ANALYSIS OF WILLINGNESS TO PAY FOR ALTERNATIVE LOCAL READY-TO-USE THERAPEUTIC FOOD FOR MALNUTRITION MANAGEMENT IN WESTERN KENYA

BY

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DECLARATION

Declaration by the Candidate

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DEDICATION

This thesis is dedicated to my dear parents, family, friends and everyone whose words and patience have been my source of encouragement and inspiration.

ABSTRACT

Malnutrition still remains to be a major hurdle in Western Kenya with mortality rates of children under the age of 5 standing at 64 deaths per 1000 live births; higher than the national average of 52 deaths per 1000 live births. Ready-to-use therapeutic foods (RUTFs) have been proven to be one successful intervention for management of malnutrition. These are macronutrient and energy dense foods that have been fortified with minerals and vitamins. They also do not require any preparation before use, are easy to store and can easily be preserved from bacterial contamination. Despite their enormous benefits, most communities in Western Kenya have been unable to access the RUTFs. Currently, they are no indigenously local made RUTF that meet the required criteria in Kenya despite its potential. Research has shown that there is potential for the production of a local RUTFs bearing in mind that most of the ingredients are grown locally in Western Kenya. However, little is known about the consumer acceptability of a local Ready-to-use foods and the monetary value attached to it in Western Kenya. This prompted this study which aimed at establishing the willingness to pay of consumers for an alternative local Ready-to-use therapeutic foods and the price they would attach to the product. The utility maximization framework guided this study. It postulates that consumers make decisions on what to purchase with the goal of maximizing their expected utility. The study employed a household survey on 383 respondents residing in Bungoma and Busia County who use the current RUTFs. Questionnaire were used in collecting primary data on factors, challenges and willingness to pay for alternative local RUTFs. It covered respondents. Descriptive statistics were used to characterize the respondents' socio economic status and willingness to pay. The effect of socio-economic status, RUTFs consumption frequency and Household dietary diversity score on the consumer willingness to pay and price was assessed using Cragg's double hurdle model. The willingness to pay for a local alternative RUTFs was high at 252 out of 400 respondents accounting for 63 percent. Among the challenges experienced in accessing the existing RUTFs were high transportation costs (33.3 percent), Shortages in stock (29.6 percent), Stigmatization (22.2 percent), harassment from harsh hospital staff (6.4 percent), frequent illness (6.2 percent) and long queues in the RUTFs dissemination centres (1.2 percent). Gender, Monthly income, HDDS, Size of Household and Marital Status were found to positively influence the WTP while frequency of consumption of RUTFs negatively and significantly affected WTP. Gender was positively significant to price of an alternative local RUTFS while distance to dissemination center a negative influence on the price of an alternative local RUTFs. The study therefore recommends increased investments and policy support for increasing production of a local RUTFs to satisfy the demand and ultimately manage malnutrition in Western Kenya. Furthermore, ingredients used in production of RUTFs should be sourced locally creating a marketing opportunity for the locals to the producers of RUTFs and hence economically benefit the locals. The socio economic characteristics, specifically the Gender of respondent, HDDS, Monthly income, Size of Household, Frequency of RUTFs use and marital status should be considered when developing a marketing mix for the product.

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LIST OF ABBREVIATIONS AND ACRONYMS

FAO	Food and Agriculture Organization
HDDS	Household Dietary Diversity Score
HIV	Human Immunodeficiency Virus
KNBS	Kenya National Bureau of Statistics
KShs	Kenyan Shillings
MAM	Moderate Acute Malnutrition
RUTFs	Ready-to-use therapeutic-Foods
SAM	Severe Acute malnutrition
UNICEF	United Nations Children's Fund
WHM	weight-for-height percentage of the median
WHO	World Health Organization
WTA	Willingness to accept
WTP	Willingness to pay

OPERATIONAL DEFINITION OF TERMS AND VARIABLES

Dietary diversity: the number of different foods or food groups consumed over a given reference period and used in this study as a proxy for nutrition (Ruel, 2003).

Malnutrition: Lack of proper nutrition, caused by not having enough to eat or not eating enough of the right things (Jensen *et al*., 2013).

RUTFs: High-energy, lipid-based spreads used in any cultural setting for the treatment malnutrition (Irena *et al*., 2015).

Willingness to pay: is the maximum amount an individual is willing to sacrifice to procure a good (Anselmsson *et al*., 2014).

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CHAPTER ONE

INTRODUCTION

The following chapter introduces the thesis outlines the background information, statement of the problem, objectives of the study, research questions, the significance and scope of the study.

1.1 Background Information

Malnutrition still remains to be a major hurdle resulting in the deaths of more than one third of children globally, albeit it being rarely recognized as the major contributor (Bain, *et al*., 2013). Malnutrition has been defined by The World Food Programme (WFP) as "a condition where the physical function of a person is impaired to a point where he/she is unable to maintain enough bodily performance process such as pregnancy, growth, and physical work lactation and recovering from disease (Bain, *et al*., 2013). The U.N. Millennium Development Goals (MDGs) initiated various interventions with an aim of reducing hunger to a half by 2015 (Johnson-Welch, *et al.*, 2005). Despite these initiatives, the current statistics on hunger stand at 12 percent globally representing a population of 842 million people (Kimani *et al*., 2015). The most vulnerable groups that are susceptible to food insecurity comprise of lactating, pregnant and low income earning women, victims of war, the sick, migrant workers, urban dwellers earning a low income, the elderly people and children below the age of 5 (Bain *et al*., 2013). The situation is worse in the developing countries where approximately 30 percent of the population suffer from any of the various kind of malnutrition (Bain *et al*., 2013). Children under the age of 5 in

the developing countries are the most affected with 49 percent out of 10 million deaths being as a result of malnutrition (Bain *et al*., 2013). The African region is the most adversely with child malnutrition standing at about 39.4 percent stunted, 24.9 percent underweight and wasting at 10.3 percent for children under the age of 5 (Akombi, *et al*., 2017). Over 204 million out of the 842 million hungry people reside in Sub-Saharan Africa (Bain *et al*., 2013). In fact, the proportion of children who are underweight has stagnated in Sub-Saharan Africa with the absolute numbers increasing over the last decade (De Sherbinin, 2011). Chopra & Darnton-Hill (2006) notes that the child mortality Millennium Development Goals might be achieved in 2115 (a century after the target) if the current trends persist. East Africa is especially affected by stunting with close to a half of the young children being affected (Kimani-Murage, *et al*., 2015). Kenya, in particular bears high rates of under-nutrition as a result of delicate population-environment balance, declining food availability risks and drying weather trends which put pressure on food systems (Grace, *et al*., 2012). The stunting and wasting levels have remained unchanged in Kenya for over the past 20 years standing between 30 percent and 35 percent for stunting and 6 percent and 7 percent for wasting (Kimani *et al*., 2015). The problem of malnutrition is further catapulted by increase in the demand of food as a result of increasing populations, change of eating habits and unequal distribution of food growing areas and the recent climate change effects (Kimani *et al*., 2015). Further, illiteracy, poverty, high family size, inadequate food production, corruption, ignorance, policy, obstacles in terms of distribution, climate change, unsuccessful local agriculture, and inability for local officials to act (Bain *et al*., 2013). Expansion in the land for cultivation as a result of increasing population leading to encroachment onto fallow lands

has led to reductions in soil fertility hence worsening the issue of malnutrition (Chopra & Darnton-Hill, 2006). This is especially the case in Western Kenya where the increasing population due to high birth rate has led to creation of smallholder households. These smallholder households usually face limitations in terms of accessing productive capital, resources, technology and lack the bargaining power for fair prices at the market (Valbuena *et al*., 2015). With farming being the most source of livelihood being practiced in the region, there has been an enormous pressure on the land. Continuous farming of the soil has rendered the soil infertile leading to severe declines in crop yields, low farm income, and endemic food deficits on most Western Kenya smallholder farms (Kisinyo *et al*., 2012). The low crop yields leads to low income which is by extension translated to malnutrition. According to KNBS (2009), 60 percent of the Western Kenya population are living below the rural poverty line.

According to Kenya Nutrition Profile *(*2019), 26 percent of children below 5 years of age are suffering from chronic malnutrition. This creates a worrying trend worth of prompt action by policymakers. With a high proportion of Africa's population depending on agriculture for livelihood, it is prudent to study the impact of agriculture on food availability. Over the past 20 years, Kenya has failed to develop its agricultural sector for reduction of malnutrition in poor people (Kimani *et al.*, 2015). Agricultural productivity per worker in the country has fallen by about 12% since 1980 (Chopra & Darnton-Hill, 2006. It is further projected that, despite the improvement in the indicators of malnutrition, an estimate of approximately US$38.3 billion in GDP will be lost due to reduction of workforce productivity as a result of undernutrition *(Kenya Nutrition Profile,* 2019).This depicts a significant worrying trend as most of the population are unable to

afford a daily nutritious balanced diet. The resulting nutrition insecurity is exacerbated by a large burden of morbidity. In the adult population, anecdotal evidence indicates significant rates of under nutrition with the dry plains reporting over 20% among rural population groups (Bor, *et al*., 2016). It lead to an increase in mortality and morbidity rates, reduction in children's cognitive abilities educational performance, reduction in labour productivity and the reduction in the general quality of life of the affected (Mwaniki, 2006). Malnutrition in childhood is known to have important long-term health consequences on the adults' work productivity and intellectual performance (Bain *et al*., 2013). Malnutrition leads to sub optimal intellectual development (Bain *et al*., 2013). Women who are malnourished usually develop complications during pregnancy and generally deliver children having birth weights that are low. This further leads to having children who are mentally and physically stunted (Bain *et al*., 2013).

Ready-to-use therapeutic foods (RUTFs) are one successful intervention for management of malnutrition (Bechman, *et al*., 2015). These are macronutrient and energy dense foods that have been fortified with minerals and vitamins (Bechman *et al*., 2015). The term RUTF is used generally to include different food including spreads for administering to children who are severely malnourished (Manary, 2006). Among the variety of RUTFs, spreads use very simple technology in preparation. This has enabled their successful transfer to developing countries without much industrial infrastructure (Manary, 2006). The use of RUTFs in home based management has yielded better results as compared to standard hospital therapy (Kapil, 2009). RUTF has revolutionized treatment of severe malnutrition through provision of foods that can be used safely at home and guarantee quick weight gain in severely malnourished children (WHO, 2019).One major benefit of

RUTFs as a remedy for malnutrition is that the ingredients such as minerals, powdered sugar, peanuts, powdered milk, oil and vitamins are mostly locally available and do not require preparation after processing hence accommodating home treatment (Bechman *et al*., 2015).

Despite their enormous benefits, powdered milk is one of the major component of the currently available RUTFs. This makes it producing RUTFs to be expensive especially in the third world countries where cases of malnutrition persist (Bechman *et al*., 2015). International response focusing on excessive food assistance rather than efficiencies in Sub Saharan Africa further affects sustainability and limits access to RUTFs (Bain *et al*., 2013).

WHO advocates for the local production of RUTFs for alleviation of malnutrition provided a right mix of food is used with international standards (Kapil, 2009). Among the countries that have embraced local production of RUTFs paste include Ethiopia, Niger, Congo, and Malawi (WHO, 2019). Through this intervention, there is a higher likelihood of reaching a wider number of poor and vulnerable people at a relatively cheaper cost hence leading to sustainable results (Mwaniki, 2006).

1.2 Statement of the Problem

The use of RUTFs has a potential of managing malnutrition in Western Kenya. WHO recommends for the local production of RUTFs for alleviation of malnutrition provided a right mix of food is used with international standards (Kapil, 2009). The use of locally produced ingredients with the right mix can guarantee the alleviation of malnutrition through edification of people on its potential hence reaching a wider coverage of

malnourished people (Mwaniki, 2006). Currently, they are no indigenously made RUTF that meet the required criteria in Kenya despite its potential (Kapil, 2009). This creates a potential avenue for producers to venture into productions of a local alternative RUTFs. However, little is known on the acceptability of consumers on local Ready-to-use foods in Western Kenya. Understanding willingness to pay of consumers and factors that influence their willingness to Pay (WTP) assists strategic marketers in segmenting potential consumers. The socioeconomic factors of a consumer relate with the attributes of a product and assist in determining their WTP for RUTFs. Moreover, there is lack of information on the awareness of consumers on RUTFs and the monetary value attached to RUTFs in Western Kenya. In addition, information on socio-economic factors influence consumers' WTP for Ready-to-use foods in Western Kenya is invariably unavailable. This prompted this research that sought to determine whether the people of Western Kenya would be willing to pay in case a local RUTFs is produced that will be easily accessible to the locals.

1.3 Objectives of the Study

1.3.1 Main Objective

The main objective of the study was to determine the willingness to pay for an alternative local Ready-To-Use Therapeutic Food for malnutrition management in Western Kenya.

1.3.2 Specific Objectives

i.   To determine the challenges experienced in accessing RUTFs in Western Kenya

ii.   To estimate the willingness to pay of consumers and the price for an alternative local RUTFs

iii.   To determine the socio economic and institutional factors influencing the willingness to pay for a local alternative RUTFs in Western Kenya

iv.   To determine the socio-economic and institutional factors influencing the price consumers are willing to pay for a local alternative RUTFs in Western Kenya

1.4 Research Questions

i.   What challenges do people living in Western Kenya experience in accessing RUTFs?

ii.   Are consumers willing to pay for an alternative local RUTFs and what is the price they are willing to pay?

iii.   How do Socio-economic and institutional factors influence the willingness to pay for a local alternative RUTFs in Western Kenya?

iv.   How do Socio economic and institutional factors influence the price consumers are willing to pay for a local alternative RUTFs in Western Kenya?

1.5   Significance of the Study

The study anticipated to pinpoint whether or not respondents were willing to pay for a locally available Ready-To-Use Therapeutic Food in the study area. An understanding of their malnutrition status, the challenges they face in accessing the RUTFs and their willingness to pay would provide policy makers with information to design programs that can contribute to combating malnutrition in Western Kenya.

In addition, the result is useful to all developmental partners like the government, food relief programs, food processors, local and international NGO and researchers in designing different policies and strategies that designed to produce nutrition remedies and also contribute to the information on willingness to pay in the context of a changing

agriculture and appropriate analytical methodologies to deal with the same. Finally the results obtained would add to the wealth of information currently available on the subject.

1.6   Scope of the Study

The study put emphasis on consumers' willingness to pay for an alternative local Ready-to-use Therapeutic-Food in Western Kenya. It covered respondents in Bungoma and Busia County who use the current RUTFs. These counties were purposively chosen due to reported high cases of malnutrition (KDHS 2014). Stunting rates in Bungoma and Busia counties stand at 24 and 22 percent respectively with wasting being at 1.8 and 2.2 percent in Bungoma and Busia counties respectively (KDHS 2014). Mortality rates are also high in Western Kenya with Under 5 mortality rates standing at 64 deaths in every 1000 live births, which was significantly higher than the 52 deaths per 1000 live births national average. (KDHS 2014)

CHAPTER TWO

LITERATURE REVIEW

This section reviews previous studies conducted on malnutrition status in Western Kenya, the management of malnutrition through RUTFs use, the concept of Willingness to pay, Household dietary diversity score and factors affecting willingness to pay.

2.1 Malnutrition Status in Western Kenya

Malnutrition occurs due to people being unable to consistently consume the recommended types, quantities of food and vital nutrients required by the body. Globally, approximately 3 million children die each year as a result of malnutrition (Kotloff *et al*., 2013).

In Kenya, Malnutrition remains one of the major health setback; currently, the stunting rates in Kenya stand at (35 percent) with increasing non-communicable diseases associated with diet, such as cancers, kidney complications, liver and diabetes. These diseases are directly related to low nutritive food consumption (Lachat *et al., 2013*). The susceptibility of malnutrition in Kenya is further catapulted by the ever changing erratic climatic conditions and high costs of living (KNBS, 2010). The unpredictable change in rainfall patterns have led to the increase in food security crisis with increasing population (Kenya Emergency Humanitarian Response Plan 2012). A survey by Concern Worldwide show that the urban poor suffer a higher rate of chronic malnutrition standing at 38 percent stunting as compared to the national rate of 35percent stunting. (Concern and UNICEF, 2011). The HIV/AIDs infection rate of Western which is higher (13

percent) as compared to 0.9 percent in North-Eastern Province further worsens the problem of malnutrition (Kenya Emergency Humanitarian Response Plan 2012).

Undernutrition further leads to an estimated death of a third of all children under 5 (Onis, 2006).Reports from KNBS(2010) show that male children have a higher prevalence to stunting a 37 percent as compared female children (33 percent) with more than a third of children being stunted in Kenya.

The issue of nutrition in Western Kenya still remains a major hurdle inhibiting the development of the region (Kabubo-Mariara *et al*., 2009). Ironically, the area has sufficient rainfall required for agriculture and it is located near Lake Victoria which is fish laden. The prevalence of HIV/ AIDs, which exceeds 25 percent (Ayisi *et al*., 2000), further acts as a catalyst worsening the pandemic. This increased the number of orphans and deaths with motherless orphans standing at more than 1.5 million (Onu *et al*., 2016). The orphaned children whose parents have died from HIV/AIDS are immensely burdened having lost the parental attention, care and basic human resources access (Foster *et al.,* 2005).

Among the serious implications of malnutrition are that it significantly lowers the productivity of individuals, deteriorates health, and lowers the life expectancy of people (Caulfield *et al*., 2004). This ultimately inhibits ability of Sub Saharan African countries to combat poverty (Grantham-McGregor *et al*., 2007). Individual cognitive development is further derailed in around 200 million children below the age of 5 in third world countries due to the poor health status of an individual due to malnutrition (Ezzati *et al*.,

2002). This will go further to impact negatively the child's school performance and later lead to less developed adults who cannot produce effectively.

2.2 Malnutrition Management and the Use of RUTFs

The use of fortified blended flours has often been prescribed as the standard remedy for moderate acute malnutrition (MAM) treatment (Navarro-Colorado, 2008). The World Health Organization (WHO) has established new standards (Onis, 2006) which has enabled the inclusion of more severely malnourished children who were previously excluded through the median weight-for-height percentage (Isanaka *et al*., 2009). With these new standards, children who were initially classified as moderately malnourished now stand a chance to benefit more as they will follow the dietary procedures prescribed for treatment of severe acute malnutrition(SAM) and be included when prescribing ready-to-use therapeutic food (RUTF). This was not previously the case when liquid based products were initially used. The previous liquid based treatments were prone to growth of pathogenic bacteria. This required the need for perfect hygienic conditions to prevent the growth of pathogens that would induce life threatening diarrhea (Manary *et al*., 2005). Practically, the existence of such hygienic areas is not possible in realistic situations. It also required the discarding of the products which were not consumed immediately due to lack of refrigeration facilities. This led to wastes and continuous preparation of the liquid product for as many times as the children required to feed.

The invention of RUTFs immensely relieved this burden as it didn't require the use of water and hence elimination of bacteria. RUTF has proven to be a successful therapeutic food in managing severe acute malnutrition and in the facilitation of home based therapy (Manary *et al*., 2005).

The success of RUTF has led to an increase in manufacture of the product and adoption in many countries in Africa. This has reduced RUTF costs, led to creation of employment and led to the upgrade of food manufacturing industries in many countries across Africa; it also creates some demand and market for local farm produced by smallholder farmers thus providing economic benefits back to vulnerable groups (Manary, *et al.,* 2005).

Studies focusing on the efficacy of RUTFs in Malawi show that they are more superior to standard therapy for the moderately wasted children treatment with a significantly increased weight gain rate of recovery (Defourny *et al*., 2007). Me´decins Sans Frontie`res (MSF) also support this theory after recording encouraging findings after using RUTFs. In theory the production process for production of RUTFs is not that complex (Latham, 2014).

In Kenya, the kind of RUTF that is being used is Plumpy-Nut which is commercially produced by Nutriset. The distribution and supply chain is mostly carried out through a co management between GoK with UNICEF and IPs where the government, through the Ministry of Health at county level (UNICEF, 2009).

Delivery and timely availability of RUTFs with an ever expanding demand currently poses a serious challenge for the government (UNICEF, 2009). Reports from some donors indicate that the health supply and delivery system has a shortage of capacity and requires more capacity development. (UNICEF, 2009). As it stands currently, the distribution network starts from the health facilities where the demand is usually assessed. Requests are then made to the UNICEF Kenya Country Office who further direct it to UNICEF Supply Division. The RUTFs are then manufactured overseas and

delivered by air or sea to Kenya before being transported by trucks to the UNICEF warehouses in Nairobi for subsequent dispatch to counties in need(UNICEF, 2009)

Kenya stood at position five in the list of top beneficiaries of RUTFs in 2010, with 924 metric tonnes (about 70,000 cartons) deliveries to reach out 44,000 children suffering from severe acute malnutrition.

2.3 Concept of WTP

Product testing is one of the fundamental component of research that any company requires in order to develop markets, achieve product superiority, build brand, increase customer loyalty and boost profitability (Kwakwa, 2013). Acceptance research has aided producers in provision of vital insights which explain the performance of introduced products or services (Campbell, *et al.,* 2014). In order to achieve product success in the market, customers' reactions should be evaluated, especially on their perception on features and quality of the product. Product consumer testing and price willing to be paid by consumers should also be determined (Kwakwa, 2013). Testing of the market also aids the trader to manage risks such as: not meeting the requirements of the consumer; being unable to understand the needs of the user; inability to analyze the competition and late discovery of errors in the development of the product (Olynk, *et al.,* 2010).

As the interest for consumer preference increases, Willingness to pay studies has emerged as one of the methods used in provision of essential insights and suggestions concerning the consumers' perception on the value of a product based on its features (Miller, *et al.,* 2011).

Literature on willingness to pay suggest three major ways to estimate willingness to pay in nonmarket valuation scenarios (Okoffo *et al., 2016)*. They are; revealed preference and

stated preference and a mixture of theory with microeconomic variables of a household and market in the estimation of suitable market premium (Okoffo *et al., 2016)*. In revealed preference, the action of buyers and sellers directly portray their preferences hence determining the price to tag on the commodity (Howie, *et al.,* 2010). The individual's behaviour are analyzed and assist in building economic models. (Cason & Plott 2014). Through observation of the choices that consumers make when purchasing goods, it provides insights on how goods will be valued.

In cases where goods are not in the market, stated preferences methods are employed in eliciting the consumers' willingness to pay values based on hypothetical scenarios (Boyle, 2017). In this study, there are no local RUTFs in the market. This prompted the use of stated preference method with presentation of the features of hypothetical RUTFs to consumers including the challenges they have been facing in accessing the imported RUTFs. Based on the challenges, they gave their WTP for those attributes. In situations where information lacks on the market of a particular product, a type of stated preference method known as contingent valuation method is recommended (Taneja, *et al*., 2014).

2.4 Contingency Valuation Method

Contingent valuation method is used in analyzing economic scenarios which comprise of non-market/hypothetical goods or services to elicit their value in terms of price (Carson, 2012). The term contingent valuation is derived by the virtue of willingness to pay being subject/contingent on a hypothetical scenario. Bogale & Urgessa, (2012) argue on the reliability of using Contingency Valuation Method based on the fact that he respondents might not purchase the commodity once the hypothesized commodity is actualized.

Contingency valuation method seeks to determine the price willing to be paid by a consumer for a hypothesized product without interfering with his utility. It also gives the consumers a chance to either reject or accept a product hence enabling the simulation of choice. Taneja *et al*., (2014) advocates for contingent valuation method in surveys that measure willingness to pay and preferences.

There is a link between welfare economics and microeconomic fundamentals in contingency valuation method through equivalent variation(Nyström, 2017).This is portrayed in this study where the equivalent variation shows the price willing to be paid by a consumer whilst maintaining the same level of utility(Nyström, 2017).

Contingent Valuation Method also possesses the advantage of allowing socioeconomic and institutional attributes of the respondents (Mitchell & Carson, 2013). For instance, Danso-Abbeam *et al*., (2014); Kwadzo *et al*., (2013) and Ulimwengu and Sanyal (2011) used contingency valuation method to analyze farmers' willingness to pay. However, Munro, *et al*., (2001) argues that through Contingency method of valuation, respondents might give a correct preference but be unable to correctly give a reasonable WTP price for the commodity.

The Contingent Valuation Method is used for this study because there is no observed data that are already available to help in the valuation of RUTFs.

As proposed by Boyle (2017), a good Contingent Valuation Method survey questionnaire consists of an introductory section that will assist the respondent to comprehend what the survey is about, a clear description of :the hypothesized product,

the method of provision, mode of payment, decision rule, the product provider, and any additional information that will aid in eliciting the WTP.

There are different elicitation formats that can be used in a Contingent Valuation Method survey. They include closed or open ended questions, bidding game, dichotomous choice (single, double, or multiple bounded) and the payment card (Boyle, 2017; Carson, 2012). All the elicitation formats have their advantages and disadvantages but Boyle (2017) postulated that, dichotomous choice elicitation formats and open-ended do not have any significant difference, and that both formats produce reliable results. The open ended question asks the respondents the price they will be willing to pay for the good while the closed ended gives options from which the respondents choose how much they are willing to pay. The format of dichotomous choice requires the respondent to answer "yes" or "no" to a specific payment (Loomis, 2011). This led to the decision of using contingent valuation method in this study.

2.5 Factors affecting WTP

Understanding socioeconomic and institutional factors influencing Willingness to Pay (WTP) of a consumer on a product assists in consumer segmentation which further assists in strategic marketing (Charity, 2016). Different factors can affect the choice of human food. As Sobal *et al.,* (2006) noted, "People are actively selecting what, when, where, with whom and how to eat and the range of factors potentially involved in human food choice is tremendously diverse and extensive. Studies by other researchers show that consumers look for many factors when making decisions on food with convenience, taste, cost, and health being among the major factors affecting their choice of food (Sobal *et al*., 2006). A research on factors that influence the decision making process for the purchase

of food can be of utmost benefit to restaurants, producers, and institutions dealing with food service institutions in defining new strategies for marketing.

Supporting findings were gotten by Maseta, (2016) who evaluated the efficacy of quality protein maize-based composite supplementary foods on rehabilitation of undernourished children in Mvomero District. He revealed that, family's source of income, age of the child, dietary diversity score ≤3 food groups, consumption of animal foods, family size and consumption frequency were among the factors that influenced stunting of children significantly hence increasing the demand for supplementary foods

Wongnaa *et al*., (2019) assessed consumers' perception and willingness to pay for tiger nut yoghurt developed. The results showed a positive perception for tiger nut yoghurt and high willingness to pay with an overall mean perception index of 0.67. The findings also revealed that, age, sex, educational level, household size, monthly income and price of the product were the factors influencing consumers' willingness to pay (WTP) for tiger nut yoghurt.

In their study on willingness to pay for locally grown animal products, Carpio and Isengildina-Massa (2009) found that indicated that the factors that influenced the premiums for local products included age, gender, income and the perception of consumers on product quality, to support the local economy and the ties of consumers to agriculture. The above results however vary from those of Tregear and Ness (2005), whose findings showed that demographic characteristics were less influential.

The age and the health status of a consumer have been reported to have an effect on the selection and consumption of a product and hence the willingness to pay. Older people often have more knowledge and skills accrued in their lifetime which enables them to

better understand the benefits of accepting and willing to pay. Healthy adults are also more enthusiastic about adopting healthy diets than children and adolescents (Wongnaa *et al*., 2019. Research by Liu, Nelson, and Styles (2013) also found age to be positively related to willingness to pay. Supporting this theory is Tregear and Ness (2005) who found the variable "age" being the only significant predictor influencing buying decisions of local foods.

Income is also an important determinant of food choices with direct consequences for nutrient availability (Maseta, 2016). Channa, *et al.*, (2018) alludes that diets that are adequate nutritionally diets can mostly be purchased by people earning a middle or high income more than those earning low income. Studies by Merkle, *et al.,* 2017 and Namkung, & Jang, 2017 showed that preference of consumers towards locally produced foods are based on the demand for benefits related to income. Costanigro *et al.*, (2014) cited a significant positive correlation was found between consumers' income and the willingness to pay for local foods. Wealthier consumers are therefore more likely to buy local food, because wealthier consumers have a greater budget to buy food (Appleby, 2007; Costanigro *et al.*, 2011).

Socio-demographics such as marital status, might also help in enlighten the reason behind choices made by consumers on goods (Botonaki *et al*., 2006). Social modelling is critical in families as children's diets are determined by their parents' choice of food directly bringing in the aspect of the type of marriages (Maseta, 2016).

Consumers' education background and consumers purchasing choices have been found to be positively correlated in some studies (Alemayehu, 2014; Yue and Tong, 2009). Well-educated and wealthier consumers are more likely to purchase foods due to informed

judgement (Yue and Tong, 2009) A person with a higher level of education can easily make informed judgement. A study by Kogi-Makau, (2015) on the performance of the community based management of acute malnutrition in Lilongwe showed a positive significant relationship between a mother's level of educational and the child's nutritional status in both stunting and underweight of the children ($p < 0.05$) with the nutritional status.

Distance to the source of the product also significantly affects willingness to pay. Different studies have reported an increase in willingness to pay with distance (Rohith and Chandrakanth, 2011). Given the short distance travelled for local food, transport and storage cost of locally produced food is low (Maseta, 2016).

There are myriad of challenges that affect the access to products which affect the willingness to pay: poor state of infrastructure, insufficient resource base limiting penetration to markets,, insufficient institutions to support and lack of/or inadequate policies set(Mwaniki, 2006).

It was found that gender affects food acceptability (Wongnaa *et al*., 2019). Women portray more willingness to pay for organic grown food than men. Because females are primary household shoppers (Appleby, 2007; Costanigro *et al.*, 2014), they often have more concerns about food quality than males (Loureiro and Hine, 2002). However, no significant correlation was found between females and willingness to pay for organic food (Zheng, 2014). Maseta, 2016 postulates that women tend to be more health conscious in terms of making healthier food choices as compared to their male counterparts as they are concerned about their physical appearance

Females showed more positive attitude towards trying to eat healthy and consider it more important compared to males (Wongnaa *et al*., 2019). Furthermore, females tend to believe that healthy eating yields more benefits in European countries (Wongnaa *et al*., 2019). Contrary to the above findings, Gende, *et al.,* 2018 alludes a lower willingness to pay for females as a result of low resource endowment.

Household size is another vital component that affects willingness to pay. Previous studies have reported negative association between willingness to pay and household size reason being; bigger household sizes face more budgetary constraints leading to a decrease in WTP (Moffat *et al.*, 2012). Family sizes also influences food consumption in the sense that people are inclined to consume larger amount of meals when in a group of people (Maseta, 2016).

The prices of food prices also influences consumer choices. This is often the case for low income earners who are constrained financially making them grapple with making informed purchasing choices (Maseta, 2016). The reduction of prices has also demonstrated to be effective strategy in increasing the purchasing power of the greater population hence influencing the ability to buy healthful foods in a community-based setting. (Maseta, 2016).

2.6 Household Dietary Diversity Score

Individuals who are unwell as a result of diseases tend to require more nutritional attention further exacerbating the impact of malnutrition on food security (Mwaniki, 2006). There are three aspects of Food security; food access, food availability and food adequacy (Mwaniki, 2006). Food availability deals with food supply ensuring that food is sufficient fin terms of variety quality and quantity (Burchi & De Muro, 2016)). Food

access deals with ensuring that there is sufficient, steady and reliable delivery of nutrient-rich foods via affordable and socio-culturally acceptable sources (Mwaniki, 2006). Food insecurity can affect the intake of food ultimately having an effect on household health and nutrition (Benzekri, *et al.,* 2017; Larson, *et al.,* 2018). In most rural set ups of developing countries, majority of poor households' (over 85 percent) obtain the food used for their consumption from their farm (Mwaniki, 2006). Dietary diversification is a sustainable way of providing nutritious diets to any population (Parihar, *et al.,* 2016). Household dietary diversity score) measures using 12 food groups (Hoddinott and Yohannes, 2002). Ruel, (2003) defines dietary diversity score as a measure of the number of unique foods consumed within a specified reference period of time without regarding the frequency of consumption to gauge the quality of food intake. Dietary diversity score is used as a proxy indicator to determine the quality of diets consumed by a household. With the rising cases of malnutrition, there has been an increasing emphasis on indicators capturing the diet quality. Dietary diversity has been recommended as a proxy for access to diet quality and hence affecting the level of malnutrition (Ruel, 2003).

To operationalize dietary diversity foods or food groups are usually summed up over a specified period of reference (Hoddinott and Yohannes, 2002). Given that there is no accepted standard way on the operationalization of dietary diversity different studies employ different versions of the score. The Food and Nutrition Technical Assistance Project (FANTA), a USAID and FAO supported project were the ones who developed the Household Dietary Diversity Score (HDDS) (FAO, 2011). A list of 12 food groups is given to respondents who are asked if they consumed them within a certain recall period.

These are then summed up with equal weight. FAO (2011) recommends the use of the mean score in analysis.

Previous studies by Arimond and Ruel (2004) showed significant relationship between household dietary diversity and the Height-for-Age Z Scores (HAZ scores) while conducting survey on demographic and health in Cambodia, Ethiopia, Rwanda, Mali, Nepal, Columbia and Zimbabwe.

Thorne-Lyman *et al*., (2010) reported a correlation between household dietary diversity and land size, level of education and size of household further postulating that that the nutritional status of a child significantly improved with a decrease in the price of staples decreased as families could now be able to diversify their diet with the extra income. Hoddinott and Yohannes (2002) also reported strong association between per capita consumption and dietary diversity (food and non-food) in a survey carried out in developing countries including Kenya

This study also adopted the use of household dietary diversity as proxy for access to food for managing of malnutrition in light of the above literature.

CHAPTER THREE

RESEARCH METHODOLOGY

This chapter deals with the methods that were used in the study. It adopted the following structure: Theoretical framework, Conceptual framework, Study area, Sampling techniques and sample size determination, data collection methods, analytical framework, data analysis and ethical considerations.

3.1 Theoretical framework

The utility maximization theory was adopted in this study. The study was based on the assumption that there is willingness to pay from the households to the perceived benefits of using RUTFs. Individuals make decisions on what to purchase with the goal of maximizing their expected utility. This study adopted the utility maximization framework (Pryanishnikov and Katarina, 2003) to examine the decision to pay or not assuming that consumers are willing to pay on condition that the expected net gain from paying is greater than not purchasing it. Assuming a case where Ui and U_j has been used to represent the utility of a household's for two selections to choose;

$$U_i = B_i X_n + \varepsilon_i \ and \ U_j = B_j X_n + \varepsilon_j \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots (1)$$

Where,

Ui and Uj - perceived utilities of respondents willing to pay and not willing to pay

i and j, -choices

X_n - vector of independent variables influencing the perceived attraction of each choice,

βi and β_j -parameters to be estimated.

ε_i and ε_j -error terms assumed to be independently and identically distributed (Hensher & Greene, 2011).

If a household purchases RUTF *i,* anticipated utility from option *I* will be higher option *j,* defined as;

$$U_{ni}(B_i X_n + \varepsilon_i) > U_{nj}(B_j X_n + \varepsilon_j) \qquad i \neq j \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots$$

(2)

Where

U_{ni and} U_{nj} - the utility derived from two choices

*X*_n - vector of independent variables influencing the perceived attraction of each choice.

This theoretical framework puts emphasis on the decision of households in making alternative choices.

3.2 Conceptual framework

Conceptual framework shows a simplified illustration of how the independent relate with dependent variables. A change in the independent variable affects the dependent variable. The variable in the dependent variable is countered by the independent variable. The individual either is willing to pay or is not. The study first determined the factors influencing the probability of a respondent's willingness to pay for an alternative local RUTFs. For those who responded yes to willingness to pay, they were further asked to make second decision on the price that they were willing to pay for the alternative local RUTFs. The second analysis determined the factors influencing the price the respondents were willing to Pay for an alternative local RUTFs.

The respondent's level of education was hypothesized to be positively related to willingness to pay. This was because the higher the education level, the higher the understanding of the benefit of the RUTFs and hence a higher willingness to pay.

Household size was measured in terms of the number of members of a household and was assumed to be negatively related to willingness to pay due to the high financial demand that reduces the disposable income.

Age of the respondent was hypothesized to be positively related with the willingness to pay. This is due to the fact that an elderly person will be more health conscious and hence will be more willing to pay.

Income from farming was hypothesized to positively impact the willingness to pay. Based on the fact that a high income leads to high affordability of the famers to purchase RUTFs

Land holding in acres was hypothesized to be positively influencing willingness to pay for RUTFs as large land size denotes a high resource base for higher income to afford purchasing RUTFs.

Distance from the farm to the nearest RUTFs dissemination centre was hypothesized to have a negative association with willingness to pay as the respondents living farther from the dissemination centres incur higher transaction costs in terms of transport compared to those closer, thus less willingness to pay.

Consumption frequency of RUTFs was hypothesized to be positively related to willingness to pay based on the fact that the consumers who frequently consume RUTFs know its importance and will be more willing to pay.

HDDS score measured in terms of the score out of 10 was assumed to be negatively related to willingness to pay; reason being, respondents with a higher HDDS have all the nutrients required for consumption and do not have deficiencies. They will not require alternative nutrient remedies.

Gender took a value of 0 for male and 1 for female and was assumed to be a dummy variable. The concept of malnutrition cuts across both genders although it is mostly the female gender and children who are more vulnerable to malnutrition. Despite this fact, it is mostly men who are financially endowed which determines the willingness to pay.

Marital status was a categorical variable which will affect willingness to pay either positively or negatively. The decision making in marriage set up process is vital in influencing willingness to pay. Married respondents have to consult with each other and have to consider their spouses before willing to pay as compare to single/unmarried respondents. Divorced/widowed and separated respondents usually have a higher financial burden of raising their families single handedly and this may affect the willingness to pay either way depending on their prioritization on the need to purchase RUTFs

```
┌─────────────────────┐   ┌─────────────────────┐   ┌─────────────────────┐
│ Independent Variables│   │ Intervening Variables│   │ Dependent Variable(s)│
└─────────────────────┘   └─────────────────────┘   └─────────────────────┘
```

Gender

Distance to Dissemination center

Education level,

Age

HDDS

Education Level

Land Size

Monthly Income

Household Size

Frequency of consumption

Marital Status

Challenges in Accessing RUTFs

Willing to Pay for an alternative local RUTFs

Price consumers are willing to Pay for an alternative local RUTFs

Outcome
Management of Malnutrition

Figure 3.1 Conceptual framework of the study.

3.3 Study Areas

The areas of study was Bungoma and Busia Counties. Bungoma County borders Busia County to the West, Kakamega County to the East, and Trans-Nzoia County on the North East. KNBS (2009) estimates the population of Bungoma at 1,630,934 with female constituting 52 percent while male constituting 48 percent. The Poverty level index of

Bungoma stand at 53 percent. Subsistence agriculture is the main economic activity in most parts of Bungoma County. Of the total labour force of about 565,000, 52 percent are engaged in agricultural production accounting for 60 percent all household incomes; 19 percent wage employment, 13 percent urban self-employment.

Busia is a county in Western Kenya bordering Kakamega County to the east, Bungoma County to the north, Lake Victoria and Siaya County to the south and Busia District, Uganda to the west. KNBS Census 2009 estimated the population of Busia County to be at 653,000. The Busia District Development Plan for 2008-2012 shows a high level of poverty standing at 66 per cent. The economic activities in Busia county include small-scale agriculture, sugarcane farming, fishing and artisanal businesses. The prevalence rate of HIV/AIDS in Busia County is very high standing at 14 per cent in comparison to the national level of 6 per cent. There have been many cases of orphaned children as a result of the disease in the county (GOK, 2005). In terms of education, only 12.4 percent of children transit from primary school to secondary school. The school dropout rates in the county are high standing at 60 per cent for boys and70 per cent for girls (KNBS, 2012).Busia is a child rich county with 0-14 year old children constituting 48 percent of the entire population. This is attributed to high fertility rates among women in the county

3.4 Sampling Technique and Sampling Size Determination

The study target population comprised of RUTFs beneficiaries who accessed the products from the dissemination centers. The dissemination centers in the two counties basically comprised of the Comprehensive Care Centers (CCC) departments of the Bungoma County Referral Hospital and Teso North Sub county Hospital in Busia. From the two county registers of RUTFs beneficiaries, it was deduced that there were 4000 RUTFs

consumers in Bungoma and Busia counties who were accessing RUTFs from the Teso North Hospital and Bungoma County Referral Hospital. The study employed a combination of Convenience and Purposive sampling. The first step involved purposive selection of Bungoma and Busia counties of Western Kenya due to prevalence of malnutrition in the area. Secondly, groups of respondents who were consumers of RUTFs were conveniently selected using convenience sampling as they came to collect RUTFs from Bungoma County referral Hospital and Teso North Hospital in Busia .The required sample size was determined by using the Krejcie and Morgan table on sample size selection which uses the formula:

$$ S = \frac{X^2 NP(1-P)}{d^2(N-1) + X^2 P(1-P)} $$ ....

(3)

Where:

S $\quad$ = $\quad$ Sample size that was required

X $\quad$ = $\quad$ Z value (1.96 at confidence level of 95%)

N $\quad$ = $\quad$ Size of the population

P $\quad$ = Proportion of the population (expressed as decimal) (assumed to be 0.5 (50%)

d $\quad$ = $\quad$ Degree of accuracy (5%), expressed proportion wise (.05)

This resulted in a population sample of 351 respondents. This was adjusted to 400 respondents to compensate for cases of non-response and incomplete information.

3.5 Data Collection Method

The study employed a household survey which were conducted by use of a questionnaire in collecting primary data on factors, challenges and willingness to pay for alternative

local RUTFs. The questionnaire was designed first by specifying the full domain of the relevant content to the study, then specific areas on the selected variables and the items were transformed to questions that are testable. A questionnaire pre-test was conducted on selected respondents for determination of the appropriateness of the questionnaire in terms of its design, clarity, and relevance to the study. Finally, after collection, the questionnaires were checked for consistency and data was entered to STATA11 for statistical analysis.

3.6 Analytical Framework

3.6.1 Objective 1: Challenges experienced in accessing RUTFs in Western Kenya

Descriptive statistics was used to analyze this objective. These was captured through open ended questions that are important in understanding the challenges experienced by the consumers of RUTFs. Mean, frequencies and standard deviations of various challenges were obtained using STATA version 11 (StataCorp, 2011)

3.6.2 Objective 2: Estimate the Consumers' willingness to pay and price for an alternative local RUTFs

The question on willingness to pay was closed ended. An open ended question which tried to solicit what price the consumers were willing to pay for an alternative local RUTFs was then asked. Mean, frequencies and standard deviations were used in analysis of this objective.

3.6.3 Objective 3 and 4: Determination of The Factors affecting Willingness to pay and the Price they are willing to Pay for an alternative local RUTFs

The respondents were first given the product attributes of a locally produced RUTFs and asked whether they would be willing to pay for an alternative local RUTFs. For the

respondent who affirmed to willingness to pay, they were asked the price they were willing to pay for the alternative local RUTFs.

The double hurdle model and the Heckman's sample selection models have been used by different studies for determination of Willingness to pay with each having its pros and cons (Musah, *et al.,* 2014). The double hurdle model was adopted due to its advantages in comparison to the Heckman's sample selection model which suffers a weakness where it possesses the assumption that zero observations /responses are not present when carrying out the second hurdle (Okoffo *et al.,* 2016). The likelihood of zero response in the second hurdle arises where respondents may fail to give a response as a result of insufficient knowledge on the price they are willing to pay. (Yu and Abler 2010). The double hurdle model on the other hand takes into account the possibility of zero responses. The double hurdle model (created by Cragg (1971) and proposed by Burke (2009)) is comprised of two decisions affecting the adoption behaviour. In the first hurdle, a binary choice is made and is modelled by use of a probit model. On the second hurdle, a truncated regression/tobit model is used to measure the extent of the second positive continuous dependent variable (Gabre-Madhin *et al*., 2002). A lot of consumer choice related studies have adopted the double hurdle model due to its practicability in dealing with multiple decisions making it blend well with contingent valuation. For instance, Mabiso (2005) used a double hurdle to determine the willingness to participate and the price paid contingent on passing the first hurdle. Similarly, the study utilized a probit model in estimating the willingness to pay (WTP) for alternative local RUTFs of a consumer. In the second hurdle incorporated a truncated linear regression model with the dependent variable being the price the consumers were willing to pay.

The consumer decides to choose (D) equation:

$$
\left.
\begin{array}{l}
Di = 1 \text{ if } Di* > 0 \text{ and } 0 \text{ if } Di* < 0 \\
Di = \alpha' Z_i + U_i
\end{array}
\right\} \quad \cdots \cdots \cdots \cdots \cdots \cdots \quad (4)
$$

Where:

$D*$ = latent variable which takes 1 if the consumer is willing to pay and zero otherwise

Z = household characteristics vector

$\dot{\alpha}$ = parameters vector.

The following equation shows the price consumers are willing to pay (Y):

$$
\left.
\begin{array}{l}
Y_i = Y_i^* \quad \text{if } Y_i^* > 0 \text{ and } D_i^* > 0 \\
Y_i = 0 \quad \text{otherwise} \\
Y_i^* = \beta' X_i + V_i
\end{array}
\right\} \quad \cdots \cdots \cdots \cdots \cdots \quad (5)
$$

Where

Y_1 - observed answer to the price consumers are willing to pay for local alternative RUTFs,

X - Respondent's characteristics vector

β - Parameters vector.

The distribution of error terms, U_i and V_i are as follows:

$$\begin{cases} U_i \sim N(0,1) \\ V_i \sim N(0,\sigma^2) \end{cases} \quad \ldots \ldots \ldots \ldots \ldots \ldots \quad (6)$$

The function of the log-likelihood for the double hurdle model by (Cragg 1971) is:

$$\text{Log } L = \sum_0 \ell n \left[1 - \Phi(\alpha Z_i') \left(\frac{\beta X_i'}{\sigma} \right) \right] + \sum_+ \ell n \left[\Phi(\alpha Z_i') \frac{1}{\sigma} \phi \left(\frac{Y_i - \beta X_i'}{\sigma} \right) \right] \quad \ldots \ldots \quad (7)$$

Assuming independence between error terms V_i and U_i, the model is the same as a combination of a univariate probit and a truncated regression model. The Tobit model, as presented above, arises if

$$\lambda = \frac{\beta}{\sigma} \text{ and } X = Z.$$
$$\ldots \ldots \ldots (9)$$

The individual's Willingness to pay involves two mutually independent alternatives where the respondent is either willing to pay or not. The factors influencing the consumer's willingness to pay for an alternative local RUTFs were modelled using probit regression justified by the dichotomous dependent variable. The first probit model is shown in equation 10

$$Y(0, 1) = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + \beta_7 X_7 + \beta_8 X_8 + \varepsilon \quad \ldots \ldots \ldots \ldots (10)$$

Where:

$Y(0, 1) = $ WTP (1) or Not WTP (0)

β_0 –intercept $\beta_1 \ldots \beta_{11} = $ independent variables coefficients

X_1=Gender X_7= Monthly income,

X_2= Age X_8=Distance to Dissemination center

X_3=Land Size X_9=Frequency of consumption

X_4=Education level ε = error term.

X_5=HDDS

X_6=Household size

The factors influencing the price (i.e. the price per kg unit of RUTFs) was determined in the second part of the analysis using the truncated regression model as shown in equation 12.

$$Y = \beta_0+\beta_1X_1+\beta_2X_2 +\beta_3X_3+\beta_4X_4 +\beta_5X_5+\beta_6X_6 +\beta_7X_7+ \beta_8X_8 + \varepsilon \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots(12)$$

Where: Y =Price they are willing to pay for RUTFs/kg)

$\beta 0$ –intercept

$\beta 1 \ldots \beta 8 =$ independent variables coefficients

X_1=Gender X_7= Monthly income,

X_2= Age X_8=Distance to Dissemination center

X_3=Land Size X_9=Frequency of consumption

X_4=Education level ε = error term.

X_5=HDDS

$X_{6=}$Household size

3.6.4 Definition and Measurement of Study Variables

The dependent variable in the first hurdle was the willingness to pay (either yes or no).The dependent variable in the second hurdle was the price (continuous variable). The independent variable in the study were: Gender, Distance to Dissemination center, Education level, Age, HDDS, Education Level, Land Size, Monthly Income, Household Size, Frequency of consumption.

Table 3.1: Definition and Measurement of Variables

Variable code	Variable	measurement	Expected sign
Dependent Variable			
WTP	Willingness to pay for RUTF	Dummy (1= Yes, 0 = No)	
Price	Price for an alternative local RUTFs	Continuous	
Independent Variables			
HOUSEHOLDSIZE	Number of members in the household	Continuous	-
EDUCLEVEL	Years of education	Continuous	+
GENDER	Respondent's Sex	0=Male, 1= Female	±
MARITAL STATUS	Marital Status	(1=Single,2=Married ,3=widowed, 4=Separated	±
TOTAL_INCOME	Monthly income	In Ksh (continuous)	+
LANDHOLDING	Size of Land	Continuous(acres)	-
DISTANCE	Distance to source of RUTF	In km (continuous)	-
FREQUENCY	Frequency of accessing RUTF	Continuous	+
AGE	Age of the respondent	In years (continuous)	+

3.7 Data Analysis

Descriptive statistics encompassing means, frequency distribution, standard deviation and percentages were first used to visualize and characterize the socio economic and institutional characteristics of the respondents, challenges and willingness to pay for an alternative local RUTFs. Secondly, maximum likelihood estimates were used to analyze the double hurdle model parameters. This was all analyzed using STATA version 11.

3.8 Ethical considerations

Informed consent was sought from all respondents before the interview for voluntary and contribute voluntarily participation. The study also sought permissions from all relevant research authorities before commencing the study.

CHAPTER FOUR

RESULTS

The following chapter gives the results of the data analyzed. It has been subdivided into sections according to the objectives of the study. The sections include the descriptive results and the logit model results.

4.1 Demographic Profile of Respondents

4.1.1.1 Response Rate

The response rate achieved was at 99 percent accounting for 383 out of the anticipated 384 respondents depicting a very high response rate.

4.1.1.2 Distribution of Respondents by their Socio Economic Characteristics

Table 4.1: Socio economic Characteristics of Respondents

Variable		Frequency	Percent
Gender	Male	100	26
	Female	283	74
	Total	383	100
Marital Status	Single	64	17
	Married	82	21
	Widowed	99	26
	Separated/Divorced	138	36
	Total	383	100.0
Level Of Education	No Formal Education	27	7
	Primary	201	52
	Secondary	130	34
	Tertiary	17	4
	University	8	3
	Total	383	100.0
Household Head Occupation	Housewife	34	9
	Casual Worker	72	19
	Small Scale Business	110	29
	Large Scale Business	8	2
	Farmer	124	32
	Formal Employment	35	9.
	Total	383	100

From the results, the majority of the participants in the study were females represented by 74 percent and followed by males at a mere 26 percent. This could imply that the issue of malnutrition in Western Kenya largely affect females.

In terms of their major occupation, a high representation of respondents (accounting for 32.1 percent) practiced farming as their primary occupation. This was followed by Small Scale business persons at 29 percent; Casual workers at 19 percent; Housewives and respondents in formal employment equaling at 9 percent while a mere 2 percent owning large scale businesses

Results of the household head marital status indicated that a larger representation of the respondents (36percent) were from separated/divorced relationships, closely followed by those who were widowed (26 percent). At third were the ones who were married accounting for 21 percent and finally the single ones who stood at 17 percent.

The results of the respondents' level of education revealed that majority of them had reached primary school level (52 percent), 34 percent of the respondents furthered on to secondary school with the school dropout rate further decreasing to 4 percent at tertiary level and 3 percent at university level. There were also respondents who had not attended school standing at 7 percent.

In terms of their major occupation, a high representation of respondents (accounting for 32.1 percent) practiced farming as their primary occupation. This was followed by Small Scale business persons at 29 percent; Casual workers at 19 percent; Housewives and respondents in formal employment equaling at 9 percent while a mere 2 percent owning large scale businesses.

Table 4.2: Respondents' Socioeconomic and institutional Characteristics (Continuous variables)

Variable	N	Mean	Std. Deviation
Age	383	46.48	0.51
Distance	383	12.42	1.94
HDDS	383	6.53	0.07
Total Land Holding	383	2.66	0.06
Income	383	5215.44	487.59
Household Size	383	7	0.06

The continuous variables in the study included the age of the respondents, the distance covered to the RUTFs dissemination centers, the Household Dietary Diversity Score, The total land holding and the Household Size (Table 4.2). The mean age stood at 46 years indicating some relatively advancement in terms of age. The distance between the household homes and the RUTFs dissemination points had an average distant of 12km proving a relative long distance that would mostly require an advanced means of transport such as vehicles. In terms of land holding, the overall mean land acreage stood at 2.6 acres proving the existence of smallholder farmers. The average income of the monthly income of the respondents was at Ksh 5215 translating to around 50 USD per month. This was against an average household size was composed of 7 members. This shows a prevalence of a large population in relation to the income.

Based on the results of the above figure, knowing that the maximum score of HDDS is 12 (where the household response to all 12 questions was positive) and the minimum score is 0 (where the household response to the 9 generic questions was negative), the HDDS score showed a mean of 6 showing. This indicated an average access to the different essential types of foods needed for prevention and eradication of malnutrition.

4.2 Challenges encountered in accessing RUTFs

Out of the respondents interviewed: 33.3 percent attributed to high transportation costs as the greatest challenge, 29.6 percent complained of RUTFs running out of stock from where they used to access them, 22.2 percent complained of stigmatization from other members of the community, 7.4 percent complained of being harassed by harsh hospital staff, 6.2 percent complained of frequent illness which affected their ability to go and get the RUTFs while a mere 1.2 percent complained of long queues in the RUTFs dissemination centres.
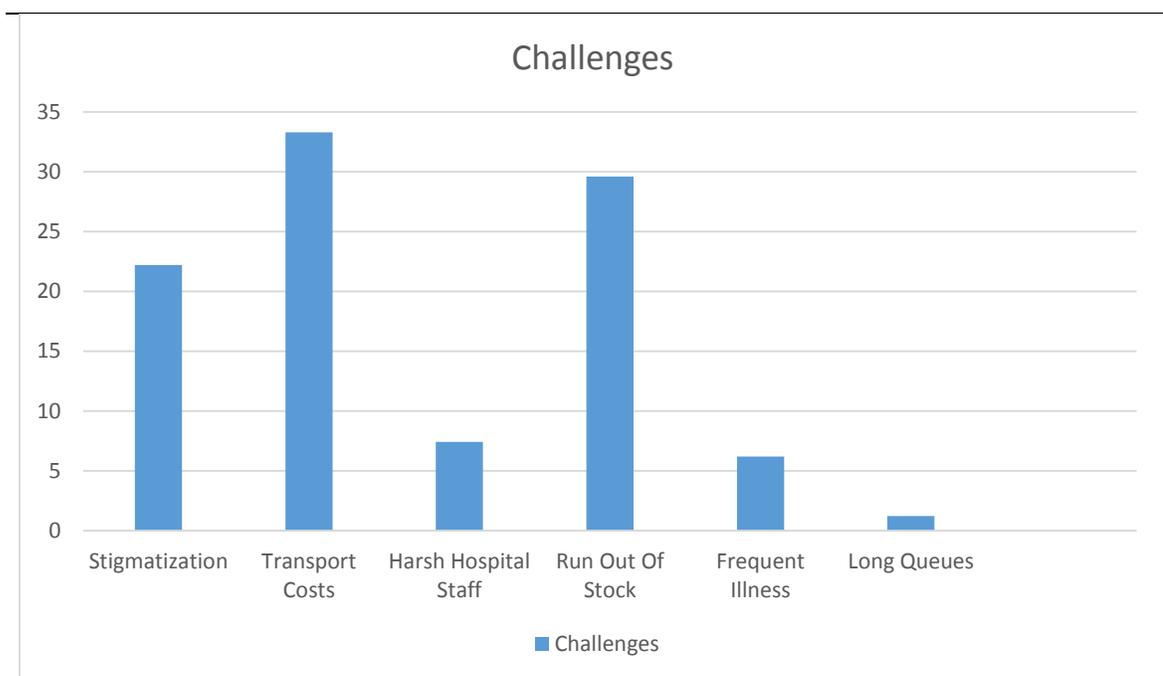
Figure 4.1: Challenges Faced in accessing RUTFs

4.3 Willingness to Pay for an alternative local RUTFs

A proportion of 66 percent of the respondents were willing to pay for an alternative local RUTFs while only a few respondents accounting for 34 percent were not willing to pay

(Figure 4.2). The high willingness to pay ratio elucidates the benefits and reprieve that an alternative local RUTFs would bring given the ready demand.
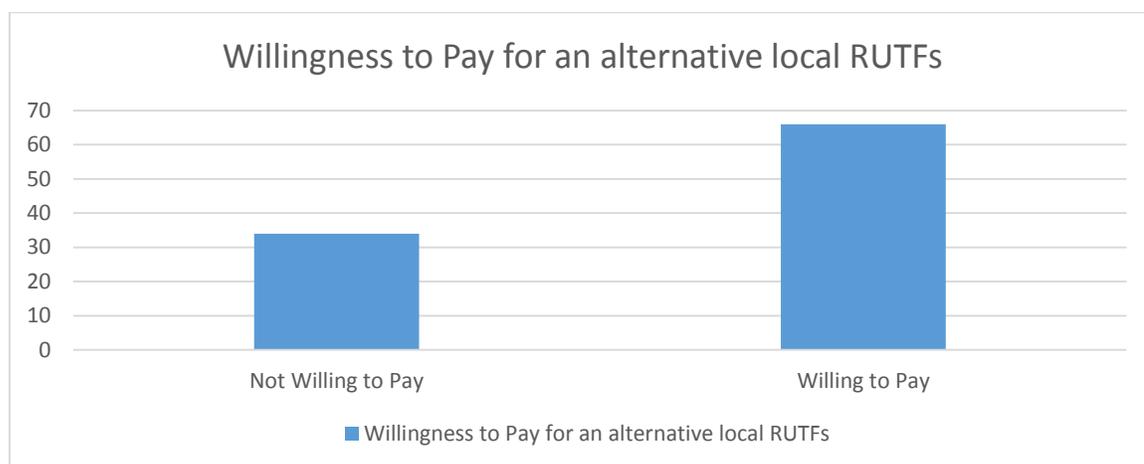
Figure 4.2: Willingness to Pay for an alternative local RUTFs

In terms of Gender, A higher proportion of females (210 out of 252) were more willing to pay for the alternative local RUTFs in comparison to their male counterparts as shown in Figure 4.3
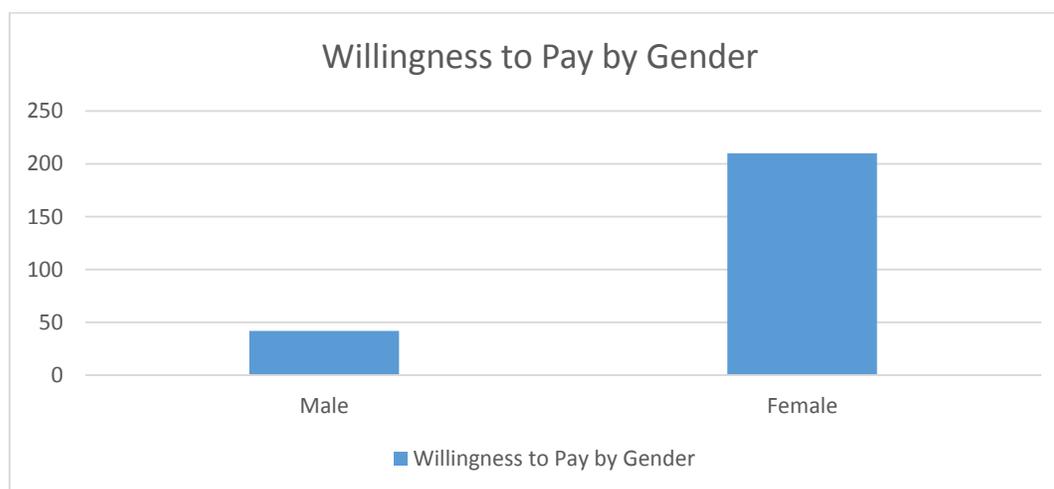
Figure 4.3: Willingness to Pay by Gender

Table 4.3: Price of an alternative local RUTFs

County	Current Marked Price(CMP)/500g of alternative fortified flour(famila)	WTP for CMP of alternative fortified flour(famila)+20%	WTP for CMP of alternative fortified flour(famila)	WTP for CMP -20% of alternative fortified flour(famila)	Not Willing to Pay
Bungoma	60	34	46	57	72
Busia	70	27	38	50	59

Table 4.3 shows the price of an alternative local RUTFs as chosen by the respondents. Since, currently there was no similar RUTFs product in the market, the researcher sought to find out what alternative nutritive rich product could be used as a means of comparison to elicit the price. In all the two sites, more respondents were willing to pay an amount less than the current market price of fortified flour that was available in the market.

On average the settle for a price of Ksh 69sh per 500g sachet of the product. This would be translated to a price of Ksh 138 per kg (Table 4.4).

Table 4.4: Mean Price of RUTFs consumers were willing to Pay

	Mean	Std. Error
Price	69.04	1.38

4.4 Diagnostic Tests

4.4.1 Multicollinearity Test

Multicollinearity exists when one variable is a linear function of another. Multicollinearity affects the efficiency of OLS estimates leading to wide confidence intervals which cause Type 1 error (Ray-Mukherjee *et al.,* 2014). This subjects OLS estimates and standard errors to high sensitivity to slight changes in the data. To test for

multicollinearity, this study used Variance Inflation Factor (VIF) as proposed by Mansfield & Helms (1982). A Variance Inflation Factor higher than 10 shows multicollinearity presence. The results of Variance Inflation Factor as shown in appendix 1.4 indicate that the Variance Inflation Factor had an average of 1.68 indicating that multicollinearity was not a problem among the dependent variables.

4.4.2 Heteroskedasticity Test

Heteroskedasticity occurs due to the variance of the error term to being consistent causing inefficiency in the test of hypothesis. Breusch-Pagan/Cook-Weisberg test was used. A significant p-value of the Breusch-Pagan/Cook-Weisberg results in rejection of the homoscedasticity. The test results of Breusch-Pagan/Cook-Weisberg was not statistically significant (p=0.29) as shown in appendix 1.3 leading to the conclusion that heteroskedasticity was not a problem (Lewbel, 2016).

4.4.3 Goodness of Fit and Normality Test

A goodness of fit test measures how accurate a model approximates the data being observed (Deluca & Corral, 2013). The Pseudo R squared measures the goodness of fit as suggested by Greene (2003). A zero Pseudo R squared value indicates a perfect lack of fit while a Pseudo R squared value of 1 indicates a perfect fit. Table 4.5 gives the results of the factors that were assumed to affect consumer willingness to pay for an alternative local RUTFs. The Cragg's double hurdle model used was fit as diagnostic tests indicated that Prob>Chi^2 was at 0.000 for the full model. The pseudo R^2 of .055 shows a good fit of the model. The normality test results of the data set indicated that the data was normal with significance of the Shapiro-Wilk's W test being greater than 0.05 at 0.43 (appendix 1.5).

4.5 Factors Influencing respondents' willing to pay for an alternative local RUTFs in Bungoma and Busia Counties

Out of the evaluated 10 variables, 6 were statistically significant. Of these, five and one variables were, respectively, positively and negatively correlated with willingness to pay for a local alternative RUTFs.

Table 4.5: Factors Affecting Consumers' Willingness to Pay for a Local alternative RUTFs

Variable	Coefficient	Standard Error
Gender	1.41**	0.37
Age	-0.05	0.03
Distance	0.05	0.00
HDDS	0.01**	0.15
Education Level	-0.01	0.05
Land Size	0.13	0.15
Monthly Income	0.00**	0.00
Household Size	0.50*	0.22
Frequency	-1.24**	0.28
Marital Status		
Married	0.43	0.55
Separated/Divorced	3.47**	0.63
Widowed	4.7**	0.77
Constant	2.01	1.90
Log likelihood	-111.27	
No. of Observation	383	
Prob>Chi2	0.0000	
Pseudo R^2	0.55	

** and *** denotes significance levels at 5% and 1% respectively.

The results of the first hurdle show that Gender of respondent ($p < 0.01$), HDDS ($p < 0.01$), Monthly income ($p < 0.01$), Size of Household ($p < 0.01$), Frequency of RUTFs use ($p < 0.01$) and marital status ($p < 0.01$) significantly affected the Willingness to pay for RUTFs.

The gender of the respondent positively influenced the willingness to pay for an alternative local RUTFs with a strong significance on 99% hence justifying the immense role that gender plays in policy formulation for production of foods and malnutrition management. The HDDS was found to positively influence the willingness to pay for an alternative local RUTFs with a strong significance on 99%. This meant that a unit increase in the score by the virtue of increasing the type of food would lead to a 0.01 increase desire in purchasing an alternative local RUTFs.

The positive and strong significance of monthly income to willingness to pay for an alternative local RUTFs implies that a unit increase in income would lead to some increase in willingness to pay albeit being too small as portrayed by the coefficient.

Household size positively influenced Willingness to pay with a strong significance level of 99 percent. This inferred that a unit increase in Household members would raise the desire for the purchase of an alternative local RUTFs by 0.5.

Surprisingly, the consumption frequency of RUTFs negatively influenced the willingness to pay for an alternative local RUTFs contrary to priori expectations.

Marital status, a categorical variable in the study had the widows and the divorce/separated sub groups positively influencing the willingness to pay at 99% confidence level.

4.6 Factors affecting the price Consumers' are Willingness to Pay for an alternative local RUTFs

The second hurdle analysis involved the use of a Tobit model in determining the factors influencing the price the participants were willing to pay for an alternative local RUTFs as shown in the Table 4.6 below. Out of the 10 variables, only two were significant in

affecting the price of purchasing an alternative local RUTFs. Gender had a strong positive significance at 1 % while contrary to priori expectation, distance negatively influenced the price with a unit decrease in distance increasing the price 0.07.

Table 4.6: Factors influencing Price of alternative local RUTFs

Price	Coefficient	Standard Error
Gender	27.60**	3.20
Age	-0.43	0.41
Distance	-0.07**	0.03
HDDS	-0.75	0.82
Education Level	0.07	0.34
Land Size	-0.01	1.05
Monthly Income	0.00	0.00
Household Size	0.63	1.14
Marital Status		
Married	9.22	6.78
Separated/Divorced	7.29	9.46
Widowed	-0.42	13.17
Constant	62.95	14.78
No. of Observation	252	
Prob>F	0.0000	

** and *** denotes significance levels at 5% and 1% respectively.

CHAPTER FIVE

DISCUSSIONS

The following chapter gives the discussion of results while comparing the findings with other related studies.

5.1 Discussion on Socio Economic and Institutional Characteristics

The research aimed at achieving a balanced gender inclusivity in the data collection by having a half/half representation of the population. This is due to the fact that malnutrition is a phenomenon that cuts across both genders across the divide. However, due to field dynamics, a proportion of 43 percent comprised of male while a proportion of 57 percent was comprised of women from the sample. This showed a fairly equal proportion of members who are consumers of RUTFs. A higher percentage of females who were willing to be interviewed also showed the severity of malnutrition among women as compared to men. In their study, Grasso *et al*., (2015) also found that women are the mostly affected by malnutrition in Western Kenya. However, a study by Walingo & Sewe (2015) in Rift Valley indicated that malnutrition prevalence was high with poor nutrition status being recorded more in men as compared to females. Despite this contrary findings, Walingo & Sewe (2015) attributes the malnutrition effect on women due to the fact that women spend a lot of time taken carrying out household chores which drains them physically and due to pregnancies.

Marital status is a strong determinant to malnutrition as single parenthood usually increases the financial burden of raising their families single handedly hence affecting the willingness to pay. A larger representation of the participants were from single parenthood in form of separated/divorced relationships and widowed family set ups.

Similarly, Tette, *et al*., (2016) reported that the probability of children to be malnourished was significantly higher for single mothers as compared to married mothers.

The results of the education levels show that most respondents had their highest education level at primary level with the number decreasing at higher education levels. This results concur with Tomedi, *et al*., (2012) who found most respondents having reached primary school level while determining the feasibility of local foods supplementation in child malnutrition prevention in Kenya. Similarly, Hong, *et al*., (2017) reported that respondents with a low levels of education had significantly lower height and weight as compared to respondents with higher education. Abuya, *et al*., (2012) attributed this to the ability of formal education enhancing parent's ability to detect illness; seek medical attention and comprehend easily medical instructions for treatment. High education levels also makes people to easily adopt modern medicine.

The aggregate average size of the households of the respondents was at seven. In comparison to the Kenya's national mean of five persons per household, it was higher by a small margin (CBS, 2005).

In terms of their major occupation, majority of the respondents were employed with only percent being unemployed. This is a good indicator as it increases the probability of respondents gaining income to purchase nutritious foods hence managing malnutrition. Similarly, Nair, *et al*., (2013) resolved that households who were employed had a lower probability to have wasted infants and underweight infants as compared to non-employed households. Noteworthy, the proportion of respondents who were formally employed was low at 9 percent. This might have been as a result of low education levels of most respondents. These results concur with Abinya (2012) who reported a small number of

mothers who were engaged in formal employment (5 percent) with only 15% of the mothers having attained secondary and post-secondary education. A high representation of respondents (accounting for 32 percent) practiced farming as their primary occupation further emphasizes the importance of farming in Western Kenya. The policy makers should, therefore, consider commercialization of the agricultural sector as a major income source to rural households. This can go further in enhancing malnutrition by supporting the cultivation of highly nutritious foods and economic empowerment of the locals through sale of surplus to the proposed local factory.

The Household Head age plays an important part in determining the decision to accept and purchase a product. The average age of the heads of Household stood at 46 years. These results concur with Jerop, (2012) who found the mean age of respondents in Siaya County of Western Kenya to be 45 years. Kilui, (2016) also found an aggregated mean age of 45in Bungoma County. Wilatsana *et al.,* (2007) further asserts that consumers who were older were more health conscious increasing their willingness to pay for produce that was guaranteed to have health benefits.

Distance from the household to the dissemination centers is often used to proxy for the ease of access to services and government issued benefits and hence a measure of the transaction cost related to accessing the services. The distance to the dissemination centers shows that the respondents covered an average of 12km. This means that as distance to the dissemination centers increases, the cost of accessing the RUTFs increases among consumers. Lodenyo, *et al.*, (2016) also reported that distance to health facilities and costs were the inhibitors to utilization of healthcare services with distances of more than 2.5km.

The HDDS which was used as a proxy for food access which indirectly affects malnutrition indicated that the respondents had an average nutrition score of 6 out of a possible 12. This was a bit higher as compared to studies by Kimiywe and Chege (2017) who found an average HDDS score of 4.72 in Western Kenya.

The monthly income was found to have an aggregated mean of 5215 Kenya shillings. This was lower than Kilui, (2016) results whose average income was at Ksh 1096 for respondents in Bungoma county of Western Kenya. Moreover, Roitner-Schobesberger *et al.*, (2008) explains that higher earning consumers are more health conscious due to their higher purchasing power hence managing malnutrition.

The average land size of the respondents was at 2.6 acres. This was however larger than findings of Kilui, (2016) who found average land size in Bungoma being at 1 acre. Gebremedhin and Swinton, (2003) attributes larger land size to higher resource base hence the ability to purchase nutritious foods.

5.2 Discussion on Willingness to Pay and Price Consumers were Willingness to Pay for an alternative local RUTF

Overall, 66 percent of the interviewed potential consumers expressed their WTP for an alternative local RUTFs, while only 34 percent were unwilling to pay. Prior to the bidding process, thorough explanation on the nutritive and medicinal value of the RUTFs was done bearing in mind the challenges they underwent in accessing the product. This results agree with those of Jerop, R. (2012) who concluded that 77 percent of respondents were willing to pay based on medicinal and nutritive value. Only 43 percent (23 percent in Bungoma and 20 percent in Busia) of respondents interviewed indicated positive willingness to pay for an alternative local RUTFs at a discount of 20 percent less than the

price of an alternative available fortified flour. The remaining 57 percent were willing to pay for an alternative local RUTFs at a price either equal or above the price of fortified flour. Among the consumers that were offered the current marked price of a 500g of fortified flour, 33 percent accepted the bid, while 24 percent accepted a bid of 20 percent and above. This conforms to the economic theory of demand and supply because the proportion of respondents that were willing to pay fell as the price they were asked to pay increased.

The price for alternative local RUTFs was based on prevailing prices of fortified flour in Bungoma and Busia counties. The findings indicated that the respondents settled for an average price of Ksh 69 per 500g sachet of the product. This would be translated to a price of Ksh 138 per kg. This was, on average, KES 8 more per kg of a local RUTFs than the price of fortified flour. RUTFs offers nutritional and medicinal values and people were appreciating it hence valuing it highly. Subsequently, consumption levels could increase drastically in case of its availability. From the results obtained, local RUTFs production could be a viable means of improving the incomes and nutrition status of farmers since crop production of the ingredients of RUTFs could be a profitable enterprise.

5.3 Discussion on Challenges encountered when accessing RUTFs

The dissemination centers that had been institutionalized for treatment of malnourished people, were mostly located in towns prompting most families to incur travel costs and travelling long distances to access them. Although the respondents appreciated the impact of the therapeutic products, the associated costs of accessing treatment was an obstacle limiting the number of households who were able to access the RUTFs. The burden of

leaving siblings at home in order to travel to the dissemination centers also affected management of malnutrition. Rogers *et al*., (2015) have also reported stigmatization, shortage of products leading to long queues and inability to access some patients who are too weak and unwell to reach the dissemination centers. This is similar to the findings of this study. Sadler (2008) also reports the same scenario as a major obstacle to access of therapeutic food in Sub Saharan Africa

Harsh staff at the dissemination center was also pointed out as a challenge. This mostly occurred in cases where a malnourished person was did not meet the program's criteria for admission hence denying him/her access to the RUTFs. Guerrero *et al*., 2010 encountered the same challenge and stated that this discourages consumer to follow-up go for further treatment as they feared future rejection.

5.4: Discussion on Factors affecting Willingness to Pay for an alternative local RUTF

In the current study, Gender was positively significant to willingness to pay for a local alternative RUTFs at 99% significant level. A higher proportion of the female accounting for 83 percent who were willing showed the essential role that women play in shopping for the family and how sensitive they are towards the nutritional value of the family. Jerop, R. (2012) also found that women elicited greater participation of females in nutritional and food matters due to their higher willingness to pay for nutritious foods.

However, contrary findings were derived by Migwi (2016) who argued that men's willingness to pay is higher due to the fact that Women are more averse to risks in comparison to their male counterparts hence reducing their likelihood of purchasing new

products. Odendo *et al*., (2009) also supports Migwi's assertions by stating that households that are male headed households access information and resources enabling them to have a higher probability of adopting of novel technologies.

Marital status, a categorical variable in the study had the widows and the divorce/separated sub groups positively influencing the willingness to pay at 1 percent significance level. An explanation to this would be the fact that single parents are highly affected by malnutrition due to the increased burden of handling parenthood single handedly. They would therefore be willing to consume any product that would have nutritional benefits to them. Contrary findings were found by Okoffo, *et al*., (2016) who found that marital status negatively influenced the willing to pay at 1 percent significance level.

Swindale and Bilinsky (2006) states that HDDS is directly related to indicators of nutrition such as concentration of hemoglobin, weight at birth, and the anthropometric status of the child. The HDDS positively influenced Willingness to pay at 99% level of significant. This was contrary to the priori expectations as a high HDDS reflects a diverse diet meaning consumers are food and nutritionally sufficient and will not be willing to pay for another therapeutic product (Kilui, 2016).

The RUTFs consumption frequency had a significant and negative influence on the willingness to pay for an alternative RUTFs at 1 percent significance level. This is contrary to priori expectations. An explanation to this would be that the most frequent users of RUTFs were the poor with low income and more affected by malnutrition hence low willingness to pay. Contrary findings to these results were found by Alemayehu (2014); Mwaura *et al*., (2010) and Ogunniyi *et al*., (2011) who reported a positive

association between frequency of utilization and willingness to pay. They attributed to the fact that those respondents who used RUTFs more frequently knew the importance of RUTFs and saw an option for an alternative as a reprieve to the challenges they had been experiencing in accessing RUTFs.

Generally, household size had a positive influence on the household WTP at 95% significance level; contrary to the priori expectations. An obvious explanation to this is due to the fact that the larger the household the more the human capital leading to a higher willingness to pay. Akankwasa (2007) reported similar results while studying acceptability of and WTP for bananas with household size being positively related to WTP. Kilui (2016) further argues that households having a large number of members are not constrained in terms of labour on farm hence save the money which can be uses to purchase nutritious foods. However, contrary results have been reported by Migwi (2016) who found that household size influenced the willingness to pay negatively. He attributes this to the increase in budg*et al*location of the household on food as a result of increase in family size.

The interaction between consumers' income level and Willingness to pay for an alternative local RUTFs reveals that high earning consumers had a higher willingness to pay at 99% significant level. High earning consumers have disposable income to cater for their nutritional and health requirements explaining this scenario (Roitner-Schobesberger *et al.*, 2008). These results concur with Charity (2016) who found put that willingness to pay for organic products was positively influenced significantly by consumer's income level. Similarly, Jerop, R. (2012) concluded that the respondents who were earning a steady income had a higher willingness to pay for goat milk who were formally employed

were 91 percent in comparison to the 9 percent who not willing to pay Migwi, (2016) also reported that household income positively influenced WTP for aflatoxin free foods at ten percent. He attributed this to the fact that an increase in income makes households to be more health conscious increasing willingness to pay for safe foods.

5.5 Discussion on Factors affecting Price Consumers were willing to pay for an alternative local RUTF

Gender also had a positive effect on the accepted price of an alternative local RUTFs. Gender is an essential socio cultural variable that has implications on ownership, access and control of key household livelihood resources (such as knowledge, water, land, credit, energy and labor) hence affecting purchasing decisions and price (Johnson, *et al*., 2016). In numerous countries in Africa, it has been observed recently that there is a substantial upsurge in women who are providing labour in the agricultural sector due to external pressures such as conflict, HIV/AIDS and migration (Fletschner & Kenney, 2014). Kimani, *et al*., (2011) postulates that women represent 75 percent of the agricultural labor force in Kenya. This shows the immense progress on gender equality initiatives hence impacting pricing decisions due to equality of access to resources

Against the priori expectations, Distance to dissemination centers led to a decrease in price at 1 percent significance level. Similarly, Emata, *et al*., (2015) found out that the increase in distance to dissemination centers reduces the prices. They attributed this to the nature of the consumers in remote areas and their affordability. Graubner *et al*., (2011) further agrees with this stating that being situated in remote areas reduces competition hence enabling oligopolistic traders to charge fairly lower prices.

CHAPTER SIX

CONCLUSION AND RECOMMENDATIONS

6.0 Introduction

The following chapter aimed at giving summary, conclusions, policy implications, recommendations and suggestion for further research based on the findings of the study that has been discussed and presented and in the preceding chapters.

6.1 Summary

The main aim of the study was to analyze the willingness to pay for an alternative local malnutrition status of people in Western Kenya, investigate the challenges facing malnourished people in accessing RUTFs, and establish the willingness to pay for RUTFs and the factors influencing the willingness to pay for an alternative local RUTFs.

Out of the 383 respondents, Majority (63 percent) of the respondents gave a positive response on willingness to pay for an alternative local RUTFs while 37 percent responding negatively on willingness to pay. The study arrived at Ksh 138 per kg as the average price that the respondents were willing to purchase a local alternative RUTFs.

The findings also revealed that socioeconomic attributes of a household play a critical influence on the price and willingness to pay for an alternative local RUTFs. Gender, Monthly income, HDDS, Size of Household and Marital Status positively influenced the WTP while frequency of consumption of RUTFs negatively and significantly affected WTP. The second tier of the double hurdle model results show that gender was positively related to price of an alternative local RUTFS while distance to dissemination center a negative influence on the price of an alternative local RUTFs.

Among the challenges that the respondents encountered in accessing RUTFs were: high transportation costs (33.3 percent), Shortages in stock (29.6 percent), Stigmatization (22.2 percent), harassment from harsh hospital staff (6.4 percent), frequent illness (6.2 percent) and long queues in the RUTFs dissemination centres(1.2 percent).

6.2 Conclusion

The study concludes that the willingness to pay for an alternative local RUTFs was considerably high. This is as a result of the challenges encountered such as shortages; stigmatization from other members of the community, harassment by harsh hospital staff, frequent illness; long queues and incurred high transportation costs when accessing the RUTFs. For those who were willing to pay for an alternative local RUTFs, they settled for an average price of Ksh 138 per kg which fell in the margin of the already alternative fortified flour used as a basis of comparison. For Willingness to pay for a local alternative RUTFs, Gender of respondent, HDDS, Monthly income, Size of Household, Frequency of RUTFs use and marital status were significantly affecting the willingness to pay for a local alternative RUTFs. Distance and gender were the key determinants of price for an alternative local RUTFs.

6.3 Policy Implications and Recommendations

The WTP analysis results show there is high demand for an alternative local RUTFs providing evidence for the potential positive impact of RUTFs as an avenue for alleviating malnutrition in Kenya. This calls for increased investments and policy support for increasing production to satisfy the demand and ultimately manage malnutrition. Furthermore, most of the ingredients used in production of RUTFs thrive well in Western Kenya. This can create a marketing opportunity for the locals to the producers of RUTFs

and hence economically benefit the locals. The socio economic factors, specifically the Gender of respondent, HDDS, Monthly income, Size of Household, Frequency of RUTFs use and marital status should be considered when developing a marketing ix for the product. The research finally provides an insight on the price to be considered by producers when developing a local RUTFs.

6.4 Suggestions for Further Research

The study intended to examine the willingness to pay of consumers for a local alternative RUTFs as a potential way of managing malnutrition. However, there are several areas that require further research.

This study mainly focused on Willingness to pay and malnutrition in Western Kenya. It will be noteworthy to say that there are other areas in Kenya; especially the ASAL in North Eastern Kenya where drought and malnutrition is rampant and could hence be a point of a similar research to be conducted

The research was conducted before the production of an alternative local RUTFs and was based on the assumption of an alternative product being produced. Future research can be done after production of a local RUTFs to determine the product acceptability in comparison to the available imported ones.

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APPENDICES

Appendix I: Double Hurdle Model Results

	Number of obs	=	383			
Log likelihood = -111.27405			LR chi2(12)	=	269.51	
			Prob > chi2	=	0.0000	

	Coeff	Std error	Z	p>{z}	95% conf. Interval	
Tier 1						
Sex	1.41067	.3745584	3.78	0.000	.6799463	2.148188
Age	-.0096067	.0252284	-0.38	0.701	-.0591434	.03975
distance	-.0007647	.0048349	-0.16	0.874	-.0102409	.0087115
HDDS	-.7782046	.157838	-4.93	0.000	-1.087561	-.4688478
Education	-.0143338	.0526735	-0.27	0.786	-.117572	.0889044
Land	-.1383904	.1508816	0.92	0.359	-.1573322	4341129
income	.0004365	.0001252	3.25	0.001	.0001612	.0006519
hhsize	.5084772	.2262445	2.25	0.025	.0650462	.9519082
frequency	-1.246162	.2793577	-4.46	0.000	-1.793693	-.6986311
Marital status						
2	.4276845	.5555692	0.77	0.441	-.661211	1.51658
3	3.469303	.6312203	5.50	0.000	2.232134	4.706473
4	4.707984	.770439	6.11	0.000	3.197951	6.218016
_cons	2.010467	1.902583	1.06	0.291	-1.718527	5.739461
Tier 2						
Sex	27.59783	3.202182	8.62	0.000	21.28986	33.9058
Age	-.4329689	.4148275	-1.04	0.298	-1.250137	.3841989
distance	-.0735322	.0253493	-2.90	0.004	-.1234678	-.0235965
HDDS	-.7589324	.8248428	-0.92	0.358	-2.383788	.8659234
Education	.0685133	.338609	0.20	0.840	-.5985119	.7355384
Land	-.012953	1.058196	-0.01	0.990	-2.097491	2.071585
Income	.0000968	.0001078	0.90	0.370	-.0001156	.0003092
Hhsize	.6313903	1.136732	0.56	0.579	-1.607855	2.870636
frequency	-.1390496	4.3904	-0.03	0.975	-8.787687	8.509588
Marital status						
2	9.36334	4.185473	2.24	0.026	1.118387	17.60829
3	7.563929	2.726242	2.77	0.006	2.19351	12.93435
4	(omitted)					
sigma_cons	63.09385	12.66103	4.98	| 0.000	38.15292	88.03479

Appendix II: Descriptive results of the Socio Economic and institutional characteristics Continuous Variables

```
Mean estimation                   Number of obs    =     383

                    Mean    Std. Err.    [95% Conf. Interval]
        age      46.47781    .5055132      45.48387    47.47174
   distance      12.42382   1.944231       8.601086    16.24656
       HDDS      6.532637    .0729849       6.389135     6.67614
       land      2.659793    .0610552       2.539746    2.779839
     income      5215.435     487.59        4256.738    6174.131
     hhsize      6.994778    .0578712       6.880992    7.108564
```

Appendix III: Test for Heteroskedasticity

```
. estat hettest

Breusch-Pagan / Cook-Weisberg test for heteroskedasticity
        Ho: Constant variance
        Variables: fitted values of price

        chi2(1)      =     1.10
        Prob > chi2  =   0.2938
.
```

Appendix IV: Variance Inflation Factor for Multicollinearity

```
. vif
        Variable |      VIF      1/VIF
             sex |     1.04    0.964901
     maritalsta~s |
               2 |     2.35    0.425701
               3 |     3.30    0.302799
               4 |     3.53    0.283500
        distance |     1.05    0.954980
            HDDS |     1.09    0.913448
       Education |     1.11    0.899668
            land |     1.12    0.896218
          income |     1.08    0.927074
          hhsize |     1.13    0.886464
        Mean VIF |     1.68
.
```

Appendix V: Shapiro-wilk w test for normal data

Variable	Obs	W	v	z	Prob>z
R	383	0.99410	1.077	0.173	0.43129

APPENDIX VI: SURVEY QUESTIONNAIRE

A: DEMOGRAPHIC FORM		
A01: Date of Interview		
A7: Respondent Sex:		☐ Male ☐ Female
A8: Respondent Age Range ☐ Less than 18 ☐ 19-35　　　　☐ Greater than 50 ☐ 36-50		What is the specific age of the respondent
A9: County:		A13: Total Land Holding (acres):
A10: Constituency:	A12: Village:	A11: Ward:
Highest level of education (Please tick one)		☐No formal education ☐Primary ☐ Tertiary ☐Secondary ☐University ☐ Other (specify) ----------------------
How many years of formal education did the Respondent study?		…………………… …………………… …………………… ………………
Who is the head of the household?		☐ Male ☐ Female
What is the occupation of the household head		
What is your monthly Income ☐< Ksh 10,000 ☐Ksh10,001–Ksh25,000 ☐Ksh25,001–Ksh50,000 ☐Ksh50,001–Ksh75,000 ☐> Ksh75,000		On average How much money cumulatively does the Household earn in a month? …………………… …………………… ……………
What is your marital Status		1=Single, 2=Married, 3=widowed, 4=Separated
Household Members Information **Enumerator Note:** Collect household information for all household members including the respondent. Household members include all persons living at the same residence and dependent on household head.		

A17: How many adult males live in your household?	
A18: How many adult females live in your household?	
A19: How many male children live in your household?	A19i: Less than 5 years _____ A19ii: 5 years old and above _____
A20: How many female children live in your household?	A20i: Less than 5 years _____ A20ii: 5 years old and above _____
A20: How many female children work on your farm?	A20i: Less than 5 years _____ A20ii: 5 years old and above _____
Compute total people living in the household	

C: FARMING ACTIVITIES

Enumerator Note: This Section captures *crops grown, harvested and sold* over the last 12 months and is to be answered by those respondents who said they practice farming irrespective of value chain.

B9a: Have you <u>harvested</u> any crop over the last 12 months?	☐Yes ☐No

B9b: How many crops have you <u>harvested</u> and sold over the last 12 months

B10: Crop harvested in last 12 months	B11: Area Under Crop (acres)	B12: Total harvested (Quantity)	B13: Unit of harvest	B14: Total Sales (Quantity)	B15: Unit of Sales code list	B15b: Unit price (Ksh/unit)	B16: Total Sales value (Ksh)	B17: Reason for zero sales (Free text)

Codes for Unit of harvest sale : kg; Carton (3kg), Carton (2kg); Carton (5kg), Bag (110kg), Bag (90kg); Bag (50kg); Bunch (25-kg); Bunch (30kg); Bunch (40kg); Crate (40kg); Crate (64kg); Unit of harvest selected should be same as unit of sales selected

C: Income of the Household

Enumerator Note: This Section captures *incomes of Household members living in the household*

B9b: Other than farming listed above, How many people living in the Household have earned any form of income for the last 12 months

B10: Name of Household member	B11: Activity carried out	B12: Highest monthly salary earnings	B13: Lowest Monthly earnings	B14: Average monthly earnings

Food Consumption (Recall period of the past one week)	
Food Group	Did you consume this food
Grains ,roots and tubers (All starchy staple food)	□Yes □No
Legumes and Nuts	□Yes □No
Dairy Products	□Yes □No
Organ meat	□Yes □No
Eggs	□Yes □No
Flesh foods and other Misc. Small animal products	□Yes □No
Vitamin A Dark green leafy vegetables	□Yes □No
Other Vitamin A rich vegetables and fruits	□Yes □No
Oil/fats	□Yes □No
Other fruits	□Yes □No
Vegetables	□Yes □No
Miscellaneous	□Yes □No

	Example
Grains ,roots and tubers (All starchy staple food)	Corn /maize, rice, wheat, sorghum, millet and any other grains or food from this e.g. (noodles, bread, porridge and other grain products. Also other local foods like ugali. White potato , white yam ,white cassava or other foods made from roots
Legumes and Nuts	Dried beans ,dried peas ,lentils , nuts, seeds or fruits made from this e.g.(hummus and pea nut butter)
Dairy Products	Milk ,cheese , yoghurt or other milk products
Organ meat	Liver, Kidney, heart, other organ meats or blood based foods.
Eggs	Eggs from chicken ,duck, guinea fowl or any other egg
Flesh foods and other Misc.	Beef, pork, lamb, goat, rabbit game, chicken, duck, other birds, insects.
Vitamin A Dark green leafy	Dark leafy vegetables including wild forms + locally available vitamin A rich vegetables such as Kales, Spinach, amaranth, cassava leaves
Other Vitamin A rich vegetables and fruits	Pumpkin, Carrot, Squash or sweet potato that are orange inside plus other available local vitamin A vegetables like red sweet pepper. Fruits include mango, pawpaw, peach and 100 percent fruit juice made of this
Other fruits and Vegetables	Other vegetables like tomato, onion, eggplant and any other locally available vegetables, Other fruits including wild fruits and 100 percent fruit juice made of this.

E: READY-TO-USE THERAPEUTIC-FOOD AND WILLINGNESS TO PAY	
Do you use supplement therapeutic foods?	□Yes □No
If yes, which food supplement were you given	
Where do you source it from?	
How many times do you access RUTFs monthly	
What distance do you cover to access RUTFs	
Do you experience any challenges in accessing RUTFS	□Yes □No
What challenges do you experience in accessing RUTFS	
Based on the challenges experienced, are you willing to pay for a locally produced RUTFs	□Yes □No
If yes at what price are you willing to pay per kg for a locally produces RUTFs	
Are you aware of any alternative local RUTFS?	□Yes □No
If yes, At what price per kg are they sold at?	
Would you be willing to pay for a price 20% lower than the price of the available alternative?	
Would you be willing to pay the same price as the available alternative?	
Would you be willing to pay for a price 20% higher than the price of the available alternative?	

Any other comment pertaining to the study that has not been captured in the questionnaire?

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THANK YOU FOR YOUR CO-OPERATION

APPENDIX VII: MAPS
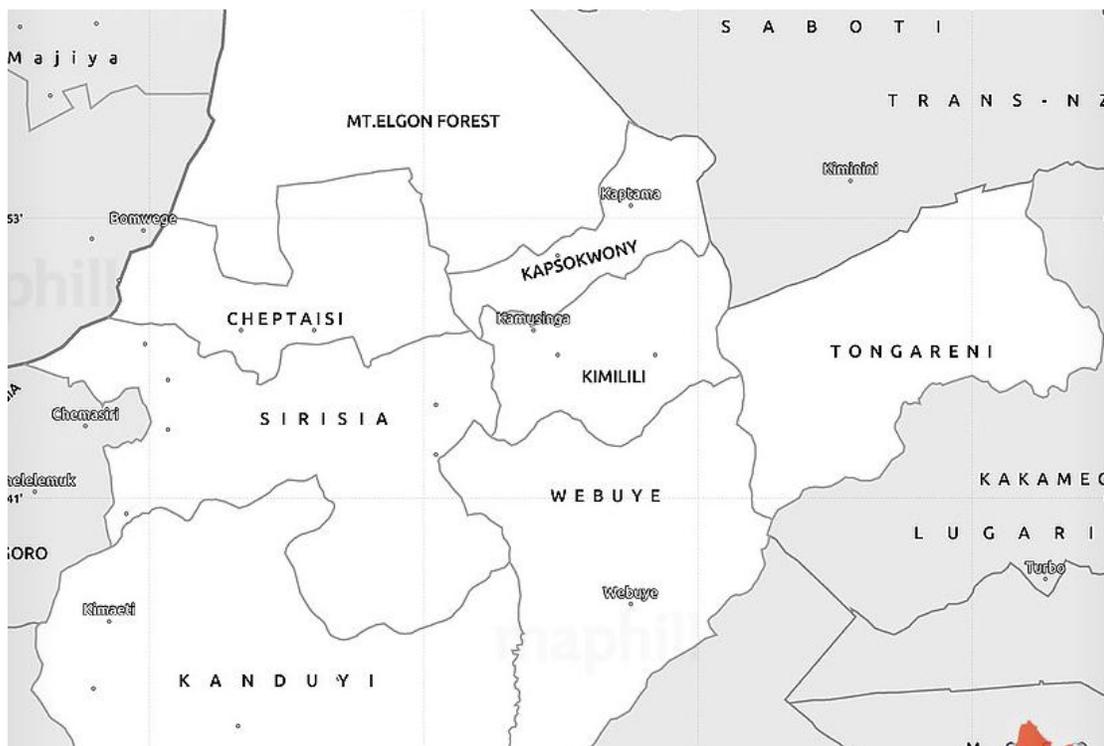
Figure 2: Map of Bungoma

Source: http://www.maphill.com/kenya/western/bungoma/simple-maps/silver-style-map/
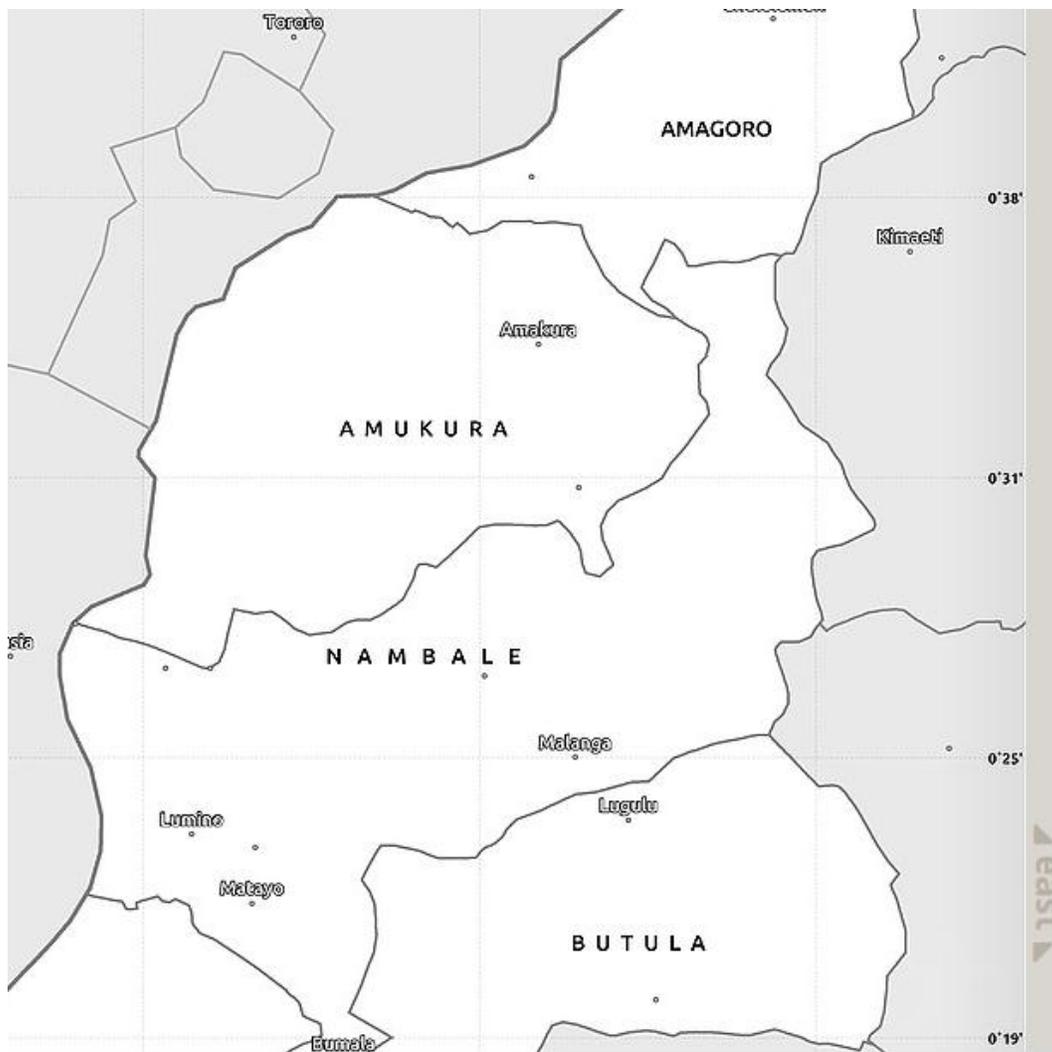
Figure 3: Map of Busia

Source: http://www.maphill.com/kenya/western/busia/simple-maps/silver-style-map/