

**CONSUMER AWARENESS, PURCHASES AND
ATTITUDES TOWARDS BAOBAB (*Adansonia Digitata*
L.) PRODUCTS IN URBAN AND RURAL MARKETS OF
KENYA**

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**Consumer Awareness, Purchases and Attitudes towards Baobab
(*Adansonia digitata L.*) Products in Urban and Rural Markets of
Kenya**

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**A thesis submitted in partial Fulfilment of the requirements for the
Degree of Master of Science in Agricultural and Applied Economics
in the Jomo Kenyatta University of Agriculture and Technology**

2020

DECLARATION

This thesis is my original work and has not been presented for a degree in any other University.

Signature: Date:

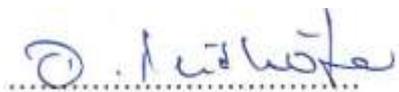
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DEDICATION

I dedicate this work to my parents for teaching me the constructs of life and hard work, my siblings Evans, Dan and Mercy for the support they gave me during my entire period of study.

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This project would not have been complete without support, assistance received from various groups whom I am so great and highly indebted.

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LIST OF ACRONYMS

ASL	Above the Sea Level.
FAO	Food and Agriculture Organization.
GDP	Gross domestic product.
GPR	General Poisson Regression Model
IFAD	International Fund for Agriculture Development
KARI	Kenya Agricultural Research Institute.
KEFRI	Kenya Forestry Research Institute
KMO	Kaiser-Meyer-Olkin Measure of Sampling Adequacy (KMO)
LL	Log-Likelihood.
MOA	Ministry of Agriculture.
mt	Metric tons.
NBRM	Negative Binomial Regression Model.
SPSS	Scientific Package for Social Science.
TIF	Tropical Indigenous Fruits.
UNICEF	United Nation International Children's Emergency Fund
ZINB	Zero-Inflated Negative Binomial Poisson.
ZIP	Zero-Inflated Poisson Model.

ABSTRACT

African Baobab (*Adansonia digitata L.*) remains one of the tropical underutilized fruit tree with high market potential and substantial contribution to livelihoods in the marginal areas of Kenya. Despite many benefits, baobab products occupy a small market share and traded by a few actors compared to other tree products such as mangoes. Understanding consumer awareness and its determinants, attitudes and purchase frequencies are essential in order to increase appreciation of this neglected tropical tree. This study examined awareness on baobab products, attitudes towards baobab products and factors that influence frequencies of purchase on baobab pulp and candies. The study employed a purposive and multistage sampling design to obtain a sample of 353 consumers from urban and rural townships in Kenya. Pretested questionnaires and personal interviews were administered to collect the data. The zero-truncated model was used to assess awareness on baobab products. Negative Binomial Regression Poisson model was used to examine determinants of purchase frequency on baobab pulp and candies. Descriptive and exploratory factors analysis was used to assess consumers' attitudes towards baobab pulp and candies respectively. Results from the study revealed a low level of awareness on baobab products in both urban and rural townships (mean = 6 products) from a list of 25 products. Zero-truncated regression results showed that age, gender, income and group membership significantly influenced awareness of baobab products on urban while age and education level significantly influenced awareness level in rural. Results from Negative Binomial Poisson regression revealed that the frequency of purchase on baobab candies was influenced by price, size of the household, group membership and knowledge on nutrition. Whereas price and education level only influenced the frequency of purchase on baobab pulp. Lastly, a considerable percentage of consumers interviewed expressed positive attitudes towards baobab products. The study recommended; (a) community sensitization on the variety of baobab products, products use, nutritional value, product value addition, and economic value in both local and international markets. This can be accomplished through formal and informal education, health and nutrition campaigns held by the government or non-governmental organization. (b) Improvement of product ingredient labeling to inform consumers on nutritional information, certification, and freshness, awareness creation through formal and informal education.

CHAPTER ONE

INTRODUCTION

1.1 Background to the study

Food nutritional security and malnutrition is a major challenge in developing countries in sub-Saharan Africa. In Kenya, the rapid population growth, climate change, and urbanization are stretching the existing food and agricultural system, leaving both rural and urban populations struggling to provide food and nutrition security (Owuor, *et al.*, 2017). The Kenyan population has significantly grown from 11million in 1970 to 40 million in 2020, and it is estimated that by 2039 the population will surpass 81 million (FAO, 2018). Over 70% of this 40 million population live in rural areas and derive their livelihoods and food nutritional security mainly from agricultural related activities (Mwema *et al.*, 2012). United Nations Children's Fund (UNICEF) Report (2018) indicates 2.55 million people as food insecure and 1.88 million Kenyan children being nutritionally insecure. The arid and semi-arid areas such as the North-Eastern region of Kenya (Kitui county), Lower Eastern region and South Coast region (Kilifi county) are increasingly becoming vulnerable to food insecurity because of climate change, unreliable weather patterns, and decline in crop production (KALRO, 2018). In regions like Kitui rains come when least expected and farmers cannot plan farm operations resulting in low crop production.

In these areas, underutilized indigenous tree species such as the African baobab (*Adansonia digitata L.*), which are often tolerant to adverse conditions of long droughts remains the major source of people's livelihood, income, and nutrition in the wake of poverty (Chadare *et al.*, 2008; Mwema *et al.*, 2012; Venter & Witkowski, 2013). Marketing and promotion of such agroforestry trees have a meaningful economic, social and environmental impact on rural communities particularly in Sub-Saharan Africa (Leakey *et al.*, 2005). African baobab not only contributes to people's livelihood but also is a cheap and quality source of nutrition for both urban and rural consumers. It is associated with savannah in the West and

Central African countries like Ghana, Benin, Mali and Togo, Lowland Semi-desert Scrub of North-Eastern Africa in countries like Somalia, Eritrea and Nuba Mountains in Sudan. In South African countries like Angola and Namibia, they occur in mature woodland (Sidibe & Williams, 2002). In Kenya, baobab thrives well in the Eastern part of the country distributed in a bush and scrub along coastland lowland in two belts; one belt on the inland from Tanzania border, East of Mt. Kilimanjaro towards Kitui and Tharaka and the other belt along the coastal region, directly on the seashore on fossils coral. The two belts cover counties; Taita Tavetta, Makueni, Mombasa, Kilifi, Kwale, Kitui and Tharaka-Nithi (Gebauer *et al.*, 2016). Baobab trees are distributed in low altitude areas with 400 – 1000 m a.s.l starting from Meru national park eastwards to the coastal lowlands of Kenya.

Baobab tree products are utilized in various ways in different regions. This includes Processed baobab pulp; edible white powdery product extracted after crushing the fruit and separating seeds and fiber is consumed as snacks, added to porridge while other people use it for medicinal purposes such as to cure cough (Kavoi *et al.*, 2016). The pulp is also used to make cold and hot drinks (Omotesho *et al.*, 2013). The Processed pulp contains 74% carbohydrates, 3% proteins, 9% fibers, 6% ash 0.2% fat, potassium and calcium respectively (Chadare *et al.*, 2008; Arnold *et al.*, 1985). It is also rich in vitamins particularly vitamin C (Ascorbic acid 300 mg per 100 g pulp) higher than the recommended 20-30 g consumption per day (Alercia, 2013). Vitamin C is an important antioxidant in the human body. Additionally, it aids in the uptake of iron and calcium from processed baobab pulp aid in the uptake of iron and calcium. Oil extracted from the seed is used as cosmetics and as cooking oil. Leaves also have significant nutritional importance, hyposensitive and antihistamine properties in baobab leave aids in kidney and bladder diseases, asthma, general fatigue, and diarrhea as well as curing insect bites (Orwa *et al.*, 2009).

Apart from nutritional importance, the baobab products (fruits, leaves, seeds, and barks) are traded to generate cash (Venter & Witkowski, 2013). Baobab food products are gaining interest in Kenya, Unprocessed dried pulp with seeds embedded are sugarcoated and sold as ‘mabuyu’ candies. Recently the Kenya Forestry Research

Institute (KEFRI) produced baobab jam. Baobab commercialization has an opportunity and great potential in improving local food and nutritional security and increasing income among households in Kenya. Baobab product exports (such as seed oil and processed pulp) is increasing around the world (Sidibe & Williams, 2002). Regarding this, approval of baobab fruit pulp could boost international trade of baobab food products (Christine *et al.*, 2010). In Kenya, the interest is increasing yearly; the setting up of Wild Living Business Resource has led to an upward trend in demand for unprocessed baobab pulp and seeds. Baobab seeds are processed at a commercial scale. Baobab powder pellets and oil are produced and sold to tourist. More than 200 farmers earn a living from supplying baobab fruits to Wild Living Resource for processing (Gebauer *et al.*, 2016).

Despite rising demand from both local and international market, processed baobab food products are rarely available (Munthali *et al.*, 2013). Most products remain unknown in the market yet they hold the potentials to contribute significantly to livelihoods and nutrition status of local people. This remain the ignored economy. The existing market is poorly structured such that baobab products fail to reach consumers. Besides, the products occupy a small market share characterized by a few value chain actors and low level of product awareness. This is a clear indication of weak, poorly integrated and coordinated value chain resulting in high prices to consumers or unstable returns to farmers (Leakey, 2017). Low availability of baobab products in the market indicates a low level of commercialization, despite their importance to livelihoods and income generation in rural arid areas (Kehlenbeck *et al.*, 2015). This study therefore sought to examine consumer awareness, attitudes, and factors influencing their purchase frequency.

1.2 Statement of the Research problem and Justification

African baobab shows a remarkably high market potential and substantial contribution to household nutritional security, income and livelihood generation among households living along the baobab belt in Kenya. However, there is a dearth of information on the product and consumer market. An observation of the market

gives one an impression of markets characterized by a weak value chain with few products and actors. As a result, its potential remains underutilized and underexploited (Gebauer *et al.*, 2016). The utilization of baobab products in Kenya is low when compared to other countries like Benin and South Africa (Christine *et al.*, 2010). Lack of product awareness and familiarity among consumers is a barrier towards purchase and consumption. The products are yet to be communicated to consumers.

To increase consumer appreciation for such an orphaned indigenous tree, there is a need to understand the determinants of consumer awareness, purchase frequency, and attitudes and how their interplay shapes the utilization of baobab products. Theoretically, consumers' purchase and consumption decision largely depends on awareness and knowledge, and attitude towards a product, more so the economic and nutritional value of the products (Thøersen & Zhou, 2012; Yin *et al.*, 2010).

This study, therefore, sought to examine awareness, knowledge, attitudes towards baobab products and factors influencing their purchase frequency.

1.3 Objectives

1.3.1 General objective

The overall objective of this study was to assess consumer awareness, Purchases and attitudes towards Baobab (*Adansonia digitata L.*) Products in Urban and Rural Markets of Kenya

1.3.2 Specific objectives

The specific objectives of the study are;

- (1) To describe rural and urban baobab candies and pulp consumers, their purchasing and consumption pattern.
- (2) To determine the factors influencing consumers' awareness of the various baobab products in urban and rural townships in Kenya.

- (3) To assess socioeconomic factors influencing purchase frequency on baobab candies and processed pulp in Kenya.
- (4) To establish consumers' attitudes towards the consumption of processed baobab pulp and candies in Kenya.

1.4 Hypotheses

The following null hypotheses were tested;

- (1) There is no significant difference in socioeconomic characteristics between rural and urban consumers.
- (2) Level of income, education level, group membership, age, gender, household size and market distance have no significant effect on awareness of baobab products.
- (3) Income level, product price, education level, group membership, household size, years of a product purchase, nutritional knowledge score, distance to the nearest point of purchase have no significant influence on the frequency of purchase on baobab pulp and candies.
- (4) Consumers have a negative attitude towards the consumption of baobab products in Kenya.

1.5 Significance of the Study

Research on awareness and knowledge, purchase and consumption frequency, attitudes and perception is the main basis for the development of locally adapted, target group -specific baobab products. This study contributes to understanding the process of market development, more so, creating expansive demand and market access, which is vital in marketing value chain efficiency. Development of marketing strategies that aim at shaping the attitudes positively, perceived norms, and control in making the change, yields better results. The more favourable the attitude is, the greater the intention of a consumer to consume a product. Information on consumer awareness is essential for any successful marketing strategy, particularly an approach

that captures a large market share (Muhummad *et al.*, 2016). Increasing consumers' knowledge and awareness alone does not make a major impact on the purchase of a commodity. However, marketing strategies that target consumers' attitude, perceived norms and control in making the change like buying of commodities yield better results (Ajzen *et al.*, 2014).

The findings from the study form a basis on how to increase the market share of baobab products. Furthermore, understanding consumer behaviour enables the market and product developers to create an ability to influence the likelihood of positive outcomes (Milner and Rosenstreich, 2013). In line with Sustainable Development Goals, this study will help in the achievement of SDG on extreme poverty eradication, hunger and nutritional security improvement in Kenya (United Nations Report, 2017).

1.6 Scope

The study explored socioeconomic characteristics of the consumers, awareness, and knowledge on a variety of baobab products, their purchasing and consumption pattern. Determinants of frequency purchase across the rural and urban market segments in Kenya. And finally, consumers' attitudes towards the consumption of baobab pulp and candies.

1.7 Definition of terms.

Candies - Flavoured and sweetened baobab seed and pulp. Also known as 'mabuyu' in the local language.

Pulp - Processed powder from baobab fruit. The baobab fruit is crushed and the fibrous matter is removed, seeds separated and the pulp gently pound to a fine powder.

Punnet - High quality plastic packaging used in packaging baobab candies.

Sachet - A small sealed polythene bag containing small quantities of something i.e candies, ice, pulp.

1.5 Organization of the Thesis

This thesis is organized into five chapters. Chapter 1 focuses mainly on the background of the study, problem statement, study objectives, hypotheses and the significance of the study. Chapter 2 consists of reviews of conceptual, empirical literature reviews, and the knowledge gap. Chapter 3 presents the research methodology adopted in this study and a description of the study area, data sources, and collections. Chapter 4 presents the research findings and discussions. Summary, conclusions, and recommendations are presented in chapter 5.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This section presents a literature review on consumer awareness and knowledge, consumer attitudes, purchasing and consumption patterns, determinants of consumption and purchase frequency. It starts by exploring the theory of consumer behavior and ends by reviewing the empirical literature. The knowledge gap creates an insight on how to raise product awareness and market development that will ensure optimal utilization and appreciation of the wonder tree.

2.2 Conceptual Literature Review

2.2.1 Conceptual framework of consumer behaviour

Various psychological theories have been developed to analyze consumer behaviour. Above all, the cognitive approach is considered modern. It roots from knowledge acquisition and understanding through thought, experience, and sense. The cognitive approach emphasizes constructs dealing with mental structures and thinking. It is categorized into; analytical and prescriptive. Both approaches are accepted. However, this study adopted the analytical approach as it provides a framework that statistically factored the consumer decision-making process. Prescriptive models are smaller and focus more on preconceptions, feelings or beliefs rather than analytical approaches. Consumers are individuals involved in the consumption process; who buy for personal consumption or to meet the collective needs of the family and household needs (Ajzen *et al.*, 2014, Jisana, 2014). They consist of a complex set of psychological and sociological characteristics needs (Schiffman & Kainuk, 2000).

Understanding various theories of consumer behaviour is integral in consumer analysis. They bring information on the type of consumers, what are their needs and wants. On the other hand, the theory seeks to find a solution to questions such as why consumers buy certain products, when do they buy, why do they prefer certain

products over the other, how much, and how often (Kotler and Armstrong, 2010). Furthermore, it brings forth reasons why certain consumers differ from one another in buying and using products or services. Consumer behaviour involves a process when individuals or groups select to purchase a product for consumption to satisfy their needs and desires (Solomon, 2004; Hanna & Wozniak, 2001; Well & Presnsky, 1996).

Theory of consumer behaviour suggests that in a purchase and consumption decision, a consumer has to go through seven steps; need recognition, search for alternative, evaluate available option, purchase and use the product, evaluate the experience, provide feedback and end the purchase and consumption process (Penson *et al.*,1999; Wells & Prenskey,1996). Howard-Sheth model represents a consumer in the market. It brings out the element of the rationality of choice of the product by the consumer under conditions of an incomplete set of information. The seven elements of the consumer decision process are collapsed into four variables; inputs, hypothetical constructs, outcome variables, and external environment.

Input variables are the source of information about the product such as marketing strategies and consumers' environment. They are categorized into three; significance incentive, symbolic incentive, and social stimuli. Significance incentives emanate from the attributes of the product such as colour, taste, price, originality, brand labeling and packaging. Symbolic stimuli are the visual characteristics as perceived by the consumer. It involves the effects of advertisements and promotions (Foxall *et al.*, 2007). While social stimuli are the consumer environment, family, consumer groups, and society. Consumers' interaction with friends influence the purchasing and consumption pattern (Schiffman & Wisenblit, 1995). Kotler (2000) reveals that psychological forces that influence consumer behavior are mostly unconscious. Extrinsic product cues such as colour, shape, weight, size, and sensation can stimulate a consumer to consume a product unconsciously. Therefore, it is imperative to understand such cues in this study.

The second group of variables is the hypothetical constructs. These are the psychological variables influencing the consumer decision-making process. They are categorized into the perceptual construct and learning constructs. Perceptual construct defines how buyers develop habits, values, and attention to stimuli. Whereas, learning constructs define how consumers form attitudes on the product and product awareness that influence purchase and consumption decisions. Perception influences individual motivation in purchasing a product to satisfy/match his or her needs (Well & Presnsky, 1996). While attitudes are the outcome of the psychological process, it can be seen by what consumers do (Schiffman & Wisenblit, 1995). Attitude reflects consumers' knowledge and assessment of a product.

Attitude towards baobab food product consumption is an important element in developing an effective marketing and utilization strategy and this could be achieved by manipulating factors that shape the attitudes towards baobab products. Therefore, this study sought to assess consumers' awareness and knowledge, consumers' attitudes towards baobab processed pulp and candies. The study results lead to strategies used to increase awareness and knowledge, purchase frequency and attitude improvement, in order to increase demand.

The third stage of variables is the outcome variables. These are the effects of the internal process such as purchase and consumption decisions. They involve the frequency of purchase and consumption, cognition, attention, and intention. The frequency of purchase is a measure of purchase and consumption decisions. Good pricing strategy does not necessarily induce demand; rather it creates incentives to customers when they buy. To predict future demand, market developers are interested in knowing why the consumers buy processed baobab pulp and candies. Is it a snack? Main meal? Medicinal purpose? or as gifts to friends? Such information on objectives of purchase and frequency of purchase, quantities of purchase and preferred product purchased were necessary for the study.

The fourth stage of variables is the external environment. Despite not forming part of the decision-making process, the external environment has a significant impact on

consumers' purchase and consumption. Most marketing strategies adopt the criterion for market segmentation. Consumer decision making does not only follow a linear progression rather it comprises interaction with other components.

However, the theory of consumer behaviour cannot address the subject in totality as the consumers frequently engage in non-conscious behaviours that might not be well modeled through a rational information processing approach (Erasmus *et al.*, 2001). Against the backdrop of consumer theory, there is a necessity to integrate, Attitude-Behavior-Context (ABC) theory, Means-end chain (MEC) theory, Health Belief (HB), Food-related lifestyle (FRL) models and Total food quality model as an overall framework. Attitude-Behavior-Context (ABC) theory incorporates contextual factors such as socio-economic, demographic and community characteristics that may influence or limit one's ability to act on their intentions.

Means-end chain theory brings a better understanding of potential food consumption motives through predicting how product attributes are linked to self-relevant consequences of consumption, i.e. consumers buy products for the functional and psychological benefits they provide (Costa *et al.*, 2004). Health belief theory, on the other hand, focuses on the desired outcomes, attitudes and beliefs.

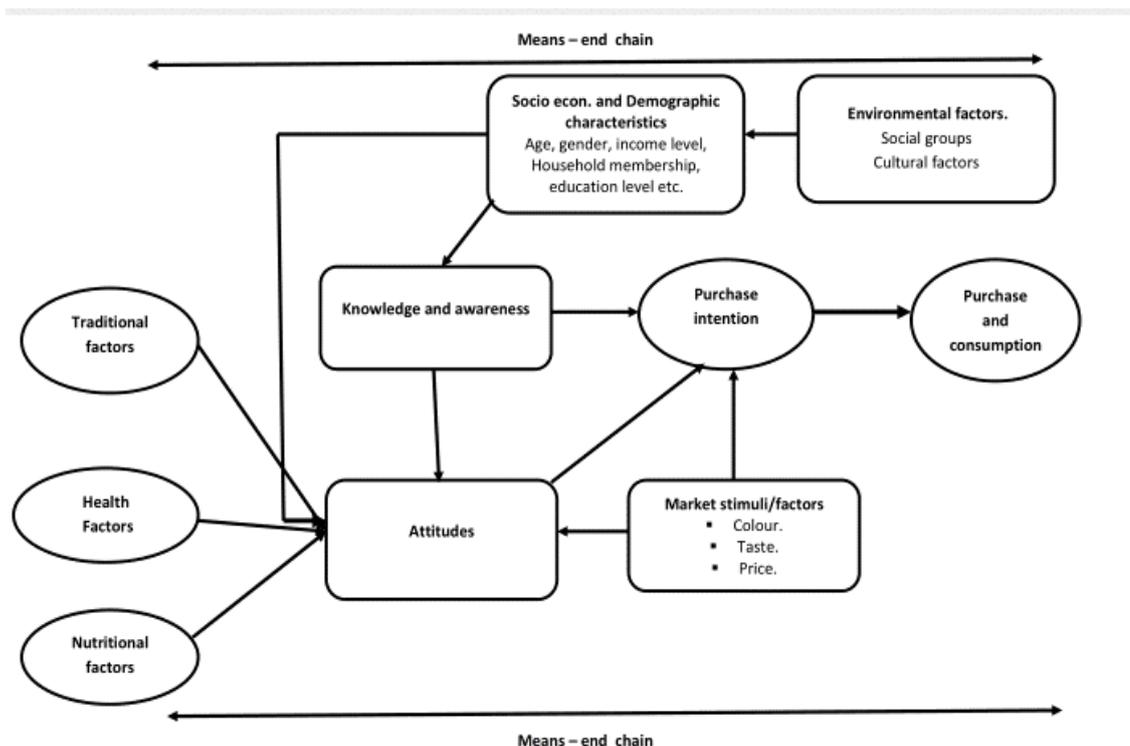


Figure 2.1: Integrated model of consumer behaviour

2.3 Previous studies on consumer awareness and knowledge

Muhummad *et al.* (2016) define consumer awareness as product characteristics exploration and recognition by consumers. From the cognitive approach, physical and cognitive acts influence a consumer to develop attention to stimuli, values, and habit leads to the formation of attitude, which in turn influences behavior of a consumer such as purchase and consumption. Increase in product awareness induces positive change in consumption pattern. This change initiate an expansive demand for a product. In-depth literature review of empirical literature on consumer awareness and knowledge on baobab yielded no results. Therefore, the following arguments are based on related studies.

Pambo (2014) undertook a study on consumers' awareness and factors affecting levels of awareness for fortified sugar. The study targeted 350 respondents in rural and urban areas in Kenya. Results from the logistic regression model showed that

age, place of purchase, the source of information and dwelling place significantly influenced consumers' level of awareness on fortified sugar. Whereas marital status, years in formal education had no significant influence. This is in contrast with previous studies by Kimenju (2005), whose studies revealed that an increase in income and number of years in formal education increased the level of awareness. According to the study, the majority of female consumers in the rural areas purchased sugar from the kiosk with limited product information. The geographical region positively influenced the probability of awareness of sugar fortification. The study recommended education programs used to create and maintain product awareness in targeted regions.

Further, similar work by Ibitoye *et al.* (2014), on consumers' awareness towards organic rice in Malaysia revealed that age, gender, education level, income level had a significant influence on the awareness towards organic rice. Income levels had a positive influence on awareness level, while female consumers were more aware than the male counterparts were. Descriptive and *Chi-square* analysis from a sample of 350 consumers were almost identical to previous studies by Altarawneh (2013) and Bernabeu (2012). The authors found out that the females were comparatively more aware and knowledgeable on organic food consumption than males. However, Kumar and Saluja (2013) document contrary results, males were comparatively more aware of organic food than females. However, there was no significant relationship between consumer's awareness of organic rice and their age. The study recommended further studies on consumer awareness on other products and willingness to pay.

Rock *et al.* (2017) evaluated consumers' awareness of organic products in Trichy district, India. A well-structured cross-sectional questionnaire was designed and distributed to 300 rural, semi-urban and urban consumers in Trichy district, India. The author concluded that 76 % were aware of organic products, 73% were knowledgeable, while 62% had purchased organic products. The most preferred source of organic foods was specific shops and kitchen gardens, the credibility and availability of the food was the most preferred factor in purchasing of organic

products. Sixty-two percent (62%), of those who purchased organic food preferred vegetables and fruits while 38 % consumed organic food regularly. Lack of awareness and knowledge and difficulty in product identification was the major constraint to consuming. The study further recommended improving awareness level and product features such as packaging, certification, and freshness to improve consumption.

Prabha (2017) probed consumers' awareness of organic food in India. A sample of 100 respondents was purposefully selected from Tirupur District. The data from the selected sample were analyzed descriptively and multiple regression analysis. The results pointed at a significant association between gender, age, education level, monthly income, and consumers' awareness and knowledge on organic products. However, consumers' occupations had no significant influence on the awareness of organic products. The author recommended that the huge gap between consumption and consumer awareness could be reduced through increasing awareness and education on organic products.

2.4 Previous studies on factors influencing purchase frequency

Food purchase and consumption patterns undergo major dietary shifts across the world. The consumers are moving towards diversified diets bringing about variation. This variation is a result of geographical location, socialization, income and varying education levels (Musotsi, 2017; Kearney, 2010). To date, insufficient data exist on urban and rural townships baobab product consumption patterns and frequencies of purchase in Kenya. However, from related studies, various factors potentially influence the purchasing and consumption of a product. Prior studies by Squires *et al.* (2001) found out that colour, taste, flavour, and concern about nutritional influence the consumers' purchase decision. Health concern, as well as chemical residue and socio-economic and demographic factors, was also found out to influence purchasing and consumption (Padel and Foster, 2005; Magnusson *et al.*, 2001)

Finzer *et al.* (2013) undertook a detailed exploration of the perception of healthy habits in South Delhi, India. The study sampled 245 households to investigate their consumption frequency on fruits and vegetables. Results from multiple linear regression model revealed that socio-economic factors such as price determined the purchasing power. Awareness on the other hand also indicated that affordability was more important than physical access. An increase in income led to increased demand, which in turn increased consumption frequency. The study recommended further studies on the influence of gender dynamics and family hierarchy on fruits and vegetable consumption.

Mutlu (2007) undertook a study on organic food consumption in Turkey and Germany. The data collected from 50 organic consumers in Turkey and 64 organic consumers in Germany were analyzed descriptively. Results indicated that there was no significant relationship between the socio-demographic characteristics of the consumers and consumption frequency. However, the time of purchase had a positive influence on purchase frequency i.e. those who adopted the organic food first had a higher frequency of consumption compared to those who adopted the organic food later. While on shopping preference, 78% of Turkish consumers preferred to buy in supermarkets where they could get a variety. The education level had a positive influence on consumption. Approximately 53% of the consumers interviewed wished to find more shops selling organic products in the future. The study further showed that consumers were motivated by health concerns to consume organic food.

Omotesho *et al.* (2013) undertook a study to examine awareness and usage of baobab in rural communities in Kwara State, Nigeria. The Study employed a three-stage sampling procedure to determine a sample size of 200 respondents. Results from logistic regression established that level of awareness and household income were the key determinants in baobab usage. The strong negative socio-cultural beliefs and poor level of awareness on the tree benefits were the major constraints towards baobab usage. The study further recommended more research on processing methods that ensures the baobab product is communicated to the consumers.

Gido *et al.* (2017) undertook a study on the evaluation of consumption intensity of leafy African Indigenous vegetables (AIVs) in Kenya. The data was collected from a sample of 450 rural and urban consumers and was analyzed using the Zero-Inflated Poisson model and the Negative Binomial regression model. The research concluded that socioeconomic factors such as age, occupation, household size, diversity of AIV leaves, distance to the market, and awareness of AIV's medicinal benefits and proportion of income allocated to food purchases significantly influenced consumption intensity of leafy. The researchers showed that diversification of production and well-coordinated market supply chain in a food system could improve consumption intensity.

2.5 Previous studies on consumer attitudes

Ranjbar *et al.* (2016) in a study on factors that influence consumers' attitudes towards organic products targeted 124 organic product consumers in Tehran, Iran. The results from regression analysis revealed that knowledge of the organic product, health awareness, consumers' motivation, and age significantly influenced attitude towards organic products. The results were consonant with previous studies done by Sangkumchaliang and Huang (2012), on knowledge of organic products, Kumar and Ali (2011), on health awareness. These studies affirmed that the above factors significantly influence attitudes toward the consumption of organic products.

In Kenya, few numbers of studies have focused on consumer attitude towards baobab food products. However, a number of studies have focused on African Indigenous Vegetables, organic food products, and genetically modified food. For instance, Kimenju *et al.* (2005) evaluated consumer awareness and attitudes towards GM food in Kenya. The study targeted 640 consumers at the point of sale (supermarkets, kiosks and posho mills). The findings from the study documented that income, education level, and employment category, environmental risk, health risk, ethics, and equity concern significantly influenced awareness and attitude on GM food.

Ntawuruhunga (2016) assessed knowledge, attitude, and practice among African Indigenous vegetable farmers in Kenya (AIVs). The study targeted 600 households growing Africa Indigenous Vegetables. A multistage sampling technique was used to select the respondents. The findings from Multinomial logit regression analysis concluded that gender, education, profession, years of experience in farming, land tenure and total land owned by farmers had a significant influence on farmers' knowledge, attitudes and practice. The author recommended increasing access to technology and providing information and training to change the current indigenous method of production. The results from the study were in line with Tehrani and Kroenner (2014), where the study emphasized the role of cultures and socioecological factors in shaping the attitude, and how attitude plays a significant role in the choice of a meal.

2.6 Conclusion

Effective promotion on the use and appreciation of African baobab requires a deeper understanding of the purchasing and consumption decision of a consumer. Consumer choice and purchase decision is highly dynamic and it is affected by an interplay of several variables reviewed in this chapter. Even though most research studies have focused on consumer behaviour, none has explored in-depth and documented, awareness, attitudes, and factors influencing the frequency of purchase on baobab products. Past studies have exhibited contradicting results. However, most have rounded up similar variables as a basis. These variables include; (i) external factors (packaging, labeling, colour) (ii) sociodemographic (age, gender, income level, group membership, access to credit) (iii) perceived product attribute (healthy, nutritional value and environmental concern) (iv) product attributes (price, taste, nutrition) (Prabha, 2017; Pambo, 2014; Ibitoye *et al.*, 2014).

Recent research intervention aiming at increasing the utilization of baobab has remarkably shown successes in South Africa and West African countries. This study sought to understand consumer awareness and knowledge, attitude towards baobab products and factors influencing purchasing frequency. Reasonable results obtained

from this study serve as a baseline for which policymakers, product developers and researchers can track the changes in consumers over time. More so how various variables influence their purchase and consumption decision. Product developers could further illustrate associations among consumers' socioeconomic characteristics, purchase decisions, attitudes, and preferences.

CHAPTER THREE

METHODOLOGY

3.1 Introduction

This chapter discusses the research methodology used in the study. This includes the theoretical framework, empirical framework, description of the study area, population and sampling techniques, and data types and data analysis.

3.2 Theoretical framework.

For several decades, researchers have used consumption frequency, purchase frequency to measure demand for agriculture products. This happens where the dependent variable follows a count data. Count data appears in different forms; count data with zeros, count data with excess number zeros, and count data with large observations (Muoka, 2017; Agreysi, 2007). An example of data count is the number of times a household consumed African Indigenous

Vegetables over a period. Purchase frequency and awareness score cannot be negative in a censored data; it assumes a non-negative natural integer. Failure to account for censoring in the real market lead to biased estimation. Varieties of modern techniques have been developed to account for such biases in estimations. These include Poisson models, random utility model, incorporating truncated error distribution, discrete-continuous models and repeated discrete choice models (Hellerstein and Mendelsohn, 1993). This study adopted a count data model framework to analyze awareness and purchase frequencies on baobab products.

3.3 Empirical models

3.3.1 Consumer characteristics and consumption pattern

This objective employed descriptive statistics such as graphs, means, percentages, and standard deviations to analyze consumers' socioeconomic characteristics,

purchasing and consumption patterns. The objective was important because it captured both quantitative and qualitative data that help us to understand the rural and urban socioeconomic characteristics. *t*-test and *Chi*-square tests were used to compare consumer characteristics between urban and rural consumers.

3.3.2 Consumer awareness and knowledge

To assess the number of baobab products that the consumer is aware of, a list of exhaustive baobab food products was drawn. The respondent was then asked whether they are aware of the product or not on each of the listed products. The expected summation was equivalent to the number of the products listed and known to the respondent.

Zero-truncated Poisson Model

A truncated regression model is used to model the number of occurrences of an event when that number is restricted to be above the truncation point. Truncations arise when certain values, such as zero are absent from observed data. In this study, awareness score was the summation of the total number of baobab products that the consumer was aware of. The dependent variable, therefore, assumed an integer value of discrete nature and a non-negative count data variable. Ordinary least squares (OLS) do not estimate count data well due to their non-normality. Therefore, Generalized Poisson Regression Model (PRM), Zero-Inflated Negative Binomial (ZINB), Negative Binomial Regression (NBR) are preferred in the analysis of count data.

For response with non-negative variables, Poisson and Negative Binomial models are the standard models for analysis. Usually, Zero-Inflated Negative Binomial (ZINB), and Zero-Inflated Poisson (ZIP) are used to account for frequencies of count zeros (Greene 2008; Winkelmann and Zimmermann, 1995). Since this study focused on the consumers only, then a zero value response will not occur. Therefore, Zero-truncated Poisson (ZTP) or the Zero-truncated Negative Binomial (ZTNB) models are recommended for the analysis. Truncated distribution arises in cases where the

occurrence of an event is limited to values that lie above or below a given threshold, i.e. the Poisson distribution conditioned on being non-zero. **Econometric model specification.**

Zero-truncated Poisson distribution is defined as a probability distribution,

Where ($y > 0$) (Cameron and Trivedi, 1999), and is modeled as;

$$p(y_i / y_i > 0, x) = \frac{p(y_i/x)}{p(y_i > 0/x)} = \frac{\mu^{y_i} \exp(-\mu)}{y_i(1 - \exp(-\mu))}, y_i = 1, 2 \dots \dots \dots (1)$$

The derived log-likelihood for the above distribution function is;

$$LL(\mu; x) = y_i \text{Log} (\mu) - \mu - \text{Log}\Gamma (y_i + 1) - \log(1 - (e^{-\mu})) \dots \dots \dots (2)$$

Where y = Number of baobab food products the respondent is aware of.

x = Covariate factors /Explanatory variables.

μ = Poisson distribution means.

β = linear predictor of random variable response.

The Log-likelihood expression above is parameterized in terms of the linear predictor x .

Where $\mu = e^{x\beta}$. Which result to;

$$LL(\beta; x) = y_i x\beta - e^{x\beta} - \log \Gamma(y_i + 1) - \log(1 - e^{(-e^{x\beta})}) \dots \dots \dots (3)$$

Cameron and Trivedi (2009) recommend robust standard errors for Poisson models. Differentiating equation above will give a basis for robust score calculation shown below;

$$y - \exp(x\beta) - \frac{\exp(x\beta) \exp(-\exp(x\beta))}{1 - \exp(-\exp(x\beta))} \dots\dots\dots (4)$$

Therefore, the functional form of Zero-truncated Poisson model estimated is.

Number of baobab products the respondent is aware of / Awareness score = f (lnage, gender, education level, lnincome, group membership, market distance, household size)

Description of model variables, their measurement, and expected value sign.

Dependent variable

Awareness score (no. of products known to the consumer) – It is the sum of baobab products that the respondent was aware of from the listed baobab products.

Independent variables.

Age – A continuous variable captures the respondent's number of years. It was predicted that older consumers have more knowledge. However, on some occasions, the direction of influence may not be predicted due to other factors such as, younger consumers are exposed to modern communication channels, risk-averse and they may be more aware than the elderly.

Gender - A binary choice variable describing the gender of the consumer. It took a value Male =1, Female =0.

Education level – It is a continuous variable capturing the number of years spent in formal education by the consumer. It is hypothesized that, the more the number of years a consumer spends in formal education the more the likelihood of attaining

information on nutrition, dietary and healthier living which in turn influence awareness (Gido *et al.*, 2017).

Level of income – It is the capital endowment of a consumer. It is a continuous variable measuring the gross income in Kenya shillings that the consumer earned from various sources over one month. In this study, a large range of income was expected therefore, the income was linearized by using the natural logarithm. It was hypothesized to influence the awareness of products.

Group membership – It is a binary choice variable that describes the respondents' belonging to a group. In this case, a group can either be concerned with health group credit, self-help, training on food nutrition, production, and processing or not. It was measured by; Yes = 1, No = 0.

Market distance – It is the distance to the point of purchase. It was measured in Kilometers

Household size – It is a continuous variable that defines the number of members in the consumers' household.

3.3.3 Determinants of purchase frequency on baobab pulp and candies.

The frequency of purchase was measured as a count data variable that assumed the non-negative integers. It focused on one-month recall on purchase frequencies, such as two times a month, three times a month or even zero times a month. The frequencies of purchase are constructed as counts. Count data exhibit non-normality and are not well estimated by Ordinary least squares regression estimates (Cameron and Trivedi, 1999). Poisson distribution model is therefore ideal for analyzing factors influencing frequency of purchase on baobab products. Poisson regression is a nonlinear regression analysis of Poisson distribution highly preferred in analysis of discrete data (count) (Melliana, *et al.*, 2013).

Poisson regression models

Count data model such as standard Poisson Regression Model (PRM), Zero-Inflated Negative Binomial (ZINB), Negative Binomial Regression Model (NBRM) and Zero-Inflated Poisson (ZIP) are considered convenient and practical in handling overdispersion (Ismail and Jemain, 2007; Gujarati,2004). Overdispersion occurs when observed counts have higher variability than expected. PRM assumes the conditional mean of the data and variance function. However, in real data, there exists an overdispersion. If overdispersion/underdispersion occurs the model gives inappropriate results. Therefore, Zero-Inflated Poisson (ZIP) and Negative Binomial Regression Model (NBRM) are the alternatives usually used.

Negative Binomial Regression Model is used to model overdispersed count data that is when the conditional variance exceeds the conditional mean. Nevertheless, ZIP and NBRM may correct the conditional mean and variance by introducing an unobserved heterogeneity term for observation i (gamma-distributed stochastic term) but still, they induce overdispersion (Greene, 2000; Mullahy, 1986). The two-combined hurdle (binary logit regression and NBR) in ZINB help in resolving overdispersion and excess zero limitation (Minami et al., 2007). Therefore, a standardized Poisson model and Negative Binomial Regression was appropriate in this analysis.

Poisson regression models have found recent applications in various agricultural fields as it allows quantifications of the relationships between dependent and independent variables when the dependent variable is a count data. For example, Gido *et al.* (2017) used it to estimate the consumption intensity of African indigenous vegetables in rural and urban dwellers in Kenya. On the other hand, Olunga (2015) used the model to assess the awareness and intensity of the use of forest products in Kipipini Division of Tana Delta. Similarly, Kirui (2011) applied the count data model in assessing the intensity of mobile-based money transfer in Kenya. While Wahyudi *et al.* (2019) employed Poisson regression models to analyze

factors influencing the frequency of consumers' purchases of locally produced Rice in Indonesia

Negative Binomial Poisson Regression model

Following Greene (2008), the Negative Binomial Regression model is written as;

$$E(y_i/x_i, \varepsilon) = \exp(\alpha + A = x^i \beta + \varepsilon) \dots \dots \dots (5)$$

Log-likelihood (LL) Equation for the above Negative Binomial Poisson distribution is given by;

$$\ln L(\theta, \beta) = \sum_{i=1}^n \left\{ \left(\sum_{j=0}^{y_i-1} (j + \alpha^{-1}) \right) - \ln y_i! - (y_i + \theta^{-1}) x \Delta \right\} \dots \dots \dots (6)$$

The model requires that;

$$Var(y_i/x_i) = [1 + \alpha \exp(x^i \beta)] \exp(x^i \beta) \dots \dots \dots (7)$$

Where x^i is a vector of independent variables (income level, price, education level, group membership, household size, years of purchase, knowledge on nutrition, and distance to the point of purchase?)

β = Represents the variable coefficient

y_i = Represents frequency of purchase

Based on the above model, the functional form of Negative Binomial regression model was estimated as;

(i) **Processed Baobab candies purchase frequency** (y) = f (\ln income, \ln price, education level, \ln household size, years of product purchase, group membership, knowledge on nutrition, distance to the point of purchase) + e .

(ii) **Baobab pulp purchase frequency** (y) = f (\ln income, \ln price, education level, \ln household size, years of product purchase, group membership, knowledge on nutrition, distance to the point of purchase) + e .

Description of model variables and their measurement

Dependent variables

The frequency of purchase (demand) / – It measures the number of times a consumer purchased baobab products over a period of time (1-month recall).

Independent continuous variables.

Educational level of the consumer – It is the number of years spent in formal education by the consumer (*as defined above*).

Consumers' household size – it a continuous variable that defines the number of members of consumers' household.

Years of product purchase – The number of years the consumer has been purchasing the product. It was measured by the number of years. It can either have negative and positive impact. Longer period of consumption can create satiation that diminishes the marginal utility of consuming more, induce a consumer to seek a substitute or continue purchasing the product (Ribeiro, 2010).

Distance to the nearby preferred market or retail shop in minutes – It is the time in minutes that a consumer takes to reach the point of sale. It was measured in minutes. Longer distances increase transaction costs (Diagne *et al.*, 2013).

Price - it is the price of the product measured in Kenyan shillings. According to Finzer *et al.* (2013) price determines the purchasing power. It was predicted that, the

lower the price the higher the affordability. High product affordability increases purchase and consumption frequency.

Income level - it is the capital endowment of a consumer (as defined above). High income level is predicted to have a positive influence on consumption frequency. The higher the income level, the higher the purchasing power for the consumer.

Independent categorical variables

Group membership – it is a binary choice variable that describes the respondents' belonging to a group. In this case, a group can either be concerned with health group credit, self-help, training on food nutrition, production and processing or not. It was measured by; Yes = 1, No = 0.

3.3.4 Analysis of consumer attitudes towards baobab food products

Consumer attitude has a huge implication on product and market development. It represents the consumers' feelings about a product and behavioral intention towards a product. This study employed exploratory factor analysis to add a scope to our knowledge of underlying factors influencing consumers' attitudes towards the consumption of baobab products. Various studies have adopted both descriptive and inferential analysis (Dolisca *et al.*, 2007). However, none between the two stands the *golden approach*. The main approach in this study was descriptive analysis, which included summing up the responses from the five points Likert scale to obtain a percentage score of the respondents.

Exploratory factor analysis was used to generate inferential statistics. To capture the consumers' attitude, a range of attitudinal statements was developed to measure attitudes, opinions, and beliefs. The response from five points Likert scale was rotated using an orthogonal rotation (varimax rotation) approach. So that the smaller number of highly correlated attitudes would be loaded into each factor component for easier interpretation. Exploratory Factor Analysis (EFA) reduced the attitudinal

statements into factor components/latent variables, with the first component having a maximum overall variance.

3.4 Data sources and collection.

3.4.1 Study Sites

The study was conducted in the three market sites described in the Baofood project package. The target study market sites were; Kitui rural township market site, Mombasa (marikiti market) and Nairobi (Eastleigh, jamia and Karen). Kitui rural township market is in Kitui county and it represents the rural consumers. It lies between latitudes -1.375081, and longitudes 37.9952 East. It is characterized by a rapidly growing population of 1,012,709 and falling resilience to food nutritional security (KNBS,2009). Approximately 60 % of the population lives below the poverty line.

Kitui County lies within the upper baobab-growing belt. In this region, baobab fruit trees exist as natural deciduous tropical woodlands with a natural distribution. Kitui County borders Makueni County to the south and Tharaka Nithi County on the North. Kalundu market in Kitui Township is preferred for the study due to its centrality, heterogeneous populations and the availability of processed baobab products.

Nairobi is a major urban city in Kenya with the highest population of urban dwellers KNBS (2009). The city is experiencing rapid expansion and population growth. It has an increasing number of alternative therapy clinics and Trust for Indigenous herbs and culture organizations championing for the use of organic products such as baobab products. Nairobi stands a chance to provide a market for baobab products only if consumers' awareness and attitude are captured. Baobab candies trade in Eastleigh and Jamia mall while the pulp is used as alternative therapy in Kalimoni, and as a food product in various Healthy yu organic shops.

In Mombasa, Kongowea, Marikiti, and Mwembe Tayari markets have relatively well-developed fruit, vegetables, legumes, and cereal markets. The market enjoys its vicinity to the port and Tanzania border. In addition, the Swahili culture along the coastal city with a history of baobab product use favours the market development particularly consumptions of baobab candies. Mombasa markets source thousands of unprocessed baobab pulp on seed bags from Makueni, Kitui, Kilifi as well as neighboring Tanzania during the low production season.

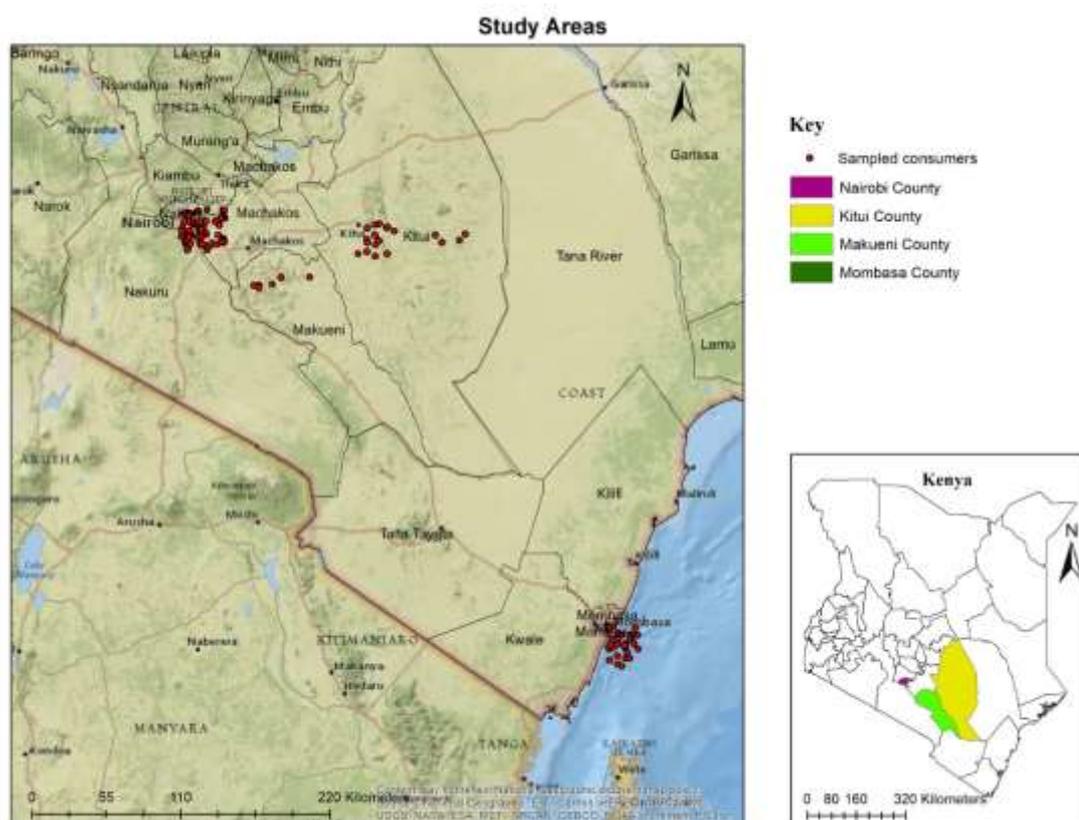


Figure 3.1: A map of study area

3.4.2 Sampling and Data collection

The target population was the urban consumers of baobab food products in Nairobi and Mombasa as well as the rural townships represented by Kitui market. For the processed baobab pulp, a random sample was drawn from a list of buyers in two of

the established pulp sellers in the upper end markets of Kalimoni and Yaya centre in Nairobi. Cochran sampling procedure was used to derive a sample size of 384

$$\begin{aligned}
 \text{Sample size} &= \frac{(t)^2 * (p) (q)}{(d^2)} \\
 &= \frac{(1.96)^2 * (.5) (.5)}{(d^2)} \\
 &= 384
 \end{aligned}$$

Where; t = Confidence interval of 1.96

p = Proportion of the target population (0.5)

(p) (q) = Estimate of variance

d = Accepted marginal error of 0.05

In total, 353 respondents were interviewed (64 for processed baobab pulp and 289 for baobab candies). The target sample size was not attained due to low turnout. Three hundred and fifty-three (353) represents 91.93% of the target sample size.

The study adopted a purposive sampling of baobab candy consumers. This approach was preferred since there was no data on the existing baobab consumers in various study markets. Furthermore, Lohr (1999) suggested that this approach is the most appropriate as it captures consumers' socioeconomics and behavioral diversity across the study area. The data was collected through face-to-face interviews. The respondents had a chance to seek clarification from the interviewer.

The first step involved a purposive selection of the main markets where baobab candies are sold. In Mombasa, the products are highly traded in umbrella shops along Marikiti market. In Nairobi, the markets are located in Eastleigh 1st avenue,

Eastleigh Madina mall, KFC Building, Eastleigh 12th street and Jamia mosque for candies. In Kitui Township, the baobab market is located in Kalundu market and Nzone stage. Enumerators were stationed in these markets at the candy sale points to interview the consumers as they purchased the product.

A questionnaire was developed and pretested to determine the validity reliability and relevance of the questions and their responses. A pre-test helped to test the flow of survey interviews, provided an option to revise and correct the data collection tool. After the survey, the questionnaires filled were cleaned and counterchecked to ensure that data was devoid of errors and omissions and to ensure consistency. Data was then cleaned, coded and entered into SPSS and STATA statistical software for analysis. SPSS was used to analyze descriptive, while Stata was employed in regression analysis. Both quantitative and qualitative techniques of analysis were employed to analyze the data collected from the survey.

3.4.3 Ethical Consideration

The study ensured protection of the rights of participants by keeping their response confidential and anonymous. The results of the study were used purposefully for research only.

CHAPTER FOUR

RESEARCH FINDINGS AND DISCUSSIONS.

4.1 Consumer characteristics, purchasing and consumption pattern.

The socioeconomic characteristics of rural and urban consumers varied as presented in Table 4.1. On average, rural consumers were significantly elderly but less educated than rural consumers. Rural consumers had more household members and low household aggregate income compared to urban. Similar findings also observed in awareness level. Awareness on the diversity of baobab products and product use was not significantly different in urban and rural market segments. While years of product consumption was significantly higher (mean 11.2) in urban consumers compared to rural consumers (mean 8.56).

Table 4.1: Presents continuous socioeconomic characteristics of rural and urban baobab consumers in Kenya

Continuous	Mean			<i>t</i> - ratio	<i>sig</i>
	Rural	Urban	Overall		
Age of the consumer (years)	36.88	30.81	31.67	3.45***	.001
Household size	4.52	3.68	3.80	2.64***	.009
Consumers' HH income in Ksh.	47540.00	79247.19	74756.09	-1.25	.211
Market distance in (km)	7.00	8.47	8.26	-1.04	.299
Years of product consumption	8.56	11.29	10.90	-1.73*	.085
Education level	9.22	11.22	10.94	-3.31***	.001
Product awareness score	5.92	6.18	6.14	-0.42	.672
Total score for usage	4.24	4.15	4.16	0.20	.842

Table 4.2: Presents categorical socioeconomic characteristics of rural and urban baobab consumers in Kenya

Categorical variables	Percentage			χ^2 - ratio	sig
Gender					
Female	80.0	52.5	56.4		
Male	20.0	47.5	43.6		
Total	14.2	85.8	100.0	13.221***	0.000
Group membership					
No	30.0	37.6	36.5		
Yes	70.0	62.4	63.5		
Total	14.2	85.8	100.0	1.076	0.300
Credit access					
No	64.0	60.1	60.6		
Yes	36.0	39.9	39.4		
Total	14.6	85.8	100.0	0.278	0.598

*, **, ***, Significant levels at 10%, 5%, 1% respectively.

Two-tailed t-test was used to determine significance difference in continuous variables between rural and urban consumers.

Pearson Chi square-test was used to determine relationship in categorical variables between rural and urban consumers.

The distance to the preferred product source was on average 7 kilometers for rural consumers and 8.47 with urban consumers. A significant difference was also observed when rural consumers and urban consumers were compared in terms of credit access and gender. Overall, 56.4 percent of the interviewed consumers were female while 43.6 were males. Credit access was a challenge in the study area, 64.0 % of the consumers in rural markets did not access any credit support, while 36% managed to acquire credit. The situation was largely the same in urban markets. 60.1% of urban consumers did not access the credit facilities while 39.99% obtained credit. Concerning credit use, a majority (49.6%) of the consumers used the credit for investment, food purchase (22.3%), school fees (19.4%) while the least percentage did spend on other businesses. Figure 4.1 shows credit purposes.

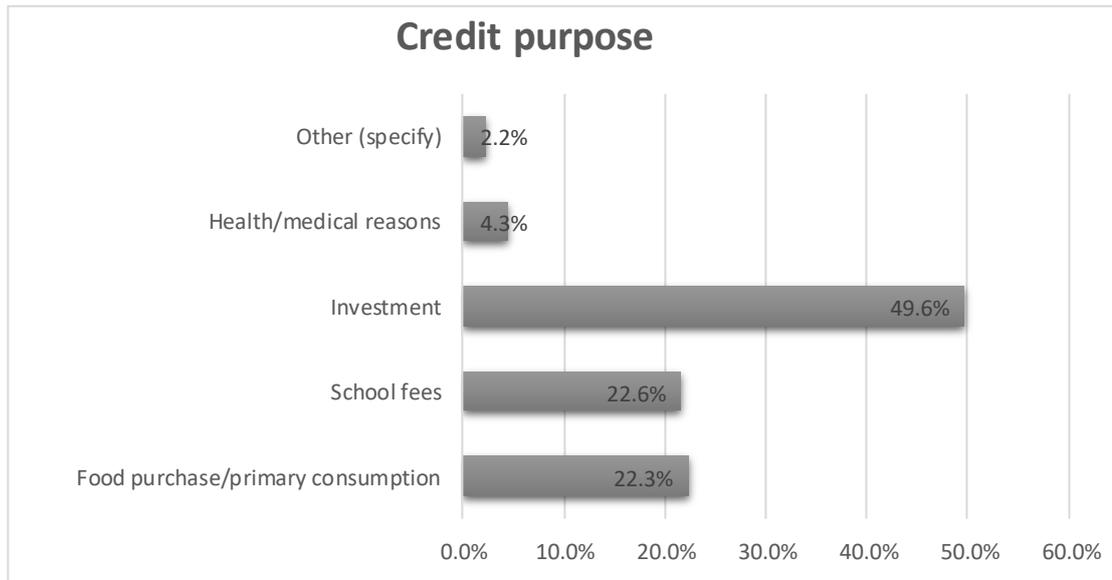


Figure 4.1: Credit purpose for baobab products consumers

4.2 Purchase and consumption pattern

Table 4.3 presents the purchase and consumption patterns of consumers. The most preferred frequency of purchase was weekly purchase (45%), daily purchase (32.3%), monthly purchase (19%), quarterly purchase (2.5%) and semiannually (1.1%) respectively. With regard to purchase and consumption pattern, (34.8%) believed that purchase and consumption has increased in the past one year, (6.4%) experienced a decrease in purchase and consumption while (59.2%) experienced constant purchase and consumption pattern.

Table 4.3: Consumption pattern

	Frequency	Count	Percentage (%)
Purchase and consumption	Daily	114	32.3
	weekly	159	45.0
	Monthly	67	19.0
	Quarterly	9	2.5
	Semi-annually	4	1.1
	Other (specify)	0	0.0
	Total	353	100
Change in purchase and consumption patterns changed over the past 3 months.	Increased consumption	121	34.3
	Decreased consumption	23	6.5
	No change	209	59.2
	Total	353	100

4.2.1 Baobab products awareness

Table 4.4 presents consumers' awareness on baobab products in the area of study. Awareness was measured by asking the consumer the number of baobab product he/she is aware of from an exhaustive list of 25 products. Ninety-eight percent (98.3%) respondents listed baobab candies as the most well known product (Table 4.4). These was followed by baobab pulp (85.26%) and baobab porridge (53.82%) respectively. Among the least known products were alcoholic product (3.40%), baobab sodas (2.83%) and baobab chutneys (1.98%). Despite rural markets being situated in producer zone, significant number of products remains unknown in the rural township market. These are; chocolate, cosmetics, sodas, chutneys, sauce and alcoholic drinks made from baobab. On average, the mean awareness score was five products in both rural and urban markets as shown in Table 4.1

Table 4.4: Consumer awareness on Baobab products in rural and urban markets of Kenya

Baobab foodstuffs and products	<i>Rural market</i> (n =50)		<i>Urban market</i> (n= 303)		<i>Pooled</i> (N=353)	
	No. aware	(%)	No. aware	(%)	Total	%
(a) Physical tree products						
Baobab Ropes	29	58	100	33	129	36.50
Baobab of baskets	20	40	81	26.73	101	28.61
Baobab vegetables	3	6	80	26.40	83	23.51
(b) Fruit products						
Baobab cooking oil	14	28	111	18.32	125	35.41
Baobab massage oil	11	22	94	31.02	105	29.74
Baobab biscuits	1	2	35	11.55	36	10.20
Baobab porridge	34	68	156	51.48	190	53.82
Baobab cakes	3	6	31	10.23	34	9.63
Baobab yoghurt	10	20	48	15.84	58	16.43
Baobab chocolate	0	0	27	8.91	27	7.65
Baobab (tablets)	2	4	27	8.91	29	8.21
Baobab juices	18	36	133	43.89	151	42.78
Baobab smoothies	15	30	55	18.15	70	19.83
Baobab ice-cream	5	10	56	18.46	61	17.28
Baobab pharmaceuticals	2	4	38	12.54	40	11.33
Baobab cosmetics	0	0	15	4.95	15	4.24
Baobab sodas	0	0	10	3.30	10	2.83
Alcoholic products	0	0	12	3.96	12	3.40
Chutneys	0	0	7	2.3	7	1.98
Sauce	0	0	62	20.46	62	17.56
Energy bars	1	2	16	5.28	17	4.82
Processed pulp	44	88	257	84.81	301	85.26
Mabuyu (candies)	50	100	297	98.02	347	98.30
(c) Waste related products						
Firewood from shells	24	48	102	33.66	126	35.69
Bowls from shells	16	32	90	29.70	106	30.03

4.2.2 Consumer knowledge on nutrition

Respondents were asked five questions ranging from understanding nutritional terms, awareness on dietary recommendation and knowledge of baobab as a source of nutrients. Other questions were testing the ability to apply nutritional knowledge on purchase choices and finally knowledge and awareness of the various associated diet diseases associations. The scores from each response were added together in order to understand their nutritional knowledge. Consumers' nutritional knowledge was counted with a range of 0 to 5. Five represented the consumer with the highest level of nutritional knowledge, while zero represented the knowledge score for a consumer with a low level of nutritional knowledge. Table 4.5 shows the mean nutritional knowledge score statistics.

Table 4.5: Mean Nutritional Knowledge Score

Type of consumer	Mean	Maximum	Minimum	Std. Deviation
Rural township	1.2400	4.00	.00	1.041
Urban	1.7756	5.00	.00	1.266
Total	1.6997	5.00	.00	1.250

Knowledge on nutrition among the urban consumers was 1.77 on average while rural consumers it was 1.24. Urban consumers were more knowledgeable on nutrition compared to rural consumers. The variation in nutritional knowledge was attributed to socioeconomic and demographic diversity in Table 4.1 and 4.2.

4.2.3 Preliminary diagnostics of the variables used in the econometric analysis

A preliminary diagnostic test on statistical problems of multicollinearity and heteroscedasticity was conducted on all the variables in the model. Variance inflation factor (VIF) was used to test the presence of multicollinearity among the independent continuous variables used in the model. This involved estimation of ordinary least

squares regressions between each of the consumers' characteristics as 'dependent variable' with the rest as 'independent variables'.

The results from the diagnostic test confirmed that there was no serious linear relationship among the explanatory continuous variables tested. The test results revealed VIF values ranging from 1.054 to 1.183 as shown in Table 4.6. VIF values <5 have no serious multicollinearity (Ringle *et al.*, 2015). Therefore, all the proposed independent continuous variables were fit for inclusion in Poisson regression analysis.

Table 4.6: Variance Inflation Factor results for continuous variables

Variable	Collinearity Statistics	
	VIF	1/VIF
Natural logs for age	1.054	0.9488
Number of years in formal education	1.183	0.8454
Natural logs for Income	1.126	0.8880

For categorical variables, contingent coefficients were calculated and the results presented in Table 4.7.

Table 4.7: Contingent coefficient test for categorical variables

Symmetric Measures for categorical variables (gender and group membership)			
		Value	Approx. Significance
Nominal by Nominal	Contingency Coefficient	.190	.000
N of Valid Cases		353	

The results revealed no serious correlation between the categorical independent variables since the contingent coefficient was less than 0.75. With respect to the rule of the thumb, there was no strong association among all the hypothesized categorical independent variables used in the regression analysis.

4.2.4 Factors influencing awareness on Baobab products

Factors influencing awareness of baobab products were determined in a Poisson regression analysis. The data were first analyzed with standard Poisson regression and later Zero-truncated Poisson regression model. The results of the two models are presented in Table 4.8 and Table 4.9. Goodness-of-fit test' was used to determine the more proficient regression model. Based on Ismail and Jemain, (2007), lower values of either Akaike's Information Criterion (AIC) or Bayesian Information Criterion (BIC) indicate a better fit. Therefore, the Zero-truncated Poisson model was regarded as better fit for the survey data due to their lower BIC and AIC values as shown in Table 4.10. A summary result of the stepwise regression model showing parameter estimates for coefficients and P-values for Poisson regression models are given in Tables 4.8 and 4.9. The discussion is based on results from the Zero-truncated Poisson model.

Table 4.8: Determinants of consumer awareness on baobab products in urban and rural townships in Kenya: Standard Poisson regression model results.

Variables	Rural Township		Urban		Overall	
	Coef.	P>/z/	Coef.	P>/z/	Coef.	P>/z/
Age	0.3470*	0.089	0.192***	0.009	0.199***	0.004
Gender	0.1175	0.475	0.219***	0.000	0.230***	0.000
Education level	0.0346*	0.088	-0.014***	0.014	-0.011**	0.053
Income level	0.0000	0.467	0.000	0.697	0.000	0.746
Group Membership	0.0590	0.682	0.340***	0.000	0.307***	0.000
Household size	-0.0053	0.876	-0.013	0.270	-0.014	0.213
Market Distance	0.0145	0.109	-0.002	0.358	-0.002	0.505
_constant	0.0105	0.989	1.102***	0.000	1.040***	0.000
	No. of obs = 50		No. of obs = 303		No. of obs = 353	
	LR chi ² (7) = 10.07		LR chi ² (7) = 89.32		LR chi ² (7) = 87.41	
	Prob > chi ² = 0.1847		Prob > chi ² = 0.0000		Prob > chi ² = 0.0000	
	Pseudo R ² = 0.0353		Pseudo R ² = 0.0447		Pseudo R ² = 0.0383	

*, **, ***, Denotes significance levels at 10%, 5%, 1% respectively

Table 4.9: Determinants of consumer awareness on baobab products in urban and rural townships in Kenya: Zero-truncated regression model results.

Variables	Rural Township		Urban		Overall	
	Coef.	P>/z/	Coef.	P>/z/	Coef.	P>/z/
Age	0.353*	0.087	0.195***	0.008	0.203***	0.003
Gender	0.117	0.481	0.223***	0.000	0.234***	0.000
Education level	0.035*	0.086	-0.015***	0.013	-0.011**	0.050
Income level	0.056	0.464	0.000	0.691	0.000	0.739
Group Membership	0.061	0.676	0.346***	0.000	0.313***	0.000
Household size	-0.005	0.876	-0.013	0.262	-0.014	0.205
Market Distance	0.015	0.106	-0.002	0.358	-0.002	0.506
_constant	-0.026	0.972	1.085***	0.000	1.022***	0.000
	No. of obs = 50		No. of obs = 303		No. of obs = 353	
	LR chi ² (7) = 10.24		LR chi ² (7) = 90.59		LR chi ² (7) = 88.72	
	Prob > chi ² = 0.1756		Prob > chi ² = 0.0000		Prob > chi ² = 0.0000	
	Pseudo R ² = 0.0359		Pseudo R ² = 0.0454		Pseudo R ² = 0.0389	

*, **, ***, Denotes significance levels at 10%,5%,1% respectively

Table 4.10: Akaike's Information Criterion and Bayesian Information Criterion.

Model	Obs	ll (null)	ll(model)	df	AIC	BIC
Zero-truncated	353	-1141.099	-1096.740	8	2209.480	2240.412
Standard Poisson	353	-1141.703	-1098.000	8	2211.999	2242.931

The model results showed that all the variables included significantly ($Prob > Chi^2 = 0.000$) explained the observed determinants of consumer awareness on baobab products in urban and rural townships in Kenya. It was observed that age had a positive association with the product awareness level. The variable was significant ($p < 0.01$) across urban consumers and ($p < 0.1$) with rural consumer. Advancement in age by one year was expected to increase awareness level by 19.5% in urban areas

and 35.5% in rural areas. This implies that older consumers were more likely to be aware of a greater range of baobab foodstuffs and products compared to young consumers. The aged were exposed to various forms of sensitization such as health awareness, trust and use of indigenous herbs and organic food. As a result, there occurred shifts from conventional food to traditional food resulting to rise in awareness level. This observation is similar to that of Prabha, (2017), who noted a positive correlation between age and consumer awareness towards organic food in Coimbatore district, India. These results were also supported by (Jansen *et al.*, 2007; Adesina and Forson., 1995) who confirmed that older consumers were more aware of a variety of products due to accumulated experience on purchase.

The gender of the consumer was positive and significant ($p < 0.01$) across the urban consumers only. The study findings illustrated that male consumers were comparatively more aware and knowledgeable than their female counterparts'. The results support earlier findings by (Nabwire, 2016; Kimenju *et al.*, 2005; Tzimitra-Kalogianni, 2002)

Group membership was found to be positive and significant ($p < 0.01$) for urban consumers. This implies that not being in a group, increases the product awareness level by 34.6 % in urban consumers given other factors kept constant. Group membership provides a link to access of a variety of information that is vital in baobab foodstuffs and product awareness. Through nutritional groups, members get to exchange ideas, participate in health nutritional training, seminars, and sensitization on a variety of use of baobab products and their benefits to human health. The education level of the consumer was negative and significant ($p < 0.01$) in rural areas, whereas in urban areas it was positive and significant ($p < 0.1$). An increase in consumers' years in formal education by one year was associated with a decrease in the probability of being aware by 0.15% in the urban area however in rural markets formal education increased the probability of being aware by 8%. Formal education in urban areas is expected to bring about shifts in dietary patterns. A shift occurs from the consumption of traditional foods to conventional foods leaving behind the traditional food.

This study had earlier hypothesized that level of income, education level, group membership, age, gender, market distance, and group membership have no significant effect on awareness of baobab products. The results of the Wald test, however, found out that, age ($p < 0.01$) in urban and ($p < 0.1$) in rural, gender ($p < 0.01$), education level; ($p < 0.05$) rural, ($p < 0.1$) urban and group membership ($p < 0.01$) had statistically significant effect on consumer awareness. The null hypothesis that level of income, education level, group membership, age, and gender have no significant effect on awareness of baobab products was therefore rejected. Overall, the model results showed the consumer awareness was positively influenced by the age of the respondent, gender of the respondent, number of years in formal education and group membership.

4.3 Factors influencing purchase frequency

4.3.1 Factors influencing purchase frequency on baobab candies

Determinants of purchase frequency were assessed by estimating both the Standard Poisson model and Negative Binomial Poisson regression models. The dependent variable was purchase frequency (number of times the consumer had purchased the product over the last month). Mean deviance and Pearson Chi-square ratio was used to assess the goodness-of-fit of the Poisson model. The estimated mean Deviance and Pearson Chi square for the model was as shown below.

$$\text{Mean Deviance} = \text{Deviance goodness-of-fit/df} = 2583.937/280 = 9.2283$$

$$\text{Pearson } Chi^2 \text{ ratio} = \text{Pearson goodness-of-fit/df} = 3127.123/280 = 11.1683$$

The results showed that both, Mean Deviance and Pearson Chi^2 ratios are significantly greater than one indicating evidence of overdispersion. Therefore, the Standard Poisson model did not fit the data well. The results of Akaike's information criterion and Bayesian information criterion were presented in Table 4.11.

Table 4.11: Akaike's information criterion and Bayesian information criterion

Model	Obs	ll(null)	ll(model)	df	AIC	BIC
Standard Poisson	289	-2131.781	-1859.693	9	3737.387	3770.385
Negative Binomial regression	289	-1028.509	-998.478	10	2016.956	2053.620

According to Schwartz (1978) and Dziak *et al.* (2019), models with lower values of either Akaike's Information Criterion (AIC) or Bayesian Information Criterion (BIC) indicate a better fit for the data. Therefore, the results in Table 4.11 established the Negative Binomial regression model to be more appropriate for data analysis.

The discussion in Table 4.12 was based on results from the Negative Binomial Regression model. The overall model results show that all variables included in the model significantly ($\text{Prob} > \text{Chi}^2 = 0.000$) explained the observed baobab candies' purchase frequency. The product price variable had a negative significant ($p < 0.01$) influence on purchase frequency. This implies that the likelihood of purchasing baobab candies decreases with an increase in the product price. Purchase frequency was used an index for quantities demanded. According to economic theory, the price of a commodity price is usually inversely related to the quantity demanded. Conversely, the quantity of goods demanded falls as the price rises and vice versa. Therefore, the study findings agree with the law of demand.

Table 4.12: Factors influencing purchase frequency on baobab candies in urban and rural markets of Kenya: Standard Poisson Regression and Negative Binomial regression model estimates.

Dependent variable = Frequency of purchase per month	Standard Poisson		Negative Binomial	
	Coef.	$P> z $	Coef.	$P> z $
Log of Income	-0.006	0.762	-0.005	0.949
Log of Product Price	-0.282***	0.000	-	0.000
			0.299***	
Years of schooling	-0.024***	0.000	-0.019	0.177
Group membership	0.229***	0.000	0.202**	0.050
Log of household size	0.144***	0.000	0.189**	0.028
Years of product purchase	0.007***	0.000	0.007	0.197
Knowledge on nutrition	0.123***	0.000		0.004
			0.138***	
Market distance	0.002	0.167	0.004	0.386
_cons	3.076***	0.000	2.932***	0.000
	No. of obs. = 289		No. of obs. = 289	
	Prob > chi ² = 0.0000		Prob > chi ² = 0.0000	
	Pseudo R ² = 0.1276		Pseudo R ² = 0.0292	

Baobab candy consumers' are empirically sensitive to price change. It is worthy to note and focus on pricing when developing a product. Affordable product pricing will positively influence baobab demand. Wekeza and Sibanda (2019) and Marian *et al.* (2014) also observed similar findings. The authors argued out that high priced products result in less repeated purchases compared to low priced organic products. Group membership was found to be positive and it significantly ($p<0.05$) influenced purchase frequency on baobab candies. Belonging to a group increases the likelihood of purchasing baobab candies by 20.2%. Groups promote ideas and knowledge exchange on baobab products. Group dynamics influence consumer behavior in

many ways specifically by the patterns of interaction. While the reference group changes the individual lifestyle purchasing behaviour.

Household size significantly ($p < 0.05$) influenced purchase frequency. Households with large membership were more likely to increase the purchase frequency and quantities compared to the smaller households. Household size was used a proxy of quantity demanded and it was anticipated that large household size demands more quantities, which result in an increase in the frequency of purchase. The results are in agreement with recent studies by Kimambo *et al.* (2018) who observed that an increase in the household size increases the frequency of intake of TAV's in Tanzania. Rimal and Fletcher (2003) also found out that large households were likely to buy pretzels and popcorn more frequently than were those with smaller households in the United States (U.S.)

Knowledge on the nutritional value on baobab candies was found to be positive and significantly ($p < 0.01$) influenced the frequency of purchase and consumption of baobab candies. An increase in nutritional knowledge level by a unit would contribute to an increase in the frequency of purchase by 13.8 %. This finding was in agreement with the study expectation. Consumers who were informed and knowledgeable about the nutritional value of baobab products were likely to purchase more. Results from Omotesho *et al.* (2013) complement these findings, consumers who were knowledgeable on baobab products and their benefits were more likely to put into use. The results of the Wald test rejected the null hypothesis that income level, product price, education level, group membership, household size, years of product purchase, nutritional knowledge, and consumer's distance to the nearest point of purchase have no significant influence on the frequency of purchase on baobab candies. The results yielded a P - value of 0.000.

4.3.2 Factors influencing purchase frequency on Baobab pulp

Factors influencing purchase frequency was assessed by estimating both Standard Poisson distribution and Negative Binomial Poisson regression models. The dependent variable was purchase frequency (number of times the consumer

purchased the product over the last one month). Mean deviance and Pearson Chi-square ratio were used to assess the goodness-of-fit of the Poisson model. The estimated mean Deviance and Pearson Chi-square for the model was shown below.

$$\text{Mean Deviance} = \text{Deviance goodness-of-fit/df} = 101.8775/64 = 1.5938$$

$$\text{Pearson } \textit{Chi}^2 \text{ ratio} = \text{Pearson goodness-of-fit/df} = 103.0029/64 = 1.6094$$

The results showed that Mean Deviance and Pearson Chi-square ratios are significantly greater than one (Mean Deviance and Pearson Chi-square ratios > 1) indicating evidence of overdispersion. Therefore, the Standard Poisson model does not fit the data well. The results of Akaike's information and Bayesian information criterion were presented in Table 4.13.

Table 4.13: Akaike's Information Criterion and Bayesian Information Criterion

Model	Obs	ll(model)	df	AIC	BIC
Standard Poisson	64	-123.7924	9	265.5847	285.0147
Negative Binomial	64	-116.7411	10	253.4823	275.0711

As previously stated, lower values of either Akaike's Information Criterion (AIC) or Bayesian Information Criterion (BIC) indicates a better fit. Therefore, the results established the Negative Binomial regression model as a better fit for the data. The discussion in Table 4.14 was based on results from the Negative Binomial Poisson model.

The model results showed that all variables included significantly (Prob > Chi²=0.000) explained the observed baobab pulp purchase frequency. The product price variable had a negative significant (p<0.01) association with purchase frequency. The likelihood of purchases decreases by 54% when the price of the pulp increase by 1Ksh. These results are consistent with earlier studies by Finzer *et al.* (2013), which illustrate that price is inversely related to the purchase and

consumption of fruits and vegetables in South Delhi. Therefore, pricing decisions in product development should take into consideration consumers' reactions.

Table 4.14: Factors influencing purchase frequency on Baobab pulp in Urban markets: Standard Poisson and Negative Binomial Poisson model estimates

Dependent variable = Frequency of purchase per month	Standard Poisson		Negative Binomial	
	Coef.	P> z	Coef.	P> z
Log of Income	-0.007	0.713	0.036	0.906
Log of Product Price	-	0.000	-0.541***	0.000
Years of schooling	-	0.007	-0.067**	0.028
Group Membership	0.279	0.273	0.243	0.450
Log of Household size	0.390*	0.017	0.320	0.126
Years of product purchase	-	0.052	-0.015	0.103
Knowledge on nutrition	-0.054	0.472	-0.025	0.798
Distance to the market	-0.011	0.504	-0.015	0.462
_cons	3.089**	0.013	3.515**	0.036
	No. of obs	= 64	No. of obs	= 64
	Wald chi ² (8)	= 58.49	Wald chi ² (8)	= 37.37
	Prob > chi ²	= 0.0000	Prob > chi ²	= 0.0000
	Pseudo R ²	= 0.2188	Pseudo R ²	= 0.1319
			Dispersion	= Mean

*, **, ***, Denotes significance levels at 10%, 5%, 1% respectively

Even though baobab pulp is nutritive, consumers still consider baobab pulp as an inferior good. The relationship between education level and purchase frequency on baobab pulp was not only negative but also statistically significant ($p < 0.05$). This implied that, the more the people get educated, the less the purchases of baobab pulp. This result correlates with that of Fungo *et al.* (2018) who found out that education level was inversely related to purchasing and consumption of nutrient-rich forest products in Cameroon. This study had earlier hypothesized that income level, product price, education level, group membership, household size, years of a product purchase, nutritional knowledge and distance to the nearest point of purchase jointly

have no significant influence on the frequency of purchase on baobab pulp. The results of the Wald test rejected the null hypothesis that income level, product price, education level, group membership, household size, years of a product purchase, nutritional knowledge and distance to the nearest point of purchase jointly have no significant influence on the frequency of purchase on baobab pulp. The results yielded a p-value of 0.000

4.4 Consumer attitudes towards Baobab products

4.4.1 Baobab candies consumers

To gauge consumer attitudes, respondents were given a series of attitudinal statements regarding consumption and utilization of baobab products. The attitudinal statements were all read to the consumer and thereafter the consumer was asked to rank the statements based on the 5-point Likert scale with the scale ranging from strongly disagree to strongly agree (1 for strongly disagree and 5 for strongly agree).

As Table 4.15 suggests, most consumers expressed positive attitudes towards baobab candies. Consumers interviewed expressed a strong positive attitude with regard to statements on baobab candies taste (84.08%), income value (76.82%), cultural perception on the consumption of baobab candies (71.63%), and strongly disagreed with myths on baobab candies being poor man's diet (77.85%). Along with attitude, consumers were moderately positive with statements on baobab candies nutrient content (43.94 %) and perception on age group (37.02%), freshness (47.06 %) trust, (33.91%), affordability (31.14%). However, 17.65% of the respondents were of a contrary opinion, as they strongly disagreed that the products are readily available in the market.

Table 4.15: Consumers Attitudes towards Baobab candies consumption

Attitudinal statements	Percentage of the consumers within the response				
	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
Baobab candies products are tasteless.	84.08	7.96	3.11	2.08	2.77
Consumption of baobab candies make a difference in my health.	37.72	23.18	16.96	12.8	9.34
Baobab candies are good for all age groups.	3.11	12.11	3.81	37.02	43.94
I consume baobab candies simply because of their freshness.	1.38	4.84	13.49	47.06	33.22
I do not trust how baobab candies are processed.	33.91	29.07	11.07	14.19	11.76
Consumption of baobab candies is a poor man's diet.	77.85	17.3	0	2.42	2.42
Our cultural values influence the consumption of baobab candies related products.	71.63	19.03	0	5.54	3.81
Consuming baobab candies products improve incomes for the locals.	0.69	0	0	22.49	76.82
Baobab candies food prices are very affordable.	0	1.04	2.08	38.06	58.82
Baobab candies products are readily available in my local market.	17.65	15.22	6.92	29.07	31.14
Consuming a variety of baobab candies give enough nutrients necessary to my body.	30.45	32.53	22.49	9.34	5.19

The idea of latent dimensions underlying different variables measuring consumer attitudes is usually not apparent. Hence, factor analysis was employed to explore the links between the observed variables and the latent constructs (factors) and to identify the factor structure. Factor analysis was selected due to its powerful statistical nature of scrutinizing relationships between latent and observed variables (Tavakol, *et al.*, 2011). Data analysis followed two-steps; step one involved exploratory factor analysis (EFA) with varimax rotation approach, which described how and to what extent do the latent constructs relate to the observed variables and

generate a factor structure/model from the set of attitudinal statements. According to Henson and Roberts (2006) factors with Eigen-value greater than 1.0 should be retained.

Hogarty *et al.* (2005) recommended factor coefficients/loading of 0.40 or greater is necessary for interpretation of factor structure. While Stevens (2002) suggested a difference of 0.20 between the factor loadings for them to be unique. Step two involved grouping together variables with large loadings on the same factor. Figure 4.1 indicated the usual cut off for retaining principal components/Factor components and showed that components 6 through to 11 were not important i.e the Eigenvalue was less than 1.

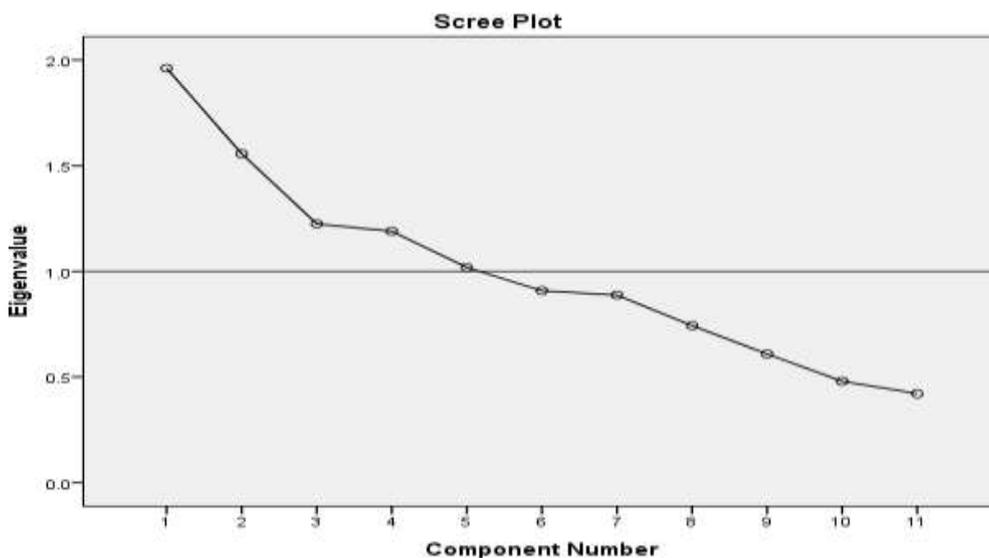


Figure 4.2: Consumers Eigenvalue Vs Factor number/Component number

Table 4.16: Results of Exploratory Factor Analysis on Baobab Candies consumers

Factor and item description	Factor Loading	% Variance explained
Factor 1. Health, nutritive value and cultures		16.91
Baobab candies food products make a difference in my health	0.810	
Consuming a variety of baobab candies products give enough nutrients necessary to my body	0.786	
Our cultural values influence the consumption of baobab candles related products	0.585	
Factor 2. Availability and freshness		12.91
Baobab candies products are readily available in my local market	0.833	
I consume baobab candies food products simply because of their freshness	0.688	
Factor 3. Taste and income value		11.613
Consuming baobab candies products improve incomes for the locals	-0.757	
Baobab candies products are tasteless	0.510	
Factor 4. Product processing and pricing		11.282
Baobab candies food prices are very affordable	0.700	
I do not trust how baobab candies food products are processed	0.692	
Factor 5. Age and product perception		10.479
Baobab candies food products are good for all age groups	-0.775	
Consumption of baobab candies food products is a poor man's diet	0.571	
Total Variance explained		63.191

The Kaiser-Meyer-Olkin Measure of Sampling Adequacy (KMO) obtained was 0.54; this showed that the data was reasonably appropriate for factor analysis. Three statements testing attitudes towards health, nutritive value and culture attitude were loaded on factor 1 with close correlation coefficients of 0.81, 0.79 and 0.59. This factor was labelled ‘health, nutritive value and cultures’, since it touched on consumers’ perception on health effects and nutritive value from consumption on baobab candies. The factor accounted for 16.91% of the total variance. The higher score from the factor 1 implies that there is need for consumers’ sensitization on nutritive value of baobab products and demystifying the culture myths surrounding baobab consumption.

Factor 2 was termed as 'availability and freshness'. It composed of statements on product freshness and product availability in the local market. The factor had a cross correlation of 0.83 and 0.69 and it accounted for 12.91% in total variance.

Factor 3 had a close correlation coefficient of 0.75 and 0.51 and it accounted for 11.61% of the total variance. Attributes on product taste and importance of product consumption to income of the locals were loaded into this factor and was named 'taste and income value'.

The attributes covering aspects such as trust of food processing and product price affordability were loaded into factor 4 with a close correlation of 0.70 and 0.69. It accounted for 11.28% of the total variance. This factor was labeled 'product processing and pricing' as it focused consumers trust on production process and price affordability.

Factor 5 had a cross correlation coefficient of 0.78 and 0.57 this factor was labelled 'age, product and perception'. It accounted for 10.48% of total variance.

Overall, cumulative on percentage variance explained across factors totaled to 63.19%.

4.4.2 Baobab pulp consumers'

In order to gauge consumer attitudes among pulp consumers, respondents were given a series of attitudinal statements regarding consumption and utilization of baobab pulp. The attitudinal statements were all read to the consumer and thereafter the consumer was asked to rank the statement basing on the 5-point Likert scale with the scale ranging from strongly disagree to strongly agree (1 for strongly disagree to 5 for strongly agree). Descriptive results from the analysis on attitudinal response were shown in Table 4.17.

Table 4.17: Consumers Attitudes towards Baobab pulp consumption

Attitudinal statements	Percentage of consumers' within the response				
	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Baobab pulp is tasteless.	67.19	4.69	1.56	12.50	14.06
Consumption of baobab pulp make a difference in my health.	9.38	6.25	12.50	40.63	31.25
Consumption of baobab pulp is good for all age groups.	1.56	1.56	1.56	51.56	43.75
I consume baobab pulp because of their freshness.	0.00	7.81	6.25	75.00	10.94
I do not trust how baobab pulp is processed.	35.94	29.69	14.06	17.19	3.13
Consumption of baobab pulp is a poor man's diet.	89.06	3.13	0.00	4.69	3.13
Our cultural values influence the consumption of baobab pulp related products.	57.81	9.38	1.56	18.75	12.50
Consuming baobab pulp and pulp related products improve incomes for the locals.	3.13	0.00	6.25	76.56	14.06
Baobab pulp prices are very affordable.	6.25	14.06	7.81	64.06	7.81
Baobab pulp products are readily available in my local market.	20.31	15.63	1.56	56.25	6.25
Consuming a variety of baobab pulp give enough nutrients necessary to my body.	23.44	6.25	10.94	40.63	18.75

In Table 4.17, baobab pulp consumers expressed positive attitude towards baobab pulp consumption. A considerable number of respondents (67.4%) strongly disagreed that baobab pulp is tasteless. However, 40.3% and 40.73% of the respondents agreed that consuming baobab pulp makes a difference in their health and supply essential nutrients to their bodies respectively. A substantial percentage 51.56% agreed that baobab is good for all age groups. Interestingly, 75% of respondents strongly agreed that they consume baobab pulp simply because of their freshness, while 35.94%

strongly agreed and trusted how baobab pulp are processed. Apparently, 89.6 % of the respondents strongly disagreed that baobab pulp is a poor man's diet, while 56.25% and 75.6% agreed that baobab prices are available in their local market and their consumption of baobab pulp improves the incomes for the local producers' respectively. Pulp consumers in the high-end market like Karen and Central business district have a perception that the more they consume baobab pulp, the higher the income for farmers in Ikutha, Kibwezi, Mwingi and Kitui. Fifty-seven percent (57.81%) strongly disagreed on the existence of cultural values that influence consumption of baobab pulp. In most cases, cultural values have a lot of influence on food consumption. However, baobab pulp was consumed mostly in the middle and upper markets where most people are educated and have relatively high income. These markets also tend to be highly cosmopolitan, so culture does not bind people.

Exploratory factor analysis was used in the selection and grouping of variables that influence consumer attitudes into factor components. Prior to extraction, the Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy and Bartlett's test were run to ensure the suitability of conducting factor analysis. The KMO obtained was 0.41 and Bartlett's test of Sphericity $\chi^2 (55) = 148.53, p < 0.001$. $KMO < 0.5$ is an indication of large partial correlation. However, it is important to realize that baobab pulp market in Kenya is nascent stage and still developing. Expectation are that there are still some facets of the market that are not fully functional hence, few aspects of statistics and economic theory may not yet be applicable. Therefore, the market data collected showing KMO of 0.41 compared to cut point of 0.5 was remotely considered marginally appropriate for factor analysis. Factor components were generated based on a correlation matrix rotated using a varimax rotational approach to eliminate multi-collinearity among factor components. An Eigen-value greater than one rule was applied in identifying the number of factors. Figure 4.2 indicated the usual cut off for retaining principal components/Factor components and showed that component 5 through to 11 were not important i.e the Eigen value were less than 1. The variables that had large loadings on the same factors were grouped together as shown in Table 4.18.

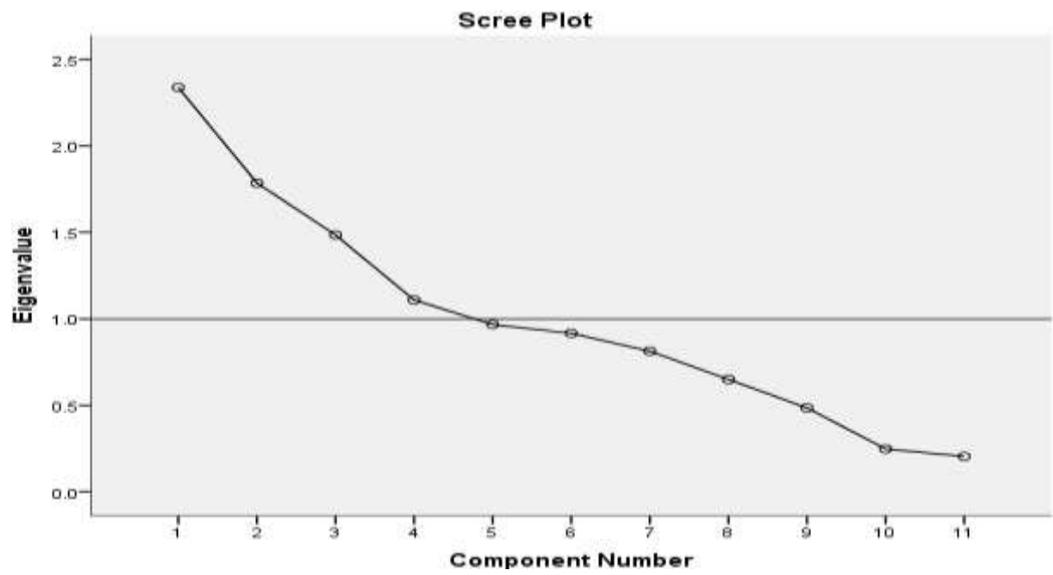


Figure 4.3: Consumers Eigenvalue Vs Factor number/Component number

Table 4.18: Results of Exploratory Factor Analysis on Baobab pulp consumers

Factor and item description	Factor Loading	% Variance explained
Factor 1. Availability, affordability and income value		18.80
Baobab pulp prices are very affordable	0.901	
Baobab pulp products are readily available in my local market	0.796	
Consuming baobab pulp products improve incomes for the locals	0.603	
Factor 2. Trust, taste and nutritive value, cultural perception		14.79
Consumption of baobab pulp food products is a poor man's diet	0.773	
I do not trust how baobab pulp food products are processed	-0.599	
Baobab pulp products are tasteless	0.548	
Baobab pulp provide enough nutrients necessary for my body	-0.544	
Factor 3. Cultural values and health difference		14.00
Our cultural values influence the consumption of baobab pulp related products	0.787	
Baobab pulp make a difference in my health	0.648	
Factor 4. Age and freshness		13.47
Baobab pulp is good for all age groups	0.677	
I consume baobab pulp food products simply because of their freshness	-0.605	
Total variance explained		61.06

Three attitude variables concerning availability, affordability and income value to local were loaded on factor 1 with the cross-correlation coefficients of 0.90, 0.80 and 0.60 respectively. This factor was termed “availability, affordability and income

value” of baobab pulp because these variables involved product affordability, availability and income value load higher in this factor compared to other attitudinal statements. Factor one accounted for 18.80 % of the total variance. Such high scores in this factor imply that it is important to consider baobab products pricing, placement and increasing purchase price for producers and local traders for efficient utilization.

The second factor was “trust and nutritive value” which had cross-correlation coefficients of 0.77, 0.60, 0.55 and 0.54 respectively. These statements focused mainly on consumer trust and product taste, nutritive value, and cultural perception. This factor was indicative of the importance of maintaining consumer trust and product taste as well as nutritional value. The factor accounted for 14.79% of the total variance. This is in consonance with Thøgersen (2007) who reported that attitudes towards organic food consumption depend primarily on beliefs about consequences. Baobab pulp is mostly utilized for medicinal purposes as well as an organic food supplement in the upper markets like Karen. Therefore, trust and its nutritive value are of great concern.

Factor 3 was “cultural values and health difference”. Two items with a close correlation coefficient of 0.79 and 0.65, was loaded into this factor. These attributes focused on the influence of cultural values on baobab pulp consumption and the health difference it has on consumers’ bodies. This factor accounted for 14.00% of the total variance. The fourth factor had a cross-correlation coefficient of 0.68 and 0.61. This statement was labeled “age and freshness” and it accounted for 13.7% of the total variance. The cumulative percent of variance for all the four factors explained was 61.06%. Exploratory factor analysis pointed out key factors that influence consumer attitude towards baobab pulp. These are; product availability, pricing, and producers’ income value. This is essential during product development and promotion.

CHAPTER FIVE

SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.1 Summary

Baobab tree offers a great opportunity for livelihoods in arid and semi-arid areas through income generation, poverty alleviation, and nutritional security Ifeyinwa et al., . African baobab not only contributes to people's livelihood but also is a cheap and quality source of nutrition for both urban and rural consumers. Many parts and products from baobab trees are used as food, especially for populations in ASAL areas of Kenya experiencing falling nutritional security and rising poverty levels (Muok, 2019). According to nutrition composition studies, baobab fruit pulp is an excellent nutrient source. It is enriched with vitamin C (ascorbic acid 300 mg per 100 g pulp), calcium (307 to 2640 mg/100 g dw), lipids (11.6 to 33.3 g/100 g dw), carbohydrates (76 mg/kg) and proteins (2.20 ± 0.220 g/100 g dw) (Muthai *et al.*, 2017; Venter and Witkowski, 2013; Alercia, 2013; Mwema *et al.*, 2012; Chadare *et al.*, 2008 and Vertuani *et al.*, 2002). With regard to its vitamin content, the pulp is used for prebiotic and antioxidant functions (Bosch et al., 2004). Furthermore, the tree contributes to livelihood generation in both urban and rural populations. Trade in baobab fruits and fruit pulp-on-seed generate cash income to supplement household food budgets.

However, there is a dearth of information on the product and consumer market. An observation of the market gives one an impression of markets characterized by a weak value chain with few products and actors. As a result, its potential remains underutilized and underexploited. This study sought to establish consumers' level of awareness and nutritional knowledge on baobab products as well as their determinants, factors influencing the frequency of purchase and their attitude towards baobab products. Descriptive statistics were used to describe consumers' characteristics, consumers' awareness level and their nutritional knowledge. Poisson regression techniques were used to determine the factors influencing awareness on baobab products and purchase frequency on baobab products. In particular, Standard

Poisson regression and Zero-truncated Poisson, regression were employed to determine factors influencing consumer awareness on baobab products. While Negative Binomial regression model was used to determine factors influencing purchase frequency on baobab products. The study further used descriptive analysis and exploratory factor analysis on consumers' attitudes towards baobab products. The data used were collected through a cross-sectional interview survey targeting 353 consumers across two market segments purposively selected to represent the two baobab consumer groups namely, urban and rural consumers.

5.2 Conclusion

In conclusion, awareness and knowledge on nutrition was generally low. In comparison, nutritional knowledge was high among the urban consumers compared to rural consumers, (mean nutritional score; 1.76 and 1.24 for urban and rural respectively). With regard to awareness on products, Baobab candies, pulp and porridge are examples of well-known products. However, a considerable percentage of products remain unknown in rural markets. They include; chocolate, cosmetics, sodas, chutneys, sauce, and alcoholic drinks. On average, the mean awareness score was five products in both rural and urban markets. Poisson regression analysis revealed four variables that significantly influenced consumer awareness of baobab products. Age, gender and group membership had a positive statistical significant influence on baobab product awareness while education level had a negative influence. Weekly purchases (45%) was the most preferred pattern of purchase. The frequency of purchase on baobab pulp was negative and significantly influenced by price and education level. While the frequency of purchase on baobab candies was positively influenced by household size, group membership, and knowledge on nutrition. However, product price had a negative correlation with purchase frequencies on baobab candies.

In general, a considerable percentage of consumers interviewed expressed positive attitudes towards baobab products. Positive attitudes towards baobab products are of great theoretical and practical importance. It demystified our perception that baobab

product is a poor man's diet. This is probably because of the entry of Non-Governmental organisations (NGO's), Trust for indigenous culture and health, Health and Nutrition campaigns championing healthy living and trust for organic products.

Information asymmetry brought about market failures, i.e. the products were unavailable, occasioning high prices, particularly for baobab pulp consumers.

5.3 Recommendation

The first measure in improving consumer awareness and nutritional knowledge will be through sustained improvement on product labeling, certification, and freshness. Such measure will increase product awareness and knowledge, thus initiating an expansive demand which is vital in baobab value chain development.

The second measure will be achieved through community sensitization on the variety of baobab products, products use, nutritional value, product value addition, and economic value in both local and international markets. This can be accomplished through formal and informal education, health and nutrition campaigns held by the government or non-governmental organization. Age was found to be the most influential factors shaping consumer awareness level. Most of the younger generations are exposed to modern communication channels. To reach out to the younger consumers, sensitization campaigns should target numerous modern communication channels such as the internet, Facebook and school programs and health clubs.

Lastly, consumers are urged to join groups. Nutritional groups provides links to access to a variety of information that is vital in baobab products awareness level. Through nutritional groups, members get to exchange ideas, participate in health nutritional training, seminars, and sensitization on a variety of use of organic products and their merits on human health. Financial groups also provide credit access, which boosts consumers' purchasing power hence cushioning the consumer against high prices.

5.4 Area for further research

This study focused on consumer awareness, attitude towards baobab products and demand, and documented interventions which were supported statistically. Future studies should focus on profitability analysis on baobab value addition and whether it can increase revenue to the smallholders in the baobab growing belt and the association between consumption of baobab and health effects. Such future studies can justify the need for enhancing the utility of the tree.

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APPENDICES

Appendix I: Questionnaire

CONSUMER'S INTERVIEW INFORMATION		BAOFOOD-CONSUMER SURVEY
<p>WE ARE A TEAM OF RESEARCHERS FROM JOHNS Hopkins UNIVERSITY OF AGRICULTURE AND TECHNOLOGY, IN COLLABORATION WITH SHINE (SAAI) UNIVERSITY OF APPLIED SCIENCES. WE ARE DOING A RESEARCH ON: FACTORS INFLUENCING CONSUMPTION OF BAOBAB FOOD PRODUCTS AND HOW FOOD SECURITY CAN BE IMPROVED THROUGH BAOBAB UTILIZATION IN KENYA. ALL THE INFORMATION WILL REMAIN ANONYMOUS AND CONFIDENTIAL. IF YOU ACCEPT TO PARTICIPATE IN THE INTERVIEW, YOU CAN DECIDE TO WITHDRAW AT ANY MOMENT WITHOUT PROVIDING A REASON. AT ANY TIME IN THE FUTURE, YOU CAN REQUEST TO CANCEL YOUR DATA FROM THE SURVEY BY CONTACTING THE STUDY SUPERVISOR (I WILL GIVE YOU HER / HIS ADDRESS AT THE END OF THE INTERVIEW). THE DATA COLLECTED WILL BE USED FOR ACADEMIC PURPOSES ONLY!</p> <p>The survey interview will require about 10-15 minutes.</p> <p>I now request your permission to begin the interview.</p> <p>Permission given? <input type="checkbox"/></p> <p>Yes = 1 [] No = 0 [] (If yes → Proceed To The Next Question)</p> <p>1. → Do you or your household normally purchase and consume Babab food product? Yes = 1 [] No = 0 [] (If yes proceed to Q2)</p> <p>2. → Are you one of the primary food shoppers in your household? Yes = 1 [] No = 0 [] (If yes proceed to Q3)</p> <p>3. → Who is mainly concerned with household decision making with regard to purchasing? []</p> <p>Code: 1=Head, 2=Spouse, 3=Child, 4=Helper, 5=Relative 6=Other (Specify) []</p>		
Section A		
<p>INT1. Type of the consumer ----- Select one ([])</p> <p>(1) Rural-Township (2) Urban =</p> <p>Interviewer's Name (Optional) =</p>	<p>INT2. Consumer ID [] =</p> <p>County =</p>	
<p>INT3. Day / month / year of interview</p> <p>..... / / 2018 []</p> <p>INT3 (a) Interview start time: (hh:mm) []</p> <p>..... (b) Interview end time: (hh:mm) []</p> <p>..... Time Taken: =</p>	<p>INT4. (a) County: []</p> <p>..... (b) Market: []</p> <p>Market code (Code: 1 = Eastleigh, 2 = Kasarani, 3 = Kileleshwa, 4 = Mwekka Town, 5 = Sarit Centre, 6 = Jomo Kenyatta)</p> <p>County Code (1 = Nairobi, 2 = Kisumu, 3 = Mombasa)</p> <p>INT5 Is the market a permanent market? <input type="checkbox"/></p> <p>→ Yes = 1 [] No = 0 [] =</p>	
<p>INT6 Distance to the consumers' household []</p> <p>INT6a In minutes (Probe the means of transport and approximate the time) []</p> <p>INT6b In km (Probe the distance to consumers' residence) []</p> <p>INT7a. Consumers' phone number: (Optional) []</p> <p>..... []</p> <p>..... []</p> <p>..... []</p> <p>..... []</p>	<p>INT8. GIS Coordinates of the interview location</p> <p>Record the coordinates, Precision < 60 []</p> <p>INT8a. Latitude: []</p> <p>INT8b. Longitude: []</p> <p>Record any observations on the GPS data collection (e.g., any landmark such as Shopping mall, Mosque, street) []</p> <p>INT8c. NOTES: []</p> <p>..... []</p> <p>INT8d. Where was the interview conducted (Place of purchase) []</p> <p>-1 = <input type="checkbox"/> Open market stall 5 = <input type="checkbox"/> Umbrella shop []</p> <p>-2 = <input type="checkbox"/> Retail shop 6 = <input type="checkbox"/> Organic Shops []</p> <p>-3 = <input type="checkbox"/> Wholesale Shop 7 = <input type="checkbox"/> Health Centre []</p> <p>-4 = <input type="checkbox"/> Stall / Vendor in Food market 8 = <input type="checkbox"/> Large Distributor =</p>	
<p>Notes. []</p> <p>[]</p> <p>[]</p>		

Section B - Consumers Knowledge and Awareness.

(Notes: This section seeks to examine the extent to which the consumer is aware of various baobab products and product uses and level of knowledge on their nutritional value.)

Consumer Awareness-product

(Consumer awareness is the state of being conscious or recognition of existence of a product.)

(Allow the respondent to talk freely and take some notes as the conversation proceeds. Use active listening techniques and, if needed, use some probes to help the conversation proceed.)

INCA1: We would like to know whether you are aware of the following Baobab products provided below and if you've ever used the product.

	Baobab products	Aware of the products	Used the products
1.	Bark-related products		
a	Ropes	Yes=1 [] No=0 []	Yes=1 [] No=0 []
b	Baskets	Yes=1 [] No=0 []	Yes=1 [] No=0 []
c		Yes=1 [] No=0 []	Yes=1 [] No=0 []
d		Yes=1 [] No=0 []	Yes=1 [] No=0 []
2.	Leaves-related products		
a	Vegetables	Yes=1 [] No=0 []	Yes=1 [] No=0 []
b		Yes=1 [] No=0 []	Yes=1 [] No=0 []
c		Yes=1 [] No=0 []	Yes=1 [] No=0 []
3.	Seed-related products		
a	Cooking oil	Yes=1 [] No=0 []	Yes=1 [] No=0 []
b	Massage oil	Yes=1 [] No=0 []	Yes=1 [] No=0 []
c		Yes=1 [] No=0 []	Yes=1 [] No=0 []
d		Yes=1 [] No=0 []	Yes=1 [] No=0 []
4.	Pulp-related products		
a	Biscuits	Yes=1 [] No=0 []	Yes=1 [] No=0 []
b	Pomjige	Yes=1 [] No=0 []	Yes=1 [] No=0 []
c	Cakes	Yes=1 [] No=0 []	Yes=1 [] No=0 []
d	Yoghurt	Yes=1 [] No=0 []	Yes=1 [] No=0 []
e	Chocolate	Yes=1 [] No=0 []	Yes=1 [] No=0 []
f	Sweets/ tablets	Yes=1 [] No=0 []	Yes=1 [] No=0 []
g	Juices	Yes=1 [] No=0 []	Yes=1 [] No=0 []
h	Smoothies	Yes=1 [] No=0 []	Yes=1 [] No=0 []
i	Ice-creams	Yes=1 [] No=0 []	Yes=1 [] No=0 []
j	Pharmaceutical products	Yes=1 [] No=0 []	Yes=1 [] No=0 []
k	Cosmetics	Yes=1 [] No=0 []	Yes=1 [] No=0 []
l	Sodas	Yes=1 [] No=0 []	Yes=1 [] No=0 []
m	Alcoholic drinks	Yes=1 [] No=0 []	Yes=1 [] No=0 []
n	Chutneys	Yes=1 [] No=0 []	Yes=1 [] No=0 []
o	Sauces	Yes=1 [] No=0 []	Yes=1 [] No=0 []
p	Energy bars	Yes=1 [] No=0 []	Yes=1 [] No=0 []
q	MARQUIS candies	Yes=1 [] No=0 []	Yes=1 [] No=0 []
r	Pulp/ Processed pulp	Yes=1 [] No=0 []	Yes=1 [] No=0 []
s	Others/ specify	Yes=1 [] No=0 []	Yes=1 [] No=0 []
t		Yes=1 [] No=0 []	Yes=1 [] No=0 []
5.	Waste-related products		
a	Firewood from shells	Yes=1 [] No=0 []	Yes=1 [] No=0 []
b	Bowls from shells	Yes=1 [] No=0 []	Yes=1 [] No=0 []
c	Others, specify	Yes=1 [] No=0 []	Yes=1 [] No=0 []
	Total awareness / use score		

Dependent variable = Total awareness / use score + Total Nutritional Knowledge score

Av. Consumer knowledge and awareness =

INCK2-Consumer Knowledge

(Consumers knowledge is the factual and interpretative information that leads to understanding or that is useful in making decisions or informed actions on a product)

Code (1 = if the consumer is knowledgeable on nutrition ; 0 = if the consumer is not knowledgeable on the nutrition)

1. Understanding of nutrition terms

(a) Think about day to day life. Do you understand what a balanced diet is?

Yes = 1 [] No = 0 []

If yes, explain what it is

(b) Please, mention five groups of foods that constitute a balance diet.

[Hint: proteins, carbohydrates, vitamins, fats, minerals]

2. Awareness of dietary recommendation

(a) Do you know the quantity of vitamins that one should consume per day?

Yes = 1 [] No = 0 []

(b) If yes, how much (it should be 400gm/day/person)

3. Knowledge of baobab food product as source of nutrients

(a) Are you aware of the nutrient content in baobab?

Yes = 1 [] No = 0 []

(b) If yes, mention the nutrients obtained from consumption of baobab products. (For the product which the consumer has just purchased)

4. Ability to apply nutritional knowledge on purchase choice decision

(a) Do you consider nutritional value of the baobab product before you purchase?

Yes = 1 [] No = 0 []

(b) If yes, which nutrients do you consider in baobab food product

5. Knowledge and Awareness of diet-diseases associations

(a) Are you aware of any nutritional related disease that can be cured through consumption of baobab food product?

Yes = 1 [] No = 0 []

(b) If yes, mention any two nutritional disorder cured by baobab

Total nutrition knowledge score =

Section-c. Purchasing and Consumption pattern.

1. (a) Do you purchase any baobab product in your household for consumption? Yes No

(b) If "Yes", go to number 3 of this section; if No, answer number 2a then stop here.

2. (a) If you do not purchase any of baobab product in your household, what is the reason for not consuming?

(b) Would you want to purchase any baobab food product in the future? Yes No

3. (a) Which one of the baobab products do you commonly purchase?

1 = Candies (Mabuyu) [-], 2 = Processed Baobab pulp [-], Other Specify [.....]

4. How often do you purchase the commodity? [.....]

1 = Daily, 2 = 1-2 times a week, 3 = 3-4 times a week, 4 = 5-6 times a week, 5 = daily, 6 = 2-3 times a month, 7 = Quarterly/ Once in 3 months, 8 = Other specify

5. Each time you come to purchase the product above in 3 (a) how many packets do purchase mostly and at how much?

Product	Unit of measure	Price	Quantities purchased	Frequency of purchase
1=Baobab candies				
2=Baobab pulp				

Code: [.....]

Unit of measurement: If Product 1 (1 = 20g, 2 = 55g, 3 = 50g, 4 = 230 g)

If Product 2 (5 = 75 g, 6 = 100g, 7 = 200g, 8 = 250 gm, 9 = Other specify)

Frequency of purchase 1 = Daily, 2 = 1-2 times a week, 3 = 3-4 times a week, 4 = 5-6 times a week, 5 = daily, 6 = 2-3 times a month, 7 = Quarterly/ Once in 3 months, 8 = Other specify

6. What is the main reason to why you consume the product above? (ask for the main reason)

[...] 1 = Just as a snack

[...] 2 = Because of its nutritive value

[...] 3 = Because other people are consuming it

[...] 4 = I consume it because of its medicinal value (Ability to cure some diseases /boost immunity)

[...] 5 = I consume it as 'day to day meal' / Dietary requirement

7. How many years have you been consuming the product above? (Mention the main product purchased, (e.g. Pulp, Candy).....)

8. (a) Thinking about your purchase and consumption pattern over the past three months or so, is there any change?

Yes = 1 [] No = 0 []

(b) if yes, what is the change? (increased consumption, decrease consumption)

9. Suppose you've gone to buy baobab product above, and you did not find it, which other two substitute product would you buy to satisfy your needs? (Mention the main baobab product that the consumer purchase and consume often)

Substitute 1 Price/unit

Substitute 2 Price/unit

10. I would like to ask you how important are the following food attributes in your purchase and consumption decision on baobab food products.

Food Attribute	Color	Taste	Brand	Packaging	Price	Availability
Baobab pulp						
Baobab Candies						

Code: (0 = Not important at all, 1 = slightly important, 2 = important, 3 = fairly important, 4 = extremely important)

11. (a) Are there cultural rules that influence consumptions of baobab food and related products?

Yes = 1 [] No = 0 []

(b) if yes, how do they influence? (Hint: Prohibit consumption, encourage consumption)

12. (a) Do you think something should be done to improve food products? Yes = 1 [] No = 0 []

(b) if yes, which improvement do you feel should be done? (Tick all that apply)

Product	Suggestion for improvement	Which is most required improvement
Baobab pulp		
Baobab candies		

Code: (1 = improve the packaging, 2 = introduce product fortification, 3 = improve the coloring, 4 = improve taste, 5 = improve the shelf life, 6 = improve size of packaging)

13. Please rank the three constraints which are most pressing needs in accessing baobab food products.

Constraint	Rank
Lack of adequate information	
High prices	
Market distance/Market access	

Code: (1 = most pressing, 2 = Neutral, 3 = least pressing)

Section D - Access to credit

14. (a) Did any of the household members tried to obtain access credit? Over the last one year? Yes = 1 [] No = 0 []

(b) If yes, what was the intended purpose? []

Code: 1 = Food Purchase/Primary consumption, 2 = School fees, 3 = Investment, 4 = Health or medical reason, 5 = Education, 6 = Other specify

(c) If you obtained/get the loan/credit who was the provider? []

Code: 1 = Bank/Formal credit institution, 2 = Shop/loan lender, 3 = Mobile credit (Mchwanji/Tala/Branch), 4 = Sacco, 5 = Micro-finance institution, 6 = Family and friends, 7 = Chama (merry-go-round), 8 = other specify

(d) If you tried to get/obtain the loan but did not get, what was the reason of not obtaining? []

1 = No collateral, 2 = Outstanding loan, 3 = Don't know, 4 = Lender lacked cash, 5 = N/A

(e) If you obtained the loan, did you benefit from the loan? Yes = 1 [] No = 0 []

Section E - Group membership

15. (a) Do you belong to any group or organization that provide different form of help or assistance? Yes = 1 [] No = 0 [] If yes, answer Q 15 (b)

15 (b)

Type of group (Tick) =	How many years have you been a member? =	How often do you hold meetings? (1 = weekly, 2 = Two weeks, 3 = monthly, 4 = Every 3 months) =	Benefits of the group Code: (1 = None, 2 = Education, 3 = Credit, 4 = Training on nutrition, 5 = market access) =
1. NGO []	=	[]	[]
2. Consumer group []		[]	[]
3. Self-help group []		[]	[]
4. Merry-go-round []		[]	[]
5. Trade []		[]	[]
6. SACCDs []		[]	[]

15 (c) If you are not a member of any group would you wish to join any group/organization in future? Yes = 1 [] No = 0 [] Not sure = 99 []

15 (d) If you can't join group, why?

Reason =	Response =	Rank =
I am not interested at all =	Yes = 1 [] No = 0 []	=
Groups have no or minimal benefits to me =	Yes = 1 [] No = 0 []	=
Groups have high financial obligation =	Yes = 1 [] No = 0 []	=
Groups have poor management =	Yes = 1 [] No = 0 []	=

Section F- Consumers attitude -¶

Notes-(Consumer attitudes are the outcome of the psychological process that reflects consumers' knowledge, assessment and views over a product based on previous or past purchase and consumption experience.)-¶

¶
16. Please consider the following list of statements carefully. In a scale of 5, how much do you agree or disagree with the statement below. ¶

-Code: (Please Tick appropriate, 5 = strongly agree, 4 = Agree, 3 = Neutral, 2 = Disagree, 1 = strongly disagree) ¶

Attitudinal statement =	Baobab pulp =					Baobab-candies (mabuyy) =				
	5=	4=	3=	2=	1=	5=	4=	3=	2=	1=
Health attitudes =										
Baobab products are tasteless =	3.A (-) =	A. (-) =	N. (-) =	D. (-) =	3.D (-) =	3.A (-) =	A. (-) =	N. (-) =	D. (-) =	3.D (-) =
Baobab food products makes a difference to my health e.g. boost immunity, strengthening of bones =	3.A (-) =	A. (-) =	N. (-) =	D. (-) =	3.D (-) =	3.A (-) =	A. (-) =	N. (-) =	D. (-) =	3.D (-) =
Baobab food products are good for all age group =	3.A (-) =	A. (-) =	N. (-) =	D. (-) =	3.D (-) =	3.A (-) =	A. (-) =	N. (-) =	D. (-) =	3.D (-) =
I consume baobab food products simply because of their Freshness =	3.A (-) =	A. (-) =	N. (-) =	D. (-) =	3.D (-) =	3.A (-) =	A. (-) =	N. (-) =	D. (-) =	3.D (-) =
I do not trust how baobab foods are processed =	3.A (-) =	A. (-) =	N. (-) =	D. (-) =	3.D (-) =	3.A (-) =	A. (-) =	N. (-) =	D. (-) =	3.D (-) =
Tradition attitudes =										
Consumption of baobab is a poor man's diet and for those with low income =	3.A (-) =	A. (-) =	N. (-) =	D. (-) =	3.D (-) =	3.A (-) =	A. (-) =	N. (-) =	D. (-) =	3.D (-) =
Our cultural values influence the consumption of baobab and baobab food-related products =	3.A (-) =	A. (-) =	N. (-) =	D. (-) =	3.D (-) =	3.A (-) =	A. (-) =	N. (-) =	D. (-) =	3.D (-) =
Market attitudes =										
Consuming baobab products improves the income of locals =	3.A (-) =	A. (-) =	N. (-) =	D. (-) =	3.D (-) =	3.A (-) =	A. (-) =	N. (-) =	D. (-) =	3.D (-) =
Baobab food prices are very affordable =	3.A (-) =	A. (-) =	N. (-) =	D. (-) =	3.D (-) =	3.A (-) =	A. (-) =	N. (-) =	D. (-) =	3.D (-) =
Baobab products are readily available in my local market =										
Nutrient attitudes =										
Consuming a variety of baobab food product gives enough nutrients necessary for my body =	3.A (-) =	A. (-) =	N. (-) =	D. (-) =	3.D (-) =	3.A (-) =	A. (-) =	N. (-) =	D. (-) =	3.D (-) =

¶

17. Section Q-Consumers-3000-demographic-characteristics

¶

Gender-¶ 1=Male=	Family-position=	Year-of-Birth¶ (Age)=	Marital-Status¶ (codes-below)=	Highest-level-of- formal-education=	Number-of-years-in- formal-education-schools=	Main- Occupation- (see-codes)=	Number-of- Household- members=
□	□	□	□	□	□	□	□

Codes:-¶

Gender.....(1=Male, 0=Female) ¶

Family-position---(1=Head, 2=Spouse, 3=Child, 4=Helper, 5=Relative, 6=Other (Specify).....)¶

Marital-status.....(1=Married, 2=Single, 3=Separated, 4=Divorced, 5=Widow-or-Widower)¶

Education-level..(1=No formal education, 2=Primary, 3=Secondary, 4=Middle-level college, 5=University, 6=others, (Specify.....))¶

Occupation.....(1=Agriculture, 2=Casual (job), 3=Formal Employment, 4=Business, 5=Informal Employment, 6=Agriculture and livestock, 7=other (specify).....)¶

¶

18. What has been the total income of your household during the last month? Please include all sources of income, such as income from wages, self-employment, production, remittances, donations and any form of social assistance. ¶

(a) → Per month. -Or (in case the respondent does not remember the exact income then ask Q18-b)¶

¶

(b) → Gross income category. ¶

¶

Income Category (Ksh)=	Y1ok-Category=
1=Less than 40,000=	□
2=Ksh 40,001 – 70,000=	□
3=Ksh 70,001 – 150,000=	□
4=Ksh 150,001 – 200,000=	□
5=Ksh 200,001 – 300,000=	□
6=Above 300,001=	□
NS/DK=	□

¶

18. On average, how much money is spent on food in Ksh?..... ¶

..... Per week Per month..... ¶

¶

20. What percentage of your income goes into food purchase?..... (With the help of approximation).....

To be answered by enumerator ¶

¶

21. Result of the interview. ¶

[-] Interview completed. ¶

[-] Partly completed. ¶

[-] To be rejected because of poor data quality. ¶

¶

22. Any additional information that could not be captured in the questionnaire? ¶

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