (0.00)	-.01***(0.00)
House-hold size	-.02 (0.02)	-.02 (0.02)	-.02 (0.02)
Education	-.08 (0.21)	-.05 (0.18)	-.22 (0.17)
Income	.00* (0.00)	.00** (0.00)	.00*** (0.00)
Amount spent on vegetable per week	-.00 (0.00)	.00(0.00)	-.00(0.00)
Financial risk	.20** (0.08)	.08 (0.07)	.12** (0.07)
Trust in national government certifiers	-.11** (0.04)	.03(0.04)	-.06(0.04)
Trust in international certifiers	.07 (0.05)	.12*** (0.05)	.09** (0.04)
Number Observations	400	400	400
Pseudo R2	0.53	0.27	0.24
Log likelihood	-219.95	-331.41	-358.93
LR chi2(10)	498.31	240.16	230.75
Prob>chi2	0.00	0.00	0.00
Cut1	8.47	2.84	1.89
Cut2	9.26	3.2	2.29
Cut 3	12.42	5.22	4.18

Source: ordered probit result computed from field data, 2016. Note: ***: significant at 1 %(P<0.01); **: significant at 5 % (P<0.05); *: significant at 10 % (P<0.1).

Age negatively affects consumers' preferences for lettuce and tomatoes at 5% and 1% significance levels, respectively, but not significant for their preferences for cabbage. These results means that

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the aged are less concerned about health and safety as opposed to the young consumers in Ouagadougou. Probably, the young who may be well educated than the aged, have more information about health and safety as opposed to the aged with low level of information about consumer health and food safety. Similar results were reported by Danso *et al.* (2014) and Kohansal and Firoozzare (2013), who confirmed in their respective studies that age is negatively correlated with consumers' preference for food choices. Allen and Ellen (2011) also revealed that younger consumers prefer both milk and yogurt to older consumers. The empirical result, however, contradicts the findings of Ogundele (2014) in Nigeria that age directly influences consumer choice of foods.

With the marginal effects from Table 4.11, age carries a positive sign for the conventional, safer and lettuce or tomatoes with national certification, and a negative sign for lettuce / tomatoes with international certification. This implies that as age increases, the probability of preferring conventional lettuce / tomatoes, safer lettuce / tomatoes and lettuce / tomatoes with national certification increases, while the probability of preferring lettuce/tomatoes with international certification decreases, *ceteris paribus.* For example, the negative sign for lettuce/tomatoes with international certification choice implies that holding all others factors constant, an increase in the age of a consumer reduces the probability of preferring lettuce and tomatoes with international certification (European certification) by 0.33% and 0.41%, respectively. However, the probability of an older consumer preferring lettuce/ tomatoes with national certification (Burkina Faso certification) will be increased by 0.17% and 0.13% (Table 4.11) respectively, *ceteris paribus*. From this it could be argued that older Burkinabe consumers prefers lettuce/tomatoes with national certification to the ones with international certification, while the opposite is true for younger consumers. A possible reason for this result could be that the aged in Burkina Faso are less health

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conscious than the young ones. Another reason could be that once they grow older they may not be economically productive compared to the younger ones and thus may lack adequate disposable income to purchase vegetables with international certification (European certification) or it could be because, the aged have higher trust in national vegetables certifiers than the younger ones.

Income was significant at 10%, 5% and 1% and positively influenced consumers' preferences for ıbbage, lettuce and tomatoes, respectively (Table 4.10). From Table 4.11, the marginal effects f income on cabbage, lettuce and tomatoes show negative signs for the conventional, safer and ıbbage/lettuce/tomatoes with national certification (Burkina Faso certification) but positive signs ır the three vegetables with international certification (European certification). The positive ıarginal effects for each of the three vegetables with international certification implies that, an ıcrease in income will result in a 0.02%, increase in the probability of consumers' preferring ıbbage with international certification over the conventional, safer and those with national ertification (Burkina Faso certification) *ceteris paribus*. Similarly, an increase in income will ıcrease the probability of consumers preferring lettuce and tomatoes with international ertification (European certification) over the conventional, safer and the ones with national ertification by 0.04% each for lettuce and tomatoes, respectively. It could be deduced that ınsumers with higher income generally preferred certified vegetables, especially the ones ertified by international certifiers. The result conforms to theory and meets *a priori* expectation. imilar findings have been made by Kohansal and Firoozzare (2013) that income has a direct effect on consumer food choices and that consumers with higher income have higher probability of selecting food products with good taste. However, some studies such as Danso *et al*. (2014) did not find income as a factor influencing consumer preference for food choice.

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Table 4.11. Marginal effects calculated from the ordered probit model of the factors influencing consumers' preference for Vegetables with specific characteristics

Variable		Lettuce choices						Tomatoes choices			
	=1	national certification(Burkina Faso certification)=2	international certification (European certification)=3	Conventional =0	Safer =1	national certification(Burkina Faso certification)=2	international certification (European certification) =3	Conventional =0	Safer =1	national certification (Burkina Faso certification)=2	international certification (European certification)=3
Price	.4***	-.0049***	.0066***	-.0011***	-.0009***	-.0022***	.0042***	-.0016***	-.0012***	.0013***	.0041***
Sex	3	.0291	-.0475	-.0118	-.0109	-.0320	.0547	-.0153	-.0115	-.0184	.04522
Age		.0004	-.0006	.0008**	.0007*	.0017**	-.0033**	.0016***	.0011***	.0013**	-.0041***
House-hold size	)	.0035	-.0047	.0016	.0014	.003313	-.0064	.0018	.0013	.0015	-.0046
Education		.0107	-.0149	.0047	.0041	.0088	-.0175	.0290	.0190	.0137*	-.0618
Income	)0	-.0001*	.0002*	-.0001**	-.0001**	-.0002**	.0004**	-.0002***	-.0001***	-.0001***	.0004***
Amount spent on vegetable per week	)	.0000	-.0000	.0000	.0000	.0000	-.0000	.0000	.0000	.0000	-.0000
Financial risk	)0**	-.0305**	.0411**	-.0065	-.0057	-.0132	.0253	-.0141*	-.0100*	-.0118	.0360*
Trust on national government certification	0**	.0170**	-.0229**	-.0027	-.0024	-.0054	.0105	.0070	.0050	.0059	-.0180
Trust on international certification	0	-.0102	.0138	-.0102**	-.0089***	-.0208***	.0399***	-.0109**	-.0077**	-.0091*	.0277***

Note: * % (P<0.01); **: Significant at 5 % (P<0.05); *: Significant at 10 %(P<0.1). Source: Ordered probit result computed from field data, 2016.

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Financial risk was dummied (1 if a consumer is willing to take financial risks, 0 if a consumer is unwilling to take financial risk) and had a significant positive coefficient at 5% for only the cabbage and tomato models. From Table 4.11, the marginal effects for cabbage and tomato models had negative signs for the first three vegetable alternatives (i.e. Conventional, safer and cabbage/tomatoes with national certification) and a positive sign for cabbage/tomatoes with international certification (European certification). This implies that consumers who are willing to ıke financial risk (financial risk lovers) have a higher probability of preferring cabbage and ɔmatoes with international certification than their counterparts who are unwilling to take financial sk, ceteris *paribus.* In practical terms, this means that consumers who are financial risk lovers ave 4.11% and 3.60% higher probability of preferences for cabbage and tomatoes with ıternational certification (European certification), respectively than their counterparts who are nancial adverse, *ceteris paribus.* It could be concluded from the results that consumers who are illing to take financial risk prefer the two vegetables with international certification compared to ıeir counterparts who are unwilling to take financial risk. This result is not surprising as it will ıke only a financial risk lover to be willing to spend money on a new product such as certified egetables (especially, the one with international certification) which he/she has not consumed efore. A possible reason for this finding could be that consumers who are willing to take financial sk have high trust in international certifiers or that they are more health conscious than those ho are unwilling to take financial risk.

Trust in national certifiers was also dummied (1 if consumers have high trust, 0 if consumers have no trust at all). This variable had a negative coefficient and was significant at 5% for only the cabbage model but not lettuce and tomatoes. In terms of the marginal effects, from Table 4.11, the variable had positive marginal effects for the conventional cabbage, safer cabbage and cabbage

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with national certification, but a negative marginal effect for cabbage with international certification alternative. The implication is that, holding all other factors constant, consumers who have a high level of trust in national certifiers have 2.2% decrease in probability of preferring cabbage with international certification than their counterpart who do not have trust at all in national certifiers. However, consumers who have high trust in national certifiers have a 1.70% higher probability of preferring cabbage with national certification than safer cabbage, with ıarginal effect of 0.50% higher than consumers who have no trust at all in national certifiers. hese results show that consumers with high trust in national certifiers prefer vegetables with ational certification than their counterparts with no trust at all in national certifiers.

rust in international certifies was also dummied (1 if consumers have high trust, 0 if respondent ave no trust at all) and had positive significant coefficients at 1% and 5% for only the lettuce ıd tomato models, respectively but not the cabbage model. Table 4.11 depicts negative marginal ffects for the conventional, safer and lettuce/tomatoes with national certification but a positive ıarginal effect for lettuce/tomatoes with international certification.

his means that consumers who have high trust in international certifiers have 3.99% and 2.77% igher probability of preferring lettuce and tomatoes with international certification than their ɔunterparts who have no trust at all in international certifiers, respectively, *ceteris paribus.* In ım, it may be concluded that consumers' who have high trust in international certifiers prefer vegetables with international certification more than those with no trust at all in international certifiers. This finding is logically feasible as Wang and Huo (2016) concluded that consumers' trust on fruits certifiers influence their preferences and thus WTP for certifier fruits.

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4.7.1 Consumers' WTP for Certified Vegetables

Generally, majority (93.7%) of the respondents revealed they were willing to pay more for certified vegetables with only 6.3% who were not willing to pay more for certified vegetables. The 93.7% of the respondents who were willing to pay more for certified vegetables believe that certified vegetables are more nutritious, tastier and healthier than the conventional ones. Balamatti (2000), Nurah (2001), Osei-Asare (2009), Phillip and Dipeolu (2010), Probst (2012), Roselyne and Frode 2012), Obuobie *et al*. (2014) and Wang and Huo (2016) concluded that the nutritional value, taste nd healthy characteristics of safer food were the main reasons why consumers' were willing to ay more for safer food. On the contrary, of the 6.3% consumers' who were unwilling to pay more or certified vegetable, their major reasons were that they could not afford certified vegetables, ney lacked trust in certification institutions and finally, conventional vegetables were safer and us there was no need for certification.

he consumers who indicated they were willing to pay more for certified vegetables were ubjected to a bidding process where the current average market price of each of the three egetables was randomly topped-up by a certain pre-determined percentage (25%, 50%, 75% and 00%). The result is shown in Table 4.12 (a), (b) and (c) below.

rom Table 4.12(a) above, 17.5% of the respondents were willing to pay the lowest premium price hile 35% were willing to pay a medium premium (no-yes) for 1kg of certified cabbage. The remaining 22.93% and 23.47% were willing to pay high and very high premium for 1kg of certified cabbage, respectively.

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Table 4.12 (a): Consumers' WTP for various Premium Prices, for 1kg of Certified Cabbage

WTP Premium categories	**Percentage (%) of respondents**
0<WTP< CFA300 = Lower premium(no-no)	17.50
300<WTP<CFA375 = Medium premium(no-yes)	35
CFA375<WTP<CFA470 = High premium(yes-no)	22.93
WTP>CFA470 = Very high premium(yes-yes)	23.47

ource: Computed from field data, 2016.

/ith 1kg bundle of certified lettuce, only 7.2% of the respondents were willing to pay the lowest remium for a bundle of certified lettuce (Table 4.12b). However, almost half (48.53%) of the spondents were willing to pay very high premium for a bundle of certified lettuce, with the maining 15.47% and 28.8% of the respondents willing to pay medium and high premiums spectively.

able 4.12 (b): Consumers' WTP for various Premium Prices for 1kg Bundle of Certified Lettuce

TP Premium categories	**Percentage (%)of respondents**
WTP< CFA275=lower premium(no-no)	7.20
FA275<WTP<CFA330=medium premium(no-yes)	15.47
CFA330<WTP< CFA440=High premium(yes-no)	28.80
WTP>CFA440= Very high premium(yes-yes)	48.53

Source: Computed from field data, 2016.

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As indicated in the Table 4.12 (c) below, 18.67% of the consumers were willing to pay the lowest premium price for 1kg of certified tomato, while 42.93%, 15.73% and 22.67% willing to pay medium, high and very high premiums, respectively.

Table 4.12 (c): Consumers' WTP for various Premium Prices, for 1kg of Certified Tomatoes

WTP Premium categories	**Percentage (%) of respondents**
)<WTP<CFA 213=low premium(no-no)	18.67
CFA213<WTP<CFA315=medium premium(no-yes)	42.93
CFA315<WTP<340=High premium(yes-no)	15.73
WTP>340=Very high premium	22.67

ource: Computed from field data, 2016.

ı summary, it may be concluded that generally, consumers are willing to pay high premium as ıajority of them were willing to pay medium premium, high premium and very high premium for ıe three certified vegetables.

.7.2A: Respondents' Mean and Median Willingness to Pay for Certified Cabbage, Lettuce nd Tomatoes

he main objective of every WTP studies is to determine the mean and median WTP. This is ecause these are used for policy decision making purposes. With the current average market prices for 1kg of conventional cabbage being FCFA271 and that of a bundle of a conventional lettuce and conventional tomato sold at FCFA220 and FCFA 170, respectively, the mean WTP for a 1kg of certified cabbage, a 1kg bundle of certified lettuce and 1kg of certified tomato were FCFA

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381.96, FCFA375.27 and FCFA 271.36 representing 62.54%, 70.57% and 59.62% increment in the current average prices, respectively.

Table 4.13. Mean and Median WTP for Certified Vegetables

	1kg of certified cabbage			1kg of a bundle of certified lettuce			1kg of certified tomato		
	CEDI	**FCFA**	**EURO**	**CEDI**	**FCFA**	**EURO**	**CEDI**	**FCFA**	**EURO**
Mean	2.56	381.96	0.58	2.52	375.27	0.57	1.82	271.36	0.14
Median	2.52	375	0.57	2.35	350	0.53	1.69	250	0.38
Standard Deviation	0.52	77.34	0.12	0.63	93.10	0.14	0.54	80.15	0.12
Minimum	1.68	250	0.38	1.68	250	0.38	0.84	125	0.19
Maximum	3.36	500	0.76	5.87	875	1.33	2.69	400	0.61

Source: Author's own calculation from field data, 2016. *Note: 1Euros=FCFA 655.96 and 1Ghana Cedi= FCFA148.96 in September, 2016; The above means amounts in FCFA represent 62.54%, 70.57% and 59.62% increment in the current market prices of 1kg of cabbage, 1kg of a bundle of lettuce and 1kg of tomatoes, respectively.*

Also, from Table 4.13 above, the median WTP for a 1kg of certified cabbage, a 1kg bundle of certified lettuce and 1kg of certified tomato were CFA 375, CFA 350 and CFA250, respectively.

The mean WTP of 0.58 Euros for 1kg of certified cabbage is almost similar to the findings of Faustin *et al.* (2015) who estimated a mean WTP for safer cabbage as 0.44 Euros. Furthermore, the mean WTP for certified lettuce GH₵ 2.36 (FCFA 332.61) is about twice of the results of Owusu and Anifori (2013) who estimated a mean WTP for organic lettuce as GH₵1.2579.

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4.7.2B: Factors Influencing Consumers' WTP for Certified Vegetables

The ordered probit was used to analyze the factors influencing consumers' WTP for certified cabbage, lettuce and tomatoes, respectively. The pseudo R-square for the three models were 0.04 (4%), 0.04 (5%) and 0.05 (5%) for the cabbage, lettuce and tomato models in Table 4.14, respectively. This shows the variation in WTP explained by the explanatory variables for each of the three models, respectively. Furthermore, the LR Chi-square values of the cabbage model was 4.76 and that of the lettuce and tomato models were 48.39 and 53.61%, respectively. These were l significant at 1 % (0.00) for the three models.

ut of the 10 explanatory variables used for the analysis of each of the three vegetables, six ariables statistically and significantly influenced consumers' WTP for certified cabbage and omato while three were significant for certified lettuce. The coefficients and the marginal effects f the three vegetables are jointly presented in Table 4.14 and Table 4.15, respectively.

n the three models from Table 4.14, the coefficient for the initial bid (price) was negative and gnificant at 1% for the certified cabbage, lettuce and tomato models, respectively. With the arginal effects for three vegetables, from Table 4.15, the initial bid (price) had positive marginal ffects for the no premium price, lower premium price, and medium premium price, implying an ncrease in WTP price premium, but negative for the high and highest premium prices, indicating decrease in WTP price premium *ceteris paribus*. For instance, holding all other factors constant, a percentage increase in the initial bid (price) will result in a 0.3%, 0.3% and 0.2% decrease in the probability of consumers' willing to pay a very high price premium for certified cabbage, lettuce and tomatoes, respectively.

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Table 4.14. Estimate of Factors Influencing Consumers' Willingness to Pay Certified Cabbage, lettuce and tomatoes

Variables	1kg of Certified cabbage Coefficient	1kg of a bundle of Certified lettuce Coefficient	1kg of Certified tomato Coefficient
Initial bid	-0.01***(.002)	-.01***(.00)	-0.01***(.00)
Sex	0.39(.30)	.31(.33)	0.24(.31)
Age	-0.01*(.00)	-.01**(.00)	-0.01(.00)
House-hold size	-0.01(.02)	-.03(.02)	-0.01(.02)
Education	-0.36**(.16)	-.02(.17)	-0.27*(.16)
Income	0.00(.00)	.00(.00)	0.00*(.00)
Knowledge of safer vegetables at farm gate	0.87***(.33)	.57(.36)	0.68**(.34)
Health risk	-0.20**(.08)	-.14(.08)	-0.24***(.79)
Trust on national government certifiers	0.09***(.03)	.08**(.04)	0.08**(.03)
Trust on international certifiers	0.01(.04)	.00(.04)	-0.01(.04)
Number Observations	400	400	400
Pseudo R2	0.04	0.04	0.05
Log likelihood	-577.93	-514.62	-555.61
LR chi2(10)	44.76	48.39	53.61
Prob>chi2	0.00	0.00	0.00
Cut1	-4.11	-3.46	-3.13
Cut2	-3.27	-3.01	-2.24
Cut 3	-2.29	-2.44	-1.07
Cut 4	-1.65	-1.67	-0.61

ource: ordered probit result computed from field data, 2016. Note: ***: significant at 1 %

><0.01);**: significant at 5 % (P<0.05);*: significant at 10 % (P<0.1).

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This finding conforms to theory because, with unlimited wants and budget constraints consumers' always prefer lower prices for goods and services. From the marginal effects of the three vegetables it could be concluded that consumers will be willing to pay for certified vegetables when price is moderate and in effect they will decline to pay when the initial bid (price) is too high. This result is similar to the findings of Zhang *et al.* (2010), Bekta *et al.* (2011) and Janani (2012) who concluded that an increase in the initial bid (price) decreases consumers' WTP. This result implies ıat price plays a major role in the marketing of a product, and so policy makers and investors ıust make sure the prices for their new goods and services are affordable.

.ge had a negative coefficient and was significant at 10% and 5% for only the certified cabbage ıd lettuce models but not the certified tomato model. With the marginal effects, from Table 4.15, ıe age variables had a positive sign for the no premium price, and the first two categories, but a egative sign for the 3rd and 4th premium prices. This implies that, *ceteris paribus*, an increase in ge increases the probability of WTP low premium, but decreases the probability of paying a igher premium. For example, holding all other factors constant, an increase in age reduces the robability of willing to pay a higher price premium for certified cabbage and lettuces by 0.2% ıd 0.3%, respectively. This further implies that, *ceteris paribus*, younger consumers are more kely to pay a higher premium than the older ones. Various studies have revealed that safer foods e meant for the young (Piraccini 2000). This finding confirms studies by Ara (2002) who ɔncluded a negative relationship between age and WTP for organic rice in Naga. However, this result contradicts the findings of Van *et al.* (2011), Faustin *et al.* (2015) and Obayelu *et al*. (2015) who revealed in their respective studies that age was positively correlated with WTP for fresh safer food. It must be noted that studies such as Jolly (1991), Darby *et al*. (2008), Basarir and Gheblawi

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(2012), Wahida *et al.*(2012), Hai et *al.* (2013), Owusu and Anifori (2013) and Wang and Huo (2016) found that age did not influence consumers WTP for food products.

Education was used as a continuous variable in all the three models and had a negative coefficient with significance levels of 5% and 10% for the certified cabbage and tomatoes models respectively, as shown in Table 4.14. With the marginal effects shown in Table 4.15, education ad a positive sign for the no premium price as well as the first two lower premium prices and a egative for the high and highest price premiums for the certified cabbage and tomatoes, implying at *ceteris paribus,* consumers with higher education had 9.2% and 6.8% lower probability of illingness to pay a higher price premium for certified cabbage and certified lettuce, respectively, ompared to their counterparts who had little or no education. A summary of the marginal effects dicated that consumers who have higher education have lower WTP than those who have little no education. This finding contradicts expectation, as it was expected that consumers' who have igher education should be more willing to pay a price premium for certified vegetables than those ith little or no education. However, a possible reason for this result may be because none of the mpled population had knowledge on the availability of certified vegetables in Ouagadougou, as dicated earlier in this document. The finding is similar to that of Basarir and Gheblawi (2012) d Stefano *et al*. (2001) who concluded that education was negatively related to WTP. On the ontrary, Wang and Huo (2016), Muhammad *et al*. (2015), Liu *et al*. (2009) and Darby *et al*. (2008) oted that education has a positive impact on consumers 'WTP for certified food.

From Table 4.14 above, the coefficient of income which determines consumer purchasing power was significant at 10% and positively influence consumers' WTP for only certified tomatoes but not certified cabbage and certified lettuce. This finding is plausible as a consumer's disposable income depends on his/her income. From Table 4.15 below, the marginal effects had negative

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signs for the no price premium, low premium price and the medium premium price of WTP depicting a decrease in WTP, but a positive sign for the high and very high premium price of WTP categories implying an increase in WTP. For instance, holding all other factors constant, consumers' who have higher income have 0.02% higher probability of paying very high price premium for certified tomatoes (Table 4.15). The result is consistent with the finding of Wang and Huo (2016) who have concluded that, income has a positive influence on consumers' WTP for certified fruits. Furthermore, studies such as Muhammad *et al*. (2015), Fanbin *et al*. (2014), Hai *et al*. (2013), Kalashami *et al*. (2012), also reported a positive correlation between income and WTP for food products. Other studies, on the other hand, have revealed no relationship between income and consumers' WTP for food products (Basarir and Gheblawi, 2012; Li *et al*. 2007; Darby *et al*. 2008; Voon *et al*. 2011).

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Table 4.15. Marginal effects calculated from the ordered probit models of certified cabbage, lettuce and tomatoes

Variables	An average sized of Cabbage WTP categories					A buddle of Lettuce WTP categories					Four pieces of Tomatoes WTP categories				
	no p p	Low m	Medium Premium	high premium	very high premium	no premium price	Low premium	Medium premium	high premium	very high premium	no premium	Low premium	medium premium	high premium	Very high premium
Initial bid	.0		.001***	-.001***	-.003***	.001***	.001***	.001***	.001***	-.003***	.001***	.001***	.001**	-.001***	-.002**
Sex	-.		-.059	.028***	.128	-.025	-.025	-.042	-.033	.125	-.019	-.045	-.027	.019	.072
Age	.(		.001*	-.001*	-.002**	.001*	.001*	.001**	.001*	-.003*	.001	.001	.001	-.001	-.002
Household size	.		.001	-.001	-.004	.003	.002	.003	.002	-.010	.001	.002	.001	-.001	-.003
Education	.(		.022***	-.045**	-.092***	.002	.002	.002	.001	-.007	.032	.053*	.009*	-.027	-.068*
Income	-.		-.000	.000	.000	-.000	-.000	-.000	-.000	.000	-.002*	-.000*	-.000	.000*	.002*
Knowledge of safer vegetables at farm gate	-.	*	-.159**	.017	.313***	-.037**	-.040**	-.074*	-.071	.222*	-.041***	-.111***	-.116	.034***	.233*
Health risk	.(		.021**	-.022**	-.057**	.014	.012	.019	.009	-.054	.024***	.050***	.017**	-.02***	-.07***
Trust on national certifiers	-.	**	-.009**	.009**	.026***	-.007**	-.006**	-.010**	-.005*	.030**	-.007**	-.014**	-.005*	.007*	.021*
Level of trust on international certifiers	-.		-.0009	.0010	.0027	-.0003	-.0003	-.0004	-.0002	.0012	.0007	.0012	.0005	-.0006	-.0018
CUTS	W					WTP CATEGORIES									
	NO PI					NO PREMIUM=WTP=0					NO PREMIUM=WTP=0				
	LOWI		VTP<CFA300			LOWER PREMIUM=0<WTP<CFA275					LOWER PREMIUM=0<WTP<CFA213				
	MEDI		FA300<WTP<CFA375			MEDIUM PREMIUM=CFA275<WTP<CFA330					MEDIUM PREMIUM=CFA213<WTP<CFA315				
	HIGH		75<WTP<CFA470			HIGH PREMIUM=CFA330<WTP<CFA440					HIGH PREMIUM=CFA315<WTP<CFA340				
	VERY		WTP>470			VERY HIGH PREMIUM=WTP>CFA440					VERY HIGH PREMIUM=WTP>340				

Sourc oit result computed from field data ,2016. Note: ***: Significant at 1 %(P<0.01); **: Significant at 5 %(p<0.05);

*: Significant at 10 %(P<0.1).

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Consumers' knowledge of the availability of safer vegetables at farm gate was used as a dummy variable in all the three models. This variable had a significant positive coefficient at 1% and 5% only for the certified cabbage and tomato models, respectively. From Table 4.15, the marginal effects for the first three categories of WTP had negative signs while the high and highest category of WTP premium had positive signs for the cabbage and tomato models, respectively. This implies that holding all other factors constant, consumers who have knowledge on the availability of safer egetables at farm gate have a lower probability of paying lower premium, but a higher probability f paying a higher and very high premium than their counterparts with no knowledge on the vailability of safer vegetables at farm gate. Specifically, consumers with knowledge on the vailability of safer vegetables at farm gate have 31.3% and 23.3% higher probability of paying ery high premium for certified cabbage and certified lettuce, respectively. A possible reason for iis finding could be that consumers who have knowledge on the availability of safer vegetables : the farm gate know the importance of certified vegetables to their health and thus may not esitate to pay a premium for certified vegetables. This finding is similar to the result of Liu et al. 2009) who found that consumers' knowledge of food safety directly influence their WTP. Also, Vang and Huo (2016) identified that high knowledge and confidence directly influence onsumers' WTP price premium for certified fruits. However, the result disagreed with the ndings of Obayelu et al. (2015) who reported a negative relationship between consumer nowledge and WTP for certified Moringa products in Nigeria. The findings above stress the need for policy makers and other stakeholders in the sector to put in measures to ensure that consumers have higher knowledge on the availability of safe food and the importance of food certification.

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Health risk was also dummied (1 if a consumer is willing to take health risk i.e., health-unconscious, 0 if a consumer is unwilling to take health risk - i.e., health conscious). From Table 4.14, the variable had negative coefficient and was significant at 5% for the certified cabbage model and 1% for the certified tomato models only. With the marginal effects, as shown in Tables 4.15, it had positive signs for the no price premium, and the first two lowest premium prices but a negative sign for the 3rd and 4th premium prices. This implies that consumers who are health nconscious have lower probability of WTP for certified vegetables than those who are health onscious. Thus, holding all other factors constant, health conscious consumers have a 5.7% and .0 % higher probability of paying very high premium for certified cabbage and certified lettuce, espectively than their counterparts who are not health conscious. This result was expected because ealth conscious consumers might value their lives than money. Therefore, they would spend extra ioney to get safer vegetables to safeguard their health. On the other hand, health unconscious onsumers may not see any harm in consuming conventional vegetables unlike health conscious onsumers. This result corroborates the findings of Obayelu *et al.* (2015) who concluded that onsumers who were health-conscious may be more likely to pay a price premium for certified Ioringa product than those who were less or not health conscious.

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onsumers' level of trust in national certifiers was dummied (1 if the consumer has high trust, 0 the consumer has no trust at all). From Table 4.14, trust in national certification had a positive oefficient and was significant at 1% for the certified cabbage, but significant at 5% for certified lettuce and tomatoes, respectively. In terms of the marginal effects shown in Table 4.15, the negative sign in the first three categories of WTP price premium depicts a decrease in WTP while the positive signs for the 3rd and 4th (highest) premium show an increase in WTP for certified cabbage, lettuce and tomatoes, respectively. For instance, the positive sign in the highest premium

price implies that holding all other factors constant, consumers who have high trust in national certifiers have 2.6%, 3.0% and 2.1% higher probabilities of willing to pay higher price premium for certified cabbage, lettuce and tomatoes, respectively, compared to their counterparts without trust in national certifiers. This finding is not surprising as indicated earlier in this study that majority of the sampled population have very high trust in national government certification (national government scientific institutions). The finding also agrees with the literature, for xample, studies such as Lagarkvist *et al*. (2011), Rostam-Abadi (2014) and Wang and Huo (2016) ho established in their respective studies that trust was a major determinant of consumers' WTP or certified food.

.8: Potential Constraints to Accessing Certified Vegetables

onsumers were given a list of potential constraints they may face in accessing certified vegetables ı Ouagadougou to rank. These constraints were selected based on existing literature on food safety ıd were used as proxies for identifying the potential constraints to accessing certified vegetables. ix constraints were presented to each respondent to rank. Each respondent was expected to onsider those constraints in the list that affected him/her before ranking. Afterwards, the Garrett ınking technique was used for the analysis and the result is presented in the Table 4.16. The iscussion of the constraints is based on the mean Garrett score and the rank.

ligher Price of Certified Vegetables

The high price of certified vegetables according to the Garrett mean score (57.72) was revealed as the most pressing constraint consumers may face in consuming certified vegetables in Ouagadougou. In the opinion of the consumers, even the prices of organic foods were very high and as a result, they presumed that prices of certified vegetables will be much higher since producers of certified vegetables will definitely want consumers to bear part of the cost of

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certification. The existing literature, for example Wang and Huo (2016) concluded that the major hindrance to purchasing certified fruits is attributed to high prices of certified products resulting from high cost of production and certification processes. Moreover, other studies (e.g., Fotopoulos and Krystallis, 2002a, 2002b; Verdurme *et al.* 2002; Larue *et al.* 2004) have shown that higher prices of certified organic food is the major challenge limiting the consumption of such food. For a potential sustainable certified vegetable market in Ouagadougou, it behoves on policy makers nd other stakeholders to establish measures that could ensure that the prices of certified food are oderate and affordable to the average consumer.

ack of Adequate Information on Certified Vegetables

his constraint was ranked as the second most pressing potential constraint in Ouagadougou with mean Garrett score of 50.66. Information plays a key role in product marketing. If consumers ck adequate information on certified vegetables they may not purchase it. Lack of or inadequate formation will definitely limit the consumption of certified vegetables as noted by Hai *et al.* 2013) and Garibay and Jyoti, (2003) that the limitation in consumption of the organic foods may e due to lack of information about organic market and low knowledge on certified organic roducts.

ack of Trust in Certification Institutions

he third important constraint that may hinder Burkinabe consumers from accessing certified vegetables was lack of trust in certification institutions. This constraint had a mean Garrett score of 47.67. Certification will not be necessary if consumers do not trust the certifier. Previous studies such as Fotopoulos and Krystallis, (2002); Verdurme *et al.* (2002) and Larue *et al.* (2004) have indicated that lack of trust hinders the consumption safer food.

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Table 4.16. Potential constraints, consumers may face in accessing certified vegetables

Number	Constraint	Mean Garrett score	Rank
1	Higher Price of certified vegetables	57.72	1
2	Lack of adequate information on certified vegetables	50.66	2
3	Lack of trust on certification institutions	47.67	3
4	Lack of certified vegetables	47.08	4
5	Lack of access to market for certified vegetables	45.08	5
6	Cultural barriers	39.87	6

ource: Computed from field data, 2016

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ack of Certified Vegetables in Ouagadougou

his constraint has a mean Garrett score of 47.08 and was the fourth most pressing constraint to the consumption of certified vegetables in Ouagadougou. There was an indication from the consumers that certified vegetables are not available in Ouagadougou. This is true because Willer and Kilcher (2011) revealed that only 80 countries were using national standards of certification of which Burkina Faso was not part. This finding presents an opportunity for investors to supply certified vegetables in Ouagadougou.

Lack of Access to Market for Certified Vegetables

This constraint had mean Garret score of 45.08 and was the fifth most pressing potential constraints limiting the consumption of certified vegetables. Consumers complained that even though they sometimes prefer certified vegetables to the conventional ones, the former were not available.

Cultural Barriers

ultural barriers represented the least potential constraint and was ranked the sixth constraint with mean Garrett score of 39.87. Consumers who ranked this constraint indicated that there were ɔme cultural beliefs such as totems that could prevent them from consuming certified foods.

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CHAPTER FIVE

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.1. Chapter Outline

This section is made-up of six subsections: subsection 5.2 is a brief summary of the study objectives and methodology, subsection 5.3 contains the major findings of the study. Also, ıbsections 5.4 and 5.5 contain the conclusions and recommendations of the study, respectively. inally, subsections 5.6 and 5.7 contain the limitation of the study and suggestions for future ɛsearch, respectively.

.2. Summary of the Study Objectives and Methodology.

he recent increase in consumers' concern about safe food, particularly, certified food, is fueled y a number of food scandals that have resulted in illness and many death cases. This study ssessed consumers' knowledge level, perceptions, trust, preferences and willingness to pay for ɛrtified vegetables, and the factors that drive these in Ouagadougou using the ordered probit ıodel.

.3. Summary of Major Findings

fter analysing the field data it was revealed that none of the consumers had knowledge on the vailability of certified vegetables in the open market, supermarket or at the farm gate. Thus, ɛrtified vegetable markets do not exist in Ouagadougou, Burkina Faso. Consequently, none of the respondents had ever purchased certified vegetables in the market, supermarket and at the farm gate, respectively. Nonetheless, 89%, 91.2%, 66.2% and 97.2% of the respondents perceived certified vegetables to be more expensive, more nutritious, tastier and healthier than conventional vegetables, respectively.

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The study also revealed that national scientific institution certification was the highly trusted certification institution with a mean score of 4.2, while the local association of vegetable farmers and traders was the least trusted certification institution with an average trust score of 2.5.

It was further revealed that about 46.5%, 49.7% and 47.2% of the respondents preferred vegetables (i.e. Cabbage, lettuce and tomatoes, respectively) with national government certification (Burkina Faso certification institution), while 32.7%, 32.8% and 31.0% of the consumers preferred the three egetables (i.e. Cabbage, lettuce and tomatoes, respectively) with international government ertification (European certification institution). Moreover, only 6%, 5.7% and 7.0% revealed they refer safer cabbage, safer lettuce and safer tomatoes, respectively. The remaining 14.8%, 11.8% nd 14.8% of the respondents revealed they prefer conventional vegetables (i.e. Cabbage, lettuce nd tomatoes) respectively.

was discovered that the price of cabbage, income and consumers who are financial risk lovers nd trust in national certification influenced consumer preference for cabbage with international ertification to the conventional ones. Similarly, the price of lettuce, age, income and trust in nternational certifiers' influenced consumers' preference for lettuce. Finally, price of tomatoes, ge, income and consumers who are willing to take financial risk influenced consumers' references for tomatoes certified by international (EU) certifiers.

lso, majority (93.75%) of the respondents were willing to pay more for certified vegetables, but f this percentage only 23.47%, 48.53% and 22.67% were actually willing to pay very high premium for 1kg of certified cabbage, 1kg of certified lettuce and 1kg of certified tomato, respectively. The mean WTP for 1kg of certified cabbage, 1kg of a bundle of certified lettuce and 1kg of certified tomato were estimated to be CFA 381.96, CFA375.27 and CFA 271.36, and these

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represent 62.54%, 70.57% and 59.62% increment in the current average prices of 1kg of cabbage, 1kg bundle of lettuce and 1kg of tomatoes, respectively.

It was found that the initial bid (price) of cabbage, age, education, knowledge, health risk and consumers' level of trust in national government certification were the key factors affecting consumers' WTP for certified cabbage. The significant factors influencing WTP for certified lettuce were initial bid (price) of lettuce, age and consumers' level of trust in national government ertification. Furthermore, the initial bid (price) of tomatoes, age, education, income, knowledge, ealth risk (consumers who are health conscious) and consumers' level of trust in national overnment certification were the significant factors influencing consumer WTP a price premium or certified tomatoes.

inally, the major constraint hindering the consumption of certified vegetables was higher prices f certified vegetables with a mean Garret score of 57.72 with cultural barrier being the least onstraint with a mean garret score of 39.87.

.3. Conclusions of the Study

ased on the major findings, the following conclusions are drawn.

was concluded that consumers have no knowledge on the availability of certified vegetables in ıe three market outlets and this negatively affected their purchasing habit of certified vegetables. owever, they perceived certified vegetables to be more expensive, nutritious, tastier and healthier ıan the conventional ones.

It was further concluded that the most trusted vegetable certification institution in Burkina Faso was national scientific institution certification (e.g. higher education institutions) while the least trusted certification institution was local association of vegetable farmers and traders certification.

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Consumers preferred certified vegetables, particularly those with national government certification (Burkina Faso certification) to the conventional ones. Price, income, willingness to take financial risk and trust in national certification influence consumers' preferences for cabbage with international certification to the conventional ones. Similarly, price, age, income and trust in international certifiers' influence consumers' preference for lettuce. Finally, price, age, income and consumers who are willing to take financial risk (financial risk lovers) influence consumers' references for tomatoes certified by international certifiers.

Moreover, consumers were willing to pay a price premium for certified vegetables. The factors influencing consumers' WTP for 1kg of certified cabbage were the initial bid (price) of vegetable, age, education, knowledge, health risk and trust in national government certification. Similarly, the significant factors influencing consumers' WTP for 1kg of a bundle of certified lettuce were initial bid (price) of lettuce, age and trust in national government certification. Furthermore, the factors influencing their WTP for 1kg of certified tomato were the initial bid (price) of tomatoes, age, education, income, knowledge, health risk and trust in national government certification.

Finally, higher prices of certified vegetables is potentially the major constraint hindering consumer accessibility of certified vegetables.

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5.4. Policy Recommendations

Based on the findings, it is recommended that policy makers and other stakeholders (farmers, consumers, marketers, government) in the certified food industries should put in measures to supply certified vegetables and create consumer awareness and sensitization on the health importance of consuming certified foods in order to improve consumers' knowledge on certified foods. Orientation and campaign programmes could also help improve consumers' perceptions and attitudes towards certified vegetables.

It is further recommended that vegetable producers and marketers should engage national government institutions, particularly the national scientific institution as their agent for their vegetable certification since consumers have higher trust in the national scientific institution certification than the other certifiers. However, government and other stakeholders in the food sector should put measures in place to ensure consumers have a better understanding of the different labels from different certifiers. This may go a long way to promote the activities of efficient and credible certification institutions. Since consumers revealed that they preferred certified vegetables, measures should be put in place by the government and other stakeholders to ensure that vegetable farmers are provided with support to enable them produce certified vegetables in the country. For instance, the government could subsidize the cost of production and certification that could motivate farmers to certify their vegetables. The findings that product characteristics (price), demographic (e.g. age) and socioeconomic (income) factors as well as trust in certifiers influence consumers' food preference should be used by stakeholders (marketers) in the food sector as a benchmark for targeting consumers. For instance, it was revealed that younger consumers with higher income and high level of trust in international government certification, prefer vegetables with international government certification to the conventional ones. With this finding, investors in the certified food sector should target such consumers.

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Moreover, the findings that consumers are willing to pay a premium for certified vegetables present a potential business opportunity to investors and stakeholders to venture into the certified food sectors. It is recommended that all stakeholders in the certified food industry should put in measures to promote consumers characteristic, product characteristics, consumers' attitudes and level of trust on food certifiers that positively influence consumers' willingness to pay for certified vegetables. Stakeholders in the sector should aim at mitigating potential constraints that may

hinder the accessibility of certified vegetables. This could be done by reducing the cost of production as well as decreasing the procedures and cost of certification.

5.5. Limitation of the study

The first limitation of this study is the fact that the study constructed a hypothetical market and besides, the issue of vegetable certification is still an emerging issue in the study area. However, ıe researcher put in measures to ensure a quality work done. Also, the study concentrated on only ɔnsumers, excluding the other actors in the certified food value chain, particularly producers and ıarketers due to time and other logistical constraints.

.6. Suggestions for Future Research

/here real market data is available, future research could assess consumers' WTP for certified ɛgetables using the revealed preference method which is done under real market situation. It is ıggested for future research to consider the other actors such as farmers and marketers willingness ɔ pay (WTP) or to willingness to accept (WTA) in relation to certified food. Finally, a study could ɛ done on the value chain of the certified vegetables.

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APPENDICE

APPENDIX 1. SURVEY QUESTIONNAIRE

URBAN FOOD PLUS/UNIVERSITY FOR DEVELOPMENT STUDIES, TAMALE, GHANA

DEPARTMENT OF AGRICULTURAL AND RESOURCE ECONOMICS

NYANKPALA CAMPUS

Consumers' Perceptions and willing to pay for Certified Vegetables in Ouagadougou, Burkina Faso

Serial Number _____ Date of Interview _____

District/Sector _____

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PART I

GENERAL HABITS OF CONSUMPTION AND FOOD-RELATED ATTITUDES

In this part of the questionnaire, I am going to ask you few questions about your consumption habits.

1. How much does your household spend on the following categories of food?

Food Item	***Average Frequency of Shopping*** **1** if Daily, **2** if Weekly, **3** if Fortnightly, **4** if Monthly **5** if Once every 2 months **6** if Other(s) _____	***Average Amount per Shopping (CFA)***	***Amount Spent per Week (CFA)*** *[To be computed by interviewer]*
Staple Crops			

(e. g. rice and rice products)			
Meat and Fish			
Beverages (non-alcoholic or alcoholic)			
Vegetables			
Others			
Total household expenditure on groceries/foodstuffs [To be computed by interviewer]			

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- Does the fresh look of vegetables positively influence your buying decision?

  Yes ☐ No ☐ do not know ☐

- Does the nutritional value of vegetables (e. g. amount of vitamins, minerals etc.) positively influence your buying decision?

  Yes ☐ No ☐ do not know ☐

- Vegetable production involves using irrigation water from different sources, such as fresh water, piped water, water from the river/ponds/streams/wells etc. Depending on where the irrigation water comes from, your health and the health of your family might be influenced in a negative way. Does the source of irrigation water for vegetable production influence your buying decision?

  Yes ☐ No ☐ do not know ☐

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5. The excessive use of agrochemicals, such as herbicides, pesticides and chemical fertilizer, might have a negative influence on your health and the health of your family. In purchasing vegetables, are you concerned as to whether or not they were produced using agrochemicals?

Yes ☐ No ☐ do not know ☐

PART II

CONSUMERS' KNOWLEDGE, PERCETIONS AND ATTITUDE TOWARDS CERTIFIED FOOD

Please, using the table below, indicate your level of knowledge, attitude, and frequency of purchasing safer and certified vegetables in the three locations.

Category/Question	**Location**	**Safer vegetables**	**Vegetables guaranteed to be safe through Certification**
Do you have any knowledge of the availability of safer / certified vegetables in Ouagadougou?	Market	Yes ☐ No ☐	Yes ☐ No ☐
	Supermarket	Yes ☐ No ☐	Yes ☐ No ☐
	Farm gate	Yes ☐ No ☐	Yes ☐ No ☐
Have you ever purchased safer/certified vegetables in Ouagadougou?	Market	Yes ☐ No ☐	Yes ☐ No ☐
	Supermarket	Yes ☐ No ☐	Yes ☐ No ☐
	Farm gate	Yes ☐ No ☐	Yes ☐ No ☐
On average how frequency do purchase safer/certified vegetables?		Daily ☐ Weekly ☐ ☐	Daily ☐ Weekly ☐ ☐

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		Monthly Occasionally ☐	Monthly Occasionally ☐
Where would you prefer to purchase safer/certified vegetables in Ouagadougou?	Market Supermarket Farm gate	Yes ☐ No ☐ Yes ☐ No ☐ Yes ☐ No ☐	Yes ☐ No ☐ Yes ☐ No ☐ Yes ☐ No ☐

. Please indicate how you perceive certified vegetables using disagree =1, neutral =2 and agree=3 *[Please tick the appropriate option for each statement]*.

Statement	**Disagree(1)**	**Neutral (2)**	**Agree(3)**
Certified vegetables are more expensive than conventional ones			
Certified vegetables are more nutritious than conventional ones			
Certified vegetables are tastier than conventional ones			
Certified vegetables are healthier for me and my family than conventional vegetables			

PART III

ELICITATION OF CONSUMERS' TRUST IN A PARTICULAR FOOD CERTIFICATION SCHEME, BASED ON EXISTING STANDARDS

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8. Various organizations in and outside Burkina Faso work on food safety certification. Assuming that, the following organizations/institutions are involved in vegetable certification; indicate your level of trust for their certification (1 = no trust at all; 5 = high trust). *[Please tick the appropriate option for each organization].*

Food Certification Organization	**No trust at all** (1)	(2)	(3)	(4)	**High trust** (5)
Local Association of Vegetable Farmers and Traders (non-governmental)					
Local Public Certification Agency (governmental)					
National Government Authority					
National Association for Consumer Protection (Non-Governmental)					
National Scientific Institution (example: Higher Education Institution)					
International Organization (EU Certified Organic or USDA) (governmental)					
International Non-Governmental Certifier					
Others (please explain):					

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PART IV

ELICITATION OF CONSUMERS' PREFRENCE FOR VEGETABLES WITH SPECIFIC CHARACTERISTICS AT A FIXED PRICE

In the Western, industrialized countries, a variety of food certification schemes are available to guarantee that food is produced according to certain standards and regulations and, thus, safe for consumption. The logos of some of these international standards are shown below.

EU Certified Organic

USDA

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Suppose that you can buy three different types of vegetables which were produced with different production methods and which have different properties. You can buy product A, where the production method (i. e. the possibility of wastewater irrigation and agrochemical usage) is unknown to you and where you have no guarantee that the product is safe and is sold at the average market price. You can buy product B where the production method is unknown to you but where you were told by the market vendor that the product is safe and is sold at 125% of market price. There is product C which guarantees you to be safe through certification by a *national* certification scheme and sold at 150% of the market price. And there is also product D which guarantees you to be safe through certification by an *international* certification scheme presented by a European one and sold at 175% of the average market. Which of the products you find in the table below would you buy at the given price?

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Attributes	**A.** Vegetables produced with unknown production methods	**B.** Vegetables without Certification	**C.** Vegetables with Burkina certification	**D.** Vegetables with European certification
Compliance with mechanisms to assure food safety	No	Yes	Yes	Yes
Food safety guaranteed through certification	No	No	Yes	Yes
International certification	No	No	No	Yes
Which vegetable do you select? (*tick one option for each vegetable*)				
Price of *1kg of cabbage* (*tick*)	CFA _____ ☐	CFA _____ ☐	FA _____ ☐	CFA _____ ☐
Price of *1kg of a bundle of lettuce* (*tick*)	CFA _____ ☐	CFA _____ ☐	FA _____ ☐	CFA _____ ☐
Price of *1kg of tomatoes* (*tick*)	CFA _____ ☐	CFA _____ ☐	FA _____ ☐	CFA _____ ☐

PART V

ELICITATION OF HOW MUCH CONSUMERS' ARE WTP FOR CERTIFIED VEGETABLES

In this section, I would like to find out what you think about certain vegetable production methods. There are no correct or false answers. I will now give you some information on vegetable production methods and their consequences on human health

Vegetable production in Burkina Faso is often characterized by wastewater irrigation and excessive use of agrochemicals (chemical fertilizers and pesticides). Untreated wastewater may contain pathogens, such as pesticide residues, which may contaminate agricultural produce. The consumption of this produce (e. g. vegetables) may cause human health risks, such as diarrhoea and typhoid.

Methods to clean wastewater, such as water filtration, will reduce pathogen load to a level where the consumption of agricultural produce is safe, i. e. not harmful to human health.

In order to guarantee that vegetables bought by consumers are "safe" for human consumption, projects in Ouagadougou are under way to promote food certification. Food certification means that organizations/institutions control, for example by soil testing, whether farmers comply with (national/international) food safety standards and, in case they do, label the farmer's produce accordingly.

The cost of water filters as well as the cost of soil testing for certification will increase the production costs for farmers. These farmers would have to pass on part of that cost to the consumers, resulting in higher prices for vegetables certified as safe compared to uncertified

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10. Would you be willing to pay more for vegetables that are guaranteed to be safe through certification and thus not harmful to your health? [Before answering this question, please take into consideration that your budget is constrained. If you are willing to pay higher prices for certified vegetables, you may have to reduce the expenditures for your other needs.] Yes ☐ No ☐

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11. If no to **10**. Why? [multiple answers are possible]

- I cannot afford certified vegetables ☐
- I don't need certification because I think that vegetables conventionally produced are safe ☐
- I don't need certification because I know that my market vendor only sells me good-quality vegetables ☐
- I do not trust the certification institution ☐
- Other reason **(**please explain _____ **)**

f yes to **10.** please proceed with the following]

The current market price for 1kg of cabbage is CFA _____]

The current market price for 1kg of a bundle of lettuce is CFA _____]

The current market price for 1kg of tomatoes is CFA _____]

Note to the interviewer: The current market prices of the vegetables above serve as a start-up rice for the WTP elicitation. Top-up the current market price randomly by 125%, 150%, 175% r 200% and manually write the concrete amounts in the blank spaces provided in the table below. the respondent answers "yes" to the first bid, the second bid is set higher by randomly assigning price premium (10%, 20%, 30% ,40% or 50%) on the initial price premium.

f the respondent answers "no" to the first bid, the second bid is set lower by randomly assigning respondents a discount (10%, 20%, 30%, 40% or 50%) on the initial price premium.

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Question	Certified and safe vegetables		
	1kg of Cabbage	1kg of a Bundle of lettuce	1kg of tomatoes
12. If certified, will you be willing to pay	CFA _____ Yes ☐ No ☐	CFA _____ Yes ☐ No ☐	CFA _____ Yes ☐ No ☐
13. If yes to **12**, will you be willing to pay	CFA _____ Yes ☐ No ☐	CFA _____ Yes ☐ No ☐	CFA _____ Yes ☐ No ☐
14. If no to **12**, will you be willing to pay	CFA _____ Yes ☐ No ☐	CFA _____ Yes ☐ No ☐	CFA _____ Yes ☐ No ☐
15. If yes to 13 what is the most you are willing to pay for certified vegetables	CFA _____	CFA _____	CFA _____
16. If no to 14 what is the most you are willing to pay for certified vegetables	CFA _____	CFA _____	CFA _____

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17. If you answered yes to **10,** why are you willing to pay higher prices than the current market price for certified vegetables?

- I can afford ☐
- It is healthier for me and my family than the conventional one ☐
- It is tastier than the conventional one ☐

- It is more nutritious (e. g. vitamins, minerals etc.) than the conventional one ☐
- Other reason: (please explain _____)

PART VI

ELICITATION OF POTENTIAL CONSTRAINTS CONSUMERS' MAY FACE IN ACCESSING CERTIFIED VEGETABLES IN OUGADOUGOU

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18. Please, using the constraints' you face in accessing safer (organic) vegetables as a proxy, identify and rank the potential constraints you may face in accessing certified vegetables from the most to the least pressing (1 = most pressing). If a constraint is not applicable to you, don't rank it.

NO.	Constraint	Tick for "yes"	Rank those that you answered "yes"	No. of constraints rank
1.	Prices of certified vegetables are high			
2.	Lack of adequate information on certified vegetables			
3.	Access to markets for certified vegetables			
4.	Lack of certified vegetables			
5.	Lack of trust in the label			
6.	Cultural barriers			

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PART VII

DEMOGRAPHIC CHARACTERISTICS

19. Religion of the respondent:

Traditional ☐ Christian ☐ Muslim ☐ Others ☐

20. Marital status of Respondent: Single ☐ Married ☐ Divorced ☐

21. Please indicate the composition of your household (resident household members only!)

[Use the table below]

HH members *(first names only)*	***Relationship to HH***	***Age***	***Sex M/F***	***Highest Education*** [1]	***Major Occupation***[2] *(Activity you spend most of your time on)*	***earnings/ month***
Respondent						

(1) Own farm, (2) daily wage labour (farming or non-farm activities), (3) salaried worker (e. g. teacher, police man), (4) petty trading, (5) craftsman (e. g. bricklayer, carpenter, tailor), (6) other **(***Please specify*)]

[2][(1) None, (2) Koranic school, (3) Non-formal (can read and write but never went to school), (4) primary class (1-6), (5) Junior High School (JHS1 – JHS3) (6) Secondary (SHS1-SHS3, Vocational or Technical School, (7) Tertiary (Training college, university, polytechnic)]

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22. What is your level of education (in year)?_____

23. What is your ethnicity? Mossi ☐ Peul ☐

Lobi ☐ Bobo ☐ Senufo ☐ Gurunsi ☐

Other **(***Please specify* _____**)**

24. Please, indicate whether you are willing to take the following risks. [*Please tick the appropriate option for each category.*]

Category	**No(1)**	**Yes(2)**
Are you willing to take financial risk?		
Are you willing to take health risk?		

25. Do you have any further comments on the topic of certified vegetables----------?

26. Please, do you have any questions for me----------

THANK YOU VERY MUCH FOR YOUR TIME AND CO-OPERATION.

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APPENDIX 2. GARRETT RANKING CONVERSION TABLE

GARRETT RANKING CONVERSION TABLE

The conversion of orders of merits into units of amount of "socres"

Percent	Score	Percent	Score	Percent	Score
0.09	99	22.32	65	83.31	31
0.20	98	23.88	64	84.56	30
0.32	97	25.48	63	85.75	29
0.45	96	27.15	62	86.89	28
0.61	95	28.86	61	87.96	27
0.78	94	30.61	60	88.97	26
0.97	93	32.42	59	89.94	25
1.18	92	34.25	58	90.83	24
1.42	91	36.15	57	91.67	23
1.68	90	38.06	56	92.45	22
1.96	89	40.01	55	93.19	21
2.28	88	41.97	54	93.86	20
2.69	87	43.97	53	94.49	19
3.01	86	45.97	52	95.08	18
3.43	85	47.98	51	95.62	17
3.89	84	50.00	50	96.11	16
4.38	83	52.02	49	96.57	15
4.92	82	54.03	48	96.99	14
5.51	81	56.03	47	97.37	13
6.14	80	58.03	46	97.72	12
6.81	79	59.99	45	98.04	11
7.55	78	61.94	44	98.32	10
8.33	77	63.85	43	98.58	9
9.17	76	65.75	42	98.82	8
10.06	75	67.48	41	99.03	7
11.03	74	69.39	40	99.22	6
12.04	73	71.14	39	99.39	5
13.11	72	72.85	38	99.55	4
14.25	71	74.52	37	99.68	3
15.44	70	76.12	36	99.80	2
16.69	69	77.68	35	99.91	1
18.01	68	79.17	34	100.00	0
19.39	67	80.61	33		
20.93	66	81.99	32		

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