ASSESSMENT OF CONSUMERS' PURCHASING BEHAVIOUR AND PREFERENCES FOR VALUE-ADDED SWEET POTATO PRODUCTS: A CASE OF HOMABAY AND NAIROBI COUNTIES, KENYA

BY

OWUOR ANTONATE AKINYI

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This thesis is my original work and has not been presented in any institution for any award.

Owuor Antonate Akinyi

Registration No: A56/19569/2019

Signature……  …… Date: 06th December 2022

This thesis has been submitted with our approval as university supervisors:

Dr. David Jakinda Otieno

Signature:  Date: 06th December 2022

Department of Agricultural Economics, University of Nairobi

Prof. Willis Oluoch-Kosura

Signature……  …… Date: 06th December 2022.

Department of Agricultural Economics, University of Nairobi

Dr. Julius Juma Okello

Signature  …… Date: 06th December 2022.

International Potato Centre (CIP), Uganda

UNIVERSITY OF NAIROBI

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Name of Student: Antonate Akinyi Owuor

Registration Number: A56/19569/2019

School/Faculty/Institute: Agriculture

Department: Agricultural Economics

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DEDICATION

This work is dedicated to my lovely parents Mr. and Mrs. Owuor for their moral support. I also dedicate it to my wonderful family and friends for their prayers and motivation.

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LIST OF ACRONYMS

AGRA	Alliance for a Green Revolution in Africa
CE	Choice Experiment
CIP	International Potato Centre
CVM	Contingent Valuation Method
FAO	Food and Agriculture Organization of the United Nations
GDP	Gross Domestic Product
GIZ	German Development Cooperation
OFSP	Orange-Fleshed Sweet Potato
RUT	Random Utility Theory
SSA	Sub-Saharan Africa
UN-SDGs	United Nations' Sustainable Development Goals
VAD	Vitamin A Deficiency
WTP	Willingness to Pay
KNBS	Kenya National Bureau of Statistics

ABSTRACT

Orange-fleshed sweet potato (OFSP) is bio-fortified with vitamin A and is therefore highly promoted for its contribution to the fight against vitamin A deficiency (VAD). It is predominantly consumed in rural areas where the roots are boiled, roasted, steamed, or eaten raw. Various research and development projects have focused on creating nutritional awareness to promote the consumption of OFSP. One of the ways to promote broader consumption of OFSP is to process it into less perishable products with wider geographical coverage. However, there is a dearth of empirical insights on the level of preferences for such value-added products; this constrains sustainable investments in such initiatives. This creates the need to investigate OFSP products and product attributes that are preferred by consumers. Therefore, this study examined consumer preference for value-added OFSP products in HomaBay and Nairobi counties, Kenya, with a focus on OFSP juice and OFSP puree *chapati*. The study was guided by the random utility theory and the theory of consumer choice. The choice experiment (CE) design was used in eliciting WTP for OFSP juice and Contingent valuation in eliciting willingness to pay (WTP) for OFSP puree *chapati*. Data was collected using semi-structured questionnaires from a random sample of 411 sweet potato consumers; 198 and 213 in HomaBay and Nairobi counties, respectively. Data was analysed using a Random Parameter Logit model for the choice experiment data on OFSP juice and a double bounded logit to assess the consumers' WTP for sweet potato puree *chapati*. The results for WTP for OFSP juice showed that consumers in rural and urban regions preferred OFSP juice with OFSP only, juice with additives, and joint inspection and certification. Further, Urban consumers were willing to pay more for OFSP juice than their rural counterparts.

The mean WTP value was Kshs. 19 and 35 for HomaBay and Nairobi counties, respectively. Further, presence of children under five years in a household, consumer awareness on benefits of OFSP, awareness of other existing OFSP products, level of education and income had significant influence on consumer WTP for OFSP puree *chapati* in both areas.

In order to increase rural consumers' WTP for OFSP juice and *chapati*, the study recommended the need to establish more OFSP products demonstration centres to create awareness, and a partnership between private and public sector in juice inspection and certification.

Keywords: Orange-fleshed sweet potato, value-addition, consumer preference, Kenya.

CHAPTER ONE

1.0 INTRODUCTION

1.1 Background of the study

Apart from the use of supplements and fortification of food staples with micronutrients, improving the quality of diets through enhanced value addition could form a significant food-based approach in ensuring adequate intake of micronutrients (Uddin, 2019). As part of a solution to vitamin A deficiency (VAD) and micronutrient deficiencies, governments in partnership with non-governmental organizations (NGOs) and other development organizations have been promoting food-based strategies, with an emphasis on the consumption of a wide variety of vitamin-rich foods as a long-term approach. This has been implemented by increasing intakes of vitamin A through selective breeding and bio-fortification of staples, such as orange-fleshed sweet potato (OFSP).

Sweet potato is one of the traditional crops that had been neglected in the past, but has recently been considered an important "food security" crop, especially in developing countries. The crop is ranked as the seventh most important food crop in the world, after wheat, rice, maize, potato, barley and cassava, respectively (CIP, 2017). Sweet potato is an important source of carbohydrates, proteins, minerals and vitamins. Globally, it is cultivated `in more than 100 countries, with China being the leading producer (FAO, 2016). In Kenya, the crop is mainly grown in the Western, Central and Coastal regions. The major sweet potato producing areas of Kenya include; Bungoma, Busia, HomaBay, Kakamega and Siaya counties. Sweet potato is an important food security crop in Kenya. As emphasized by Yadav (2014), the crop has a potential for high yield within a relatively short growing season. Small-scale farmers tend to be attracted to this crop because it performs well in comparatively low input conditions, and it is adaptable to a wide range of ecological conditions.

The OFSP, which is naturally bio-fortified is highly valued for its superior content of vitamin A compared to white and cream-fleshed sweet potato varieties. Additionally, it is a reliable source of significant amounts of carbohydrates, protein, dietary fiber, fat and other micronutrients, especially to the resource-poor population in developing countries, including Kenya (Owade *et al.*, 2018). This particular sweet potato variety is easy to grow and the beta-carotene in it is easily absorbed by human the body (Low *et al.,* 2017).

According to the World Bank (2011), there are significant amounts of food losses in sub-Saharan Africa (SSA) per year. The Alliance for a Green Revolution in Africa - AGRA

(2013) reported global post-harvest losses of more than 20% in sweet potato, with the highest proportion of the losses occurring during the period of peak harvest. Addressing the problem of post-harvest food losses is a potential solution to hunger and food insecurity. The OFSP roots are bulky and highly perishable, creating the need for post-harvest handling by processing of the sweet potato tubers to minimize food wastage and losses, and to enhance availability of the product during off-season periods (Yadav, 2014). Furthermore, processing OFSP into products with a longer shelf life is a potential solution to farmers' storage problems and a source of employment, especially to the youth.

Rapid population growth, especially in Africa, has led to an increase in the demand for food and agricultural products. Demand for high-value and processed food products has been stimulated by increased urbanization, an increasing number of women in the workforce, and rising per capita incomes. Additionally, increased income of the middle-class population has led to increased health consciousness and demand for food products with higher nutritional benefits (Henchion *et al*., 2017). Value addition through the processing of staple food such as OFSP is, therefore, a potential solution to the rising demand.

Sweet potato value addition involves activities that change the form of the raw sweet potato tuber into a more refined form. Most farmers carry out simple basic value addition activities such as cleaning, sorting, grading and packaging raw sweet potatoes for sale. In Kenya, sweet potato tuber is mainly boiled, roasted, steamed or chewed raw. The sweet potato is also processed into intermediate products such as sweet potato flour, puree and paste. The flour can be blended with sorghum or millet in the preparation of porridge. Besides, sweet potato flour and puree can be combined with wheat flour in the preparation of products such as bread, cake, *chapati* and *mandazi*. Sweet potato tuber can also be used in making juice, chips and crisps (Orinda *et al*., 2017). Processing of OFSP into products such as OFSP juice and OFSP puree that is used as an intermediate product in baking is a potential strategy for promoting consumption of OFSP, as well as increasing vitamin A intake, especially among the urban consumers who perceive sweet potato as an inferior product (Wanjuu *et al*., 2019).

As agriculture shifts from subsistence to commercial production, OFSP is one of the potential crops that smallholder farmers can produce and process to boost their incomes as well as to enhance their household food and nutrition security. However, there is a need to focus on both demand and supply in order to establish the role of OFSP in a market-oriented

smallholder farm sector (Low *et al*., 2017). Successful commercialization is spurred by sufficient demand for a product. Understanding consumers' purchasing behavior and preferences has a significant influence on production as it provides information on the specific product attributes desired by the consumers.

The major question is how the consumption of OFSP can be expanded among urban consumers who are located away from the production areas as well as the rural consumers. A potential solution to this is to process sweet potatoes into products that have a longer shelf life and quality desired by consumers.

1.2 Statement of the research problem

Promoting OFSP processing into products that can be consumed all year round is a potential way of strengthening the campaign against VAD and boosting farmers' income. It is also regarded as a possible mechanism for increasing sweet potato consumption among non-sweet potato-producing rural communities and urban consumers who perceive sweet potato as an inferior product (Okello *et al.,* 2019).

Recently, there has been increasing interest in sweet potatoes, especially OFSP, due to its high nutritional value. In Kenya, considerable resources have been allocated to research and development projects by NGOs and the Ministry of Agriculture in supporting value addition and promoting the consumption of OFSP and products derived from it. For instance, Euro Ingredients limited in partnership with International Potato Centre (CIP), Concern Worldwide and the County government of Nairobi launched a variety of OFSP-based products including OFSP puree *chapat*i to urban consumers in the slums of Nairobi, with the primary goal of improving household income.

Despite the effort and donor support for value addition in sweet potato, the extent of value addition and consumption of OFSP and OFSP-based products have remained low. The low level of value addition in OFSP is attributed to a number of factors including uncertainty of the market (Orinda *et al.,* 2017). Market availability and linkage to the consumers is one of the major factors that influence value addition. This creates the need to investigate OFSP products and product attributes that are desirable to the consumers.

Several studies have been conducted on value addition in OFSP with very few focusing on the demand side. For instance, Wanjuu *et al. (*2019) and Okello *et al*. (2021) assessed quality and psychosocial factors influencing the purchase of OFSP bread by urban consumers in supermarkets. These studies focused on sensory attributes such as taste, colour, flavours and

aroma while the current study focuses on both intrinsic and extrinsic attributes of OFSP juice. Further, these previous studies were limited to retail shops in urban centers. The current study assessed both urban and rural consumer WTP for OFSP juice and OFSP puree *chapati*. The assessment of consumer preference in rural and urban is important to policy in that it provide insight on variation in preference between consumers with different income categories and a variation in preference for consumers in OFSP production and non-production zones. This information is important in designing of the OFSP juice for different market segments.

Further, Bocher *et al.* (2019) investigated the influence of nutritional knowledge on urban consumers' preference for sweet potato juice in Rwanda. The study involved actual presentation of the juice in the market, and it focused on attributes such as taste, aroma and aftertaste. The current study used choice experiment to assess rural and urban consumers' willingness to pay for OFSP juice, with a focus on both intrinsic (additives, juice mixture) and extrinsic attributes (origin labeling, inspection and certification, and price). Additionally, the study analyzed rural and urban consumer preference for OFSP puree *chapati;* with the main target of slum dwellers in urban area. The study focused on OFSP puree *chapati* because it was considered cost-effective and thereby can be prepared or afforded by both the middle- and low-income population segments. This study thus, contributes to the growing literature on WTP for bio-fortified foods by offering insights on the rural-urban nexus of consumer preferences.

1.3. Objectives of the study

The main objective of the study was to assess consumers' purchasing behaviour and WTP for OFSP juice and OFSP puree *chapati.* The following specific objectives were pursued.

1. To characterize consumers' purchasing behaviour and consumption of OFSP and conventional sweet potato.
2. To assess rural and urban consumers' WTP for OFSP juice.
3. To investigates determinants of consumers' WTP for composite *chapati* made from OFSP puree.

1.4 Hypotheses of the study

1. Urban consumers are willing to pay more than rural consumers for OFSP juice.
2. Socio-demographic factors have no influence on WTP for OFSP puree *chapati*.

1.5 Justification of the study

Only a small proportion of the world population consumes the recommended level of fruits and vegetables for healthy lives (Zhang *et al*., 2016). Juice consumption is a potential way of increasing the intake of essential nutrients, especially among the elderly and the sick with a low appetite for food and difficulties in the digestion of bulky food. Consumption of soluble foods such as juice is therefore encouraged among infants and other invalids because of their underdeveloped or weary digestive systems.

In recent years, Kenya has experienced a growing demand for wheat and wheat products in both rural and urban areas (Kipruto, 2019). This implies that incorporating OFSP puree in wheat products such as *chapati* is a potential strategy for increasing the consumption of OFSP, which will result in a reduction in the VAD problem.

The findings of this study will be of importance to various stakeholders in the sweet potato value chain. The Kenya National Agribusiness Strategy (Republic of Kenya, 2012) *strategic priority 4.3.1* emphasizes putting markets at the center of all production, processing, product development, and packaging. The *strategic priority 4.3.2* focuses on research, development, and innovation to better catalyze the growth of a vibrant agribusiness sector. The study findings will contribute towards achieving these strategic priorities by providing information on consumers' preference for value addition, which is vital in influencing processing in the agribusiness sector.

An assessment of consumers' preference for OFSP juice and composite *chapati* from OFSP puree will provide useful information to farmers and agro-processors on the potential market of the products and the need for market expansion. This will inform their decision-making on which OFSP products to invest in. Insights on the determinants of consumers' WTP for OFSP products will contribute knowledge for designing appropriate strategies to expand the market and influence consumer behavior.

The study is in line with the United Nations (UN) Sustainable development Goal (SDG) one and two that seek to eradicate poverty and end hunger, achieve food security and improve nutrition (UN-SDG, 2015). Value addition is a potential strategy for increasing farmers' incomes and creating employment. Information on consumer preference and WTP for value addition will influence the commercialization of sweet potato and processing hence providing income to the farmers and improving their food security and reducing poverty levels.

The *SDG 2.1* target is to double the agricultural productivity and incomes of small-scale food producers, particularly women and family farmers through secure and equal access to markets and opportunities for value addition by 2030. Information on consumers' demand for OFSP products will strengthen the link between sweet potato producers and consumers. This will equally promote value addition due to the availability of markets.

Information on consumers' WTP for juice will provide useful feedback to the Ministry of Agriculture, NGOs such as the German Development Cooperation (GIZ), CIP and farmer groups who are key stakeholders in promoting production, processing and consumption of sweet potato products. Information on consumers' WTP will contribute knowledge to the design of policy measures that are geared towards supporting the consumption of value-added sweet products. Further, this may help development organizations and donors in designing and implementing future projects that are aimed at promoting the consumption of value-added agricultural products.

Insights drawn from the study will also contribute to the scant empirical evidence on consumers' perceptions and preferences for value-added agricultural products. This information will form a critical body of literature for future research on consumption of sweet potato products.

1.6 Study area

The study was conducted in HomaBay and Nairobi counties. HomaBay County is located in south Nyanza (Figure 1).

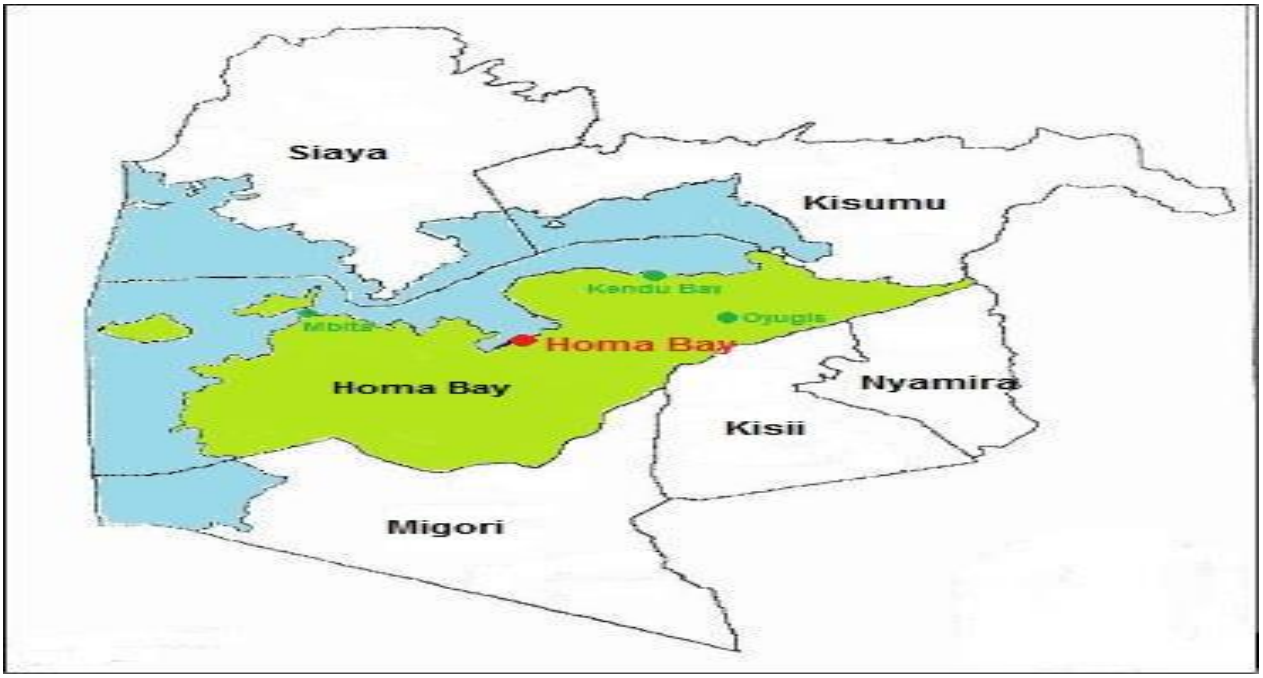

Figure 1: Map of HomaBay County

Source: The Kenya National Bureau of Statistics (2015).

HomaBay County is divided into eight sub-counties, namely: HomaBay Town, Dhiwa, Rangwe, Rachuonyo East, Rachuonyo North, Rachuonyo South, Suba North and Suba south. The county has a population of 1,131,950 people (KNBS, 2019). The county is one of the major sweet potato producing areas in Kenya. Agriculture is the major economic activity in this county. Besides, Organi Limited Company for processing sweet potato into sweet potato flour and puree is located in this county.

According to the recent census statistics, Nairobi County (Figure 2), which is the capital city of Kenya is the most populated county with 4,397,073 people (KNBS, 2019),

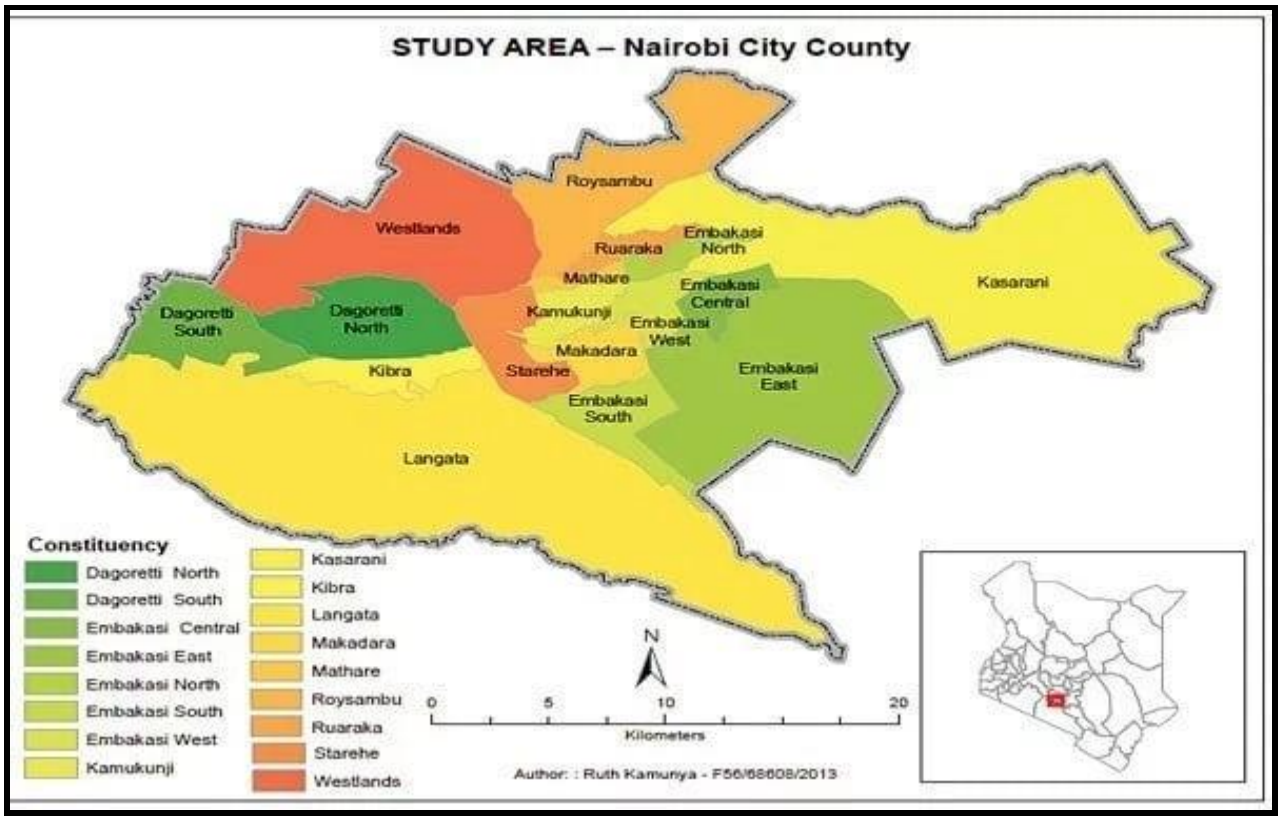

Figure 2: Map of Nairobi County

Source: Kenya National Bureau of Statistics (2013).

Nairobi contributes more than 50 percent of Kenya's gross domestic product (GDP) and more than 30 percent of the urban wage employment of the country (KNBS, 2019). Nairobi is the nerve centre of the economy of the country and it is one of the major designated markets for agricultural food products including OFSP. The city has eleven major open-air markets,

which include: Ngara, Kangemi, Gikomba, Githurai, Wakulima, Kayole, Toi, Kawangware, City Park, Korogocho, and Dagoretti.

CHAPTER TWO

2.0 LITERATURE REVIEW

2.1 An overview of the nutritional benefits of orange-fleshed sweet potato

Originally, there was a great reliance on white and yellow-fleshed sweet potato varieties in SSA. Recently, the consumption of OFSP has been encouraged due to the high content of beta- carotene compared to the white and yellow-fleshed varieties. Several varieties of OFSP have been introduced in Africa. The OFSP varieties that exist in Kenya include: KENSPOT-3,4 and 5, Vitaa, Kabonde, local check, and NASPOT 9-0. The intensity of the orange colour determines the level of beta-carotene in each OFSP variety (Owade *et al*., 2018).

Promoting the consumption of OFSP offers a great prospect for reducing VAD in the SSA region. The OFSP is an important food and nutrition security crop that is considered to be a key source of energy and vitamin A (Jenkins *et al.*, 2015). Additionally, it is an essential source of considerable amounts of fats, carbohydrates, dietary fibre, proteins, micronutrients such as sodium and calcium, iron, niacin, zinc, potassium, ascorbic acid, thiamine and iron (Mills *et al*., 2009).

Vitamin A (retinol) is one of the essential micronutrients that should always be included in the diets of children and expectant mothers. This micronutrient is important for normal vision, reproduction and development of the immune system (De Moura *et al*., 2015). Empirical evidence shows that OFSP is one of the major affordable sources of Vitamin A (Jamil *et al*., 2012). The crop is therefore considered as a potential solution to malnutrition especially in the marginalized communities (Stathers *et al*., 2013). Despite the benefits derived from the consumption of OFSP, there is limited documentation on the attitude and demand for OFSP and OFSP based products in Kenya. The current study assessed consumer preference for OFSP-based products.

2.2 Value addition in orange-fleshed sweet potato

Value addition is defined as the process of changing a commodity from its original form to a more valuable state by creating value or industrial innovation at an advanced stage (Mmasa *et al.*, 2012). Commercialization and utilization of sweet potato can be promoted through processing it into different products. Various NGOs including CIP have been carrying out extensive and innovative work in scaling-up production, value addition and processing of OFSP in SSA countries including Ghana, Kenya, Rwanda, Tanzania and Uganda, (Stathers *et*

al., 2013)**.** Substantial increase in production and commercialization creates a need to process OFSP into more valuable and durable products.

At the household level, OFSP is mainly processed into shelf-stable intermediate flour that is used in enriching different products such as weaning food. A mixture of sweet potato flour and wheat can also be used in the preparation of cakes, bread, *mandazi*, c*hapati* doughnuts, muffins and biscuits (Kuloba, 2013).

Orinda *et al*. (2017) assessed the factors that influence the extent of value addition in sweetpotato by smallholder farmers in HomaBay county. The results showed that apart from roasting and boiling, sweet potato is processed into fried chips, crisps, juice and flour. Further, the findings showed that only a few farmers in Kenya are practicing value addition in sweet potato mainly because of uncertainty of markets. The current study assessed the determinants of consumers' preference for OFSP based products.

2.3 Determinants of consumers' preference for value-added products

Consumers' choices of foods from the market are influenced by their income, tastes and preferences, resource endowment and prices of the products (Orinda *et al*., 2017). Increasing urbanization, income of the middle-class population, consumer consciousness on food quality and safety and other demographic shifts have resulted in a change in the consumption pattern and demand for food products (FAO, 2016). Based on the available literature, determinants of consumers' preferences are classified as psychological, social, cultural and product-related factors.

Mmasa and Mlambiti (2015) analysed factors that influence the consumption of processed sweet potato products in Tanzania. The results showed that the main factors that influence purchase and consumption of sweet potato products were nutritional value and packaging. The study focused on other intrinsic factors such as freshness, taste and shelf life. The study provided only a descriptive analysis (percentages) of the factors that influence consumption of sweet potato products. The current study provided a statistical inferencing on factors that influence consumers' willingness to pay for OFSP puree *chapati.*

2.4 A review of approaches for measuring willingness to pay

The WTP can be defined as the maximum amount of money that an individual would be ready to forego or trade-off for a given commodity or service. The WTP can also be considered as the premium price paid by consumers for a good or service (Kalish and Nelson, 1991) or the amount of money that an individual is willing to forego in order to obtain an

improved product that maximizes his/her utility (Arrow *et al*., 1993). Intuitively, rational consumers will be willing to pay for goods or services that maximize their utility and if the utility derived from the new product is lower than the amount of money that an individual is willing to forego then WTP will be zero. This implies that the individual will not be interested in the new product or service.

The measurement of WTP is anchored on the Lancaster's theory of consumer choice, the theory of planned behaviour (TPB) and the random utility theory (RUT). The TPB originates from the notion of reasoned action (Ajzen and Fishbein, 1980), which posits that behaviour achievement is influenced by an individual's intention and ability or perceived behaviour control (Ajzen, 1991). Perceived behaviour control is the individual's perception on the ease or difficulty in performing a given behaviour. Intention to perform a given action is influenced by the subjective norm, perceived behavioural control and attitude towards the behaviour. Intention captures the motivational aspect that affects behaviour. Intentions depict the level at which an individual is willing to carry out a given behaviour. This implies that the more an individual intends to perform a given behaviour, the higher the probability of its performance since the likelihood of acceptance is high (Ajzen and Madden, 1986).

The RUT advanced by Thurstone (1927) states that individuals choose the alternative commodity or service that maximizes utility. The RUT is based on the hypothesis that individual choice is a function of systematic and random/error components, hence we cannot directly observe an individual's utilities (McFadden, 1973). The error component arises from randomness in the environment in which choices are made as well as unobserved factors that influence individual behaviour during a choice situation. The implication is that we cannot state with certainty the bundle of goods that an individual prefers. Lancaster's theory of consumer choice posits that consumers derive their utility not from the commodity itself but from the attributes of the commodity (Lancaster, 1966). The theory involves the assessment of the role of the product attributes on demand. Therefore, the assumption is that utility is separable and a consumer's preference for attributes of a given commodity can be measured. Based on the foregoing theoretical foundations, consumers in this study derive their utilities from the consumption of OFSP *chapati* and the juice attributes.

The main approaches for eliciting WTP for a product can be broadly categorized into two; revealed preference (RP) and stated preference (SP) approaches.

2.4.1 Revealed preference methods

The RP approach is applied in measuring WTP by examining an individual choice in the market (Louviere *et al*., 2000). The commonly used revealed preference methods include the travel cost and hedonic pricing approaches. The hedonic pricing approach is appropriate where we have real transactions in closely related or surrogate markets as opposed to hypothetical markets. It is usually applied in assessing the implicit price of an attribute by making a comparison between the market value of two or more goods that are dissimilar with respect to a given characteristic. Some of the recent applications include the valuation of farm access for irrigation in Nepal (Joshi *et al*., 2017).

The travel cost method is used in the estimation of recreational values by assuming that the amount of time and cost of travel that is incurred to visit a tourist site is a reflection of the implicit price of goods or services at the site. The advantage of using RP method is that it involves observation of real behaviour of the consumer in the market. However, some of the quality attributes are often excluded from the RP models due to collinearity problems (Morikawa *et al*., 2002).

2.4.2 State preference methods

The SP methods are used to elicit WTP for non-market goods or services through hypothetical scenarios. Thus, respondents are asked hypothetical questions to understand their preference for a given product or product attributes. The main SP methods are Contingent Valuation Method (CVM) and Choice Experiments (CEs) (Louviere *et al.*, 1983).

2.4.2.1 Contingent valuation method

The CVM is a survey-based SP approach to WTP estimation where there are no market prices. It entails the estimation of WTP for the product as a whole. It has been applied in the estimation of WTP for food products for example, in the assessment of Pakistani farmers' willingness to pay for crop insurance (Fahad *et al*., 2018).

This method is prone to design bias, information bias and hypothetical bias (Hanley *et al*., 2001). The respondents may take the hypothetical questions for granted and provide unrealistic responses especially when there is an economic gain that can be accrued. The CVM techniques used in eliciting willingness to pay include; open-ended, payment cards, single-bound dichotomous questions, double-bound dichotomous choice questions or bidding games (Arrow *et al.*, 1993).

In the open-ended CVM, the respondents are asked to state the amount that they are willing to pay. In a bidding game, the interviewer states the first bid and revises it upwards in a case where the answer to the initial bid is positive up to the point at which the respondent provides a negative reaction to the suggested price. The bid is revised downwards in a case where the response to the first bid is negative up to a point where the respondent provides a positive reaction. The final bid is a measure of the amount that the respondent is willing to pay. Formats of CVM where open-ended questions are used may not be easily answered by the respondents since they do not pay for non-market goods (Hanemann, 1984).

The payment card method was introduced by Mitchell and Carson (1984). In this approach, respondents are expected to choose a single value from a range of values, which represents the maximum amount that they are willing to pay (Venkatachalam, 2004). In the payment card approach, the assumption is that the true WTP of the respondents is located above the value that is chosen and below the next higher one, if such a value exists (Hu *et al*., 2006). The advantage of this method is that the respondent will state a WTP value that they are comfortable with. Besides, WTP values can be elicited directly from the original data. The WTP values obtained from the payment card approach are more robust compared to those of discrete choice experiments (Ready *et al*., 2001). The payment card approach is free from starting point bias (Mitchell and Carson, 1984). This approach has been applied in the estimation of urban consumers' WTP for quality leafy vegetables in Nairobi (Ngigi *et al.*, 2011) and in the analysis of consumer's demand for value-added African indigenous vegetable products in coastal Kenya (Okello *et al*., 2015).

The closed-ended double bounded dichotomous choice technique is an improvement over the closed-ended single bounded dichotomous choice technique. In this CVM, the amount stated in the follow-up question will depend on the answer to the first question. In the first question, the respondent is asked whether they are willing to pay the stated amount. A higher amount will be stated in the follow-up question if the answer to the first question is positive and otherwise if the answer is negative. Due to the follow-up questions, this technique can reduce some of the bias associated with CVM. The closed-ended double bounded dichotomous choice is therefore considered to be a more efficient CVM technique that yields tighter confidence intervals (Hanemann, 1991). This study used contingent valuation with closed-ended double bounded dichotomous choice technique in eliciting WTP for OFSP puree *chapati* since the focus is on WTP for the product as a whole and not attributes. Some of the previous studies that used CVM includes; Erih *et al.* (2015) used a bivariate probit model to

estimate consumers WTP for composite cassava bread in Lagos state in Nigeria. The results showed that sociodemographic characteristics including income, age, household head position and marital status had a significant influence on WTP for composite cassava bread. This study is useful to the current study in verification of the use of contingent valuation techniques and it also informs the choice of variables included in the current study. However, Erih's study and the current study focused on different products. The current study focused on OFSP puree *chapati.* Also, the current study used double bounded logit model in estimation of WTP while the latter used bivariate probit model.

Ongudi *et al*. (2017) used a contingent valuation method in eliciting consumer WTP for bio fortified pearl millet. The result indicated that the frequency of consumption of finger millets, income, level of awareness and position of the consumer in the household had a direct influence on WTP for the bio fortified pearl millet. The study by Ongudi *et al*. (2017) was important to the current study because it provided information that guided the choice of variables included in the current study. However, the current study used a double-bound contingent valuation technique in eliciting WTP while the later used a semi-double bound contingent valuation technique. Further, the current study used the double bounded logit model to estimate WTP for OFSP puree *chapati w*hile the latter used a two-stage Heckman method.

2.4.2.2 Choice experiment method

The CE method proposed by Louviere and Hensher (1982) and Louviere and Woodworth (1983), is an attribute-based approach to analysing respondent's stated preferences for non-market goods or services. The CE is a multi-attribute approach to the elicitation of WTP, hence provides more information than the CVM (Denver and Jensen, 2014). In CE, the respondent is provided with an option in each choice set, which allows for flexibility when choosing their preferred alternatives (Hanley *et al*., 2001). The researcher can be able to approximate the extent to which respondents can trade-off the attributes. This is important in price estimations and measurement of consumers' welfare associated with improvement in the existing product or service.

The advantage of CE over CVM is that, it reduces some of the potential bias in CVM as well as allowing for eliciting additional information from the respondent. Choice experiment minimizes the correlation between the various attribute levels in a choice set (Bliemer and Rose, 2005). This study used CE in estimating consumers' WTP for OFSP juice.

In the last decade, the CE approach has been applied to evaluate various aspects of stakeholder preferences in different disciplines. For instance, Otieno and Nyikal (2017) analysed consumer preferences for quality and safety attributes in artisanal fruit juices in Kenya using CE. Some of the attributes included in their study were inspection and certification, additive and mixed fruit. The results of the study showed that consumers were willing to pay premiums prices for the juices with one fruit, no additive and those that were inspected by private companies. This literature is instrumental in the formulation of OFSP juice attributes and methodology for the current study. The study differs from the current one in that the current study focused on OFSP juice. Further, the current study included other juice attributes such as origin labelling.

Bocher *et al. (*2019) assessed consumers' WTP for OFSP juice in Rwanda. The study analysed WTP for the OFSP juice as compared to fruit juices, and the effects of nutritional knowledge on WTP for the juice. Heckman's two-stage probit model was used in the analysis of WTP, and a multinomial logit model to analyse factors that influence consumer's WTP of juice choice. The results showed that aroma, knowledge of vitamin A, taste and juice buying frequency had positive influence on consumer's WTP for the juice. Their study is different from the current study in that the current study focus on both extrinsic and intrinsic juice OFSP juice attributes while the later focused on intrinsic product attributes only. In addition, the study by Borcher *et al*. (2019) involved the actual presentation of the OFSP juice in the market while the current study uses hypothetical OFSP juice.

Pambo *et al*. (2017) assessed consumer preference for bio fortified sugar in Kenya. The study used random parameter logit to estimate consumer WTP for the fortified sugar in rural and peri-urban regions. The attributes included in the CE included: nutritional needs, colour, sources of vitamin A, levels of vitamin A and price. The current study focused on OFSP juice and attributes including inspection and certification that were not included in the latter study.

2.5 Conceptual framework

This study illustrates the relationship between consumers' preference for sweet potato juice and *chapati* containing OFSP puree and their WTP for these products. The study conceptualized that the choice of OFSP juice and *chapati* is influenced by socio-demographic characteristics (Figure 3). The socio-demographic factors hypothesized to influence decisions on WTP for *chapati* containing OFSP puree include gender, income, education, awareness on OFSP products, availability of child under 5 years old in the household, nutritional training,

awareness on benefits of consuming OFSP, and occupation of the respondent. The socio-demographic factors influence consumers' awareness and perceptions, which will in turn influence the WTP *chapati* containing OFSP puree.

According to Lancaster's theory of choice, a consumer's decision to purchase or use a given product is influenced by the attributes of the product and not the product itself (Lancaster, 1966). This study, therefore conceptualized that in CE, apart from the observed - characteristics, consumers' preference for the OFSP juice will also be influenced by product attributes such as juice mixtures, inspection and certification, origin labelling, price and use of additives. Therefore, if the consumers are aware of OFSP juice and *chapati* made from OFSP puree and their associated benefits and have a positive perception about OFSP *chapati* or on some of the attributes of OFSP juice, they would be willing to pay more to purchase and consume the products. Increased consumption of OFSP juice and *chapati* will increase demand and utilization of OFSP. This is expected to translate to better prices and higher income for farmers and agro-processors and eventual increase in the production of sweet potatoes in Kenya.

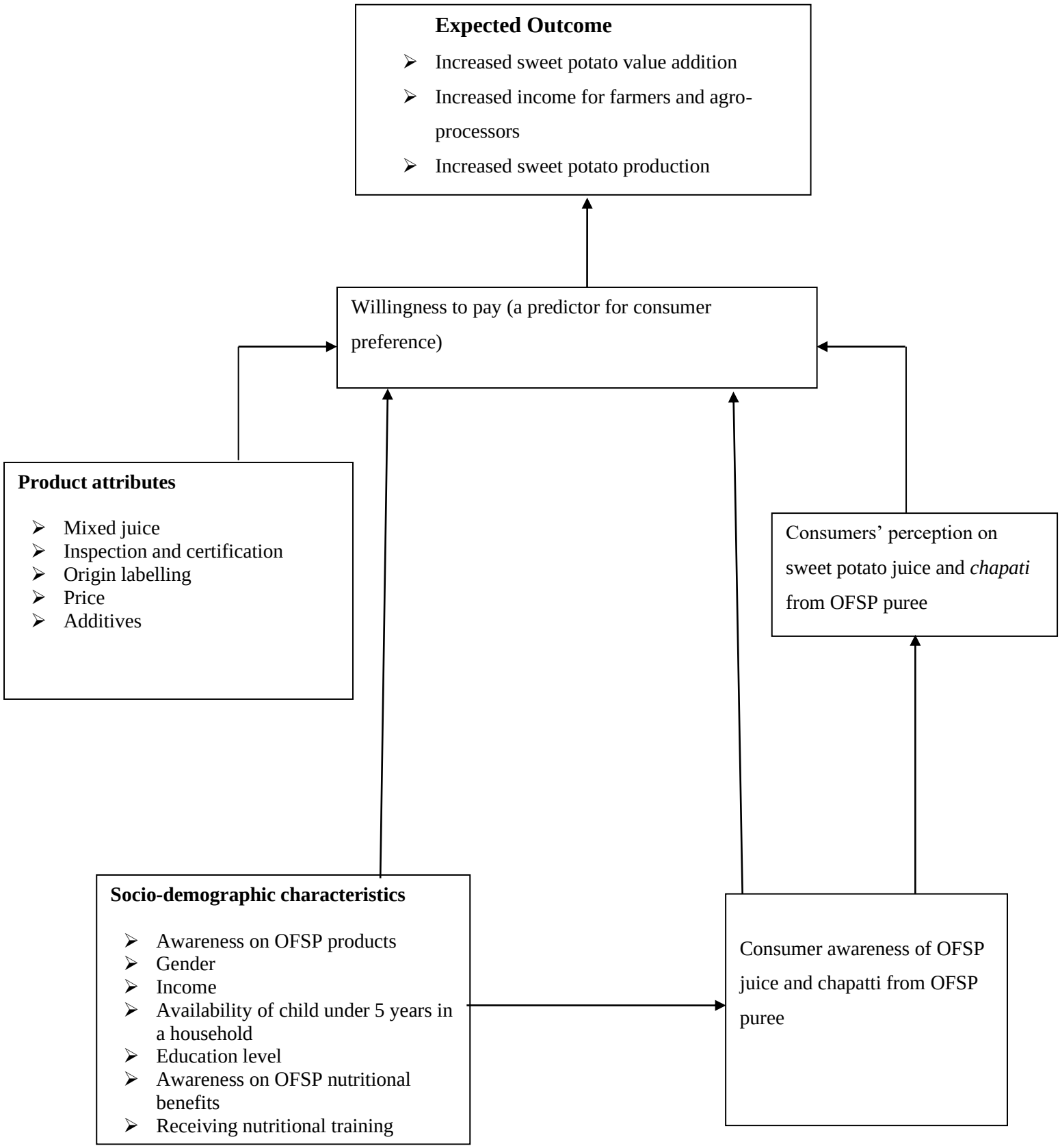

Figure 3: Conceptual framework
Source: Author (2020).

2.6 Theoretical framework

This study was anchored on the Lancaster theory of consumer choice (Lancaster, 1966) which derives from the RUT. The RUM forms the econometric basis for the analysis of consumer choice data within a discrete choice multi-dimensional environment. The individual's utility is made of the observable component and the random component (McFadden, 1973). The deterministic component can be modelled as a function of the attributes of a product.

Lancaster's theory of choice proposes that consumers gain their utility not from the good itself but its attributes. Accordingly, assuming that utility consumers gain is from the type of juice within a particular choice set *C*, consumers' choice of OFSP juice will consists of all the attributes $A_1, A_2, A_3 \ldots \ldots\ldots A_n$ related to this juice. Thus, the functional form of an individual's utility U_{iA} is given by:

$$U_{iA} = \beta_{i1}U_{A1} + \beta_{i2}U_{A2} + \beta_{i3}U_{A3} + \cdots \ldots \ldots \ldots \beta_{in}U_{An} \quad (1)$$

Where U_{An} is the level of utility derived from the consumption of attribute *n*. The goal of CE is therefore identify to the trade-offs that a consumer makes between attributes to estimate the coefficientsβ_{in}.

The utility (U_{ij}) a consumer derives from alternative *j* (in a choice set *C*) is a function of the good's attributes (*A*), the socio-demographic characteristics of the consumer *S* and unobserved factors captured in the stochastic component ε_i as expressed below:

$$U_{ij} = V(A_j, S_i) + \varepsilon_i \quad (2)$$

According to the principle of utility maximization, a rational consumer will go for the alternative that maximises his or her utility. Therefore, the chances that a consumer *i* will select alternative *j* when presented with multiple alternatives in choice set *C* is the probability that utility associated with alternative *j* is higher than the utility associated with other alternatives and can be formulated as:

$$P_i(j) = Pr\ (U_{ij} \geq U_{im},\ \forall_m \in C_i, j \neq m) \quad (3)$$

Since the utility derived from each alternative is divided into observable and error term components, we can rewrite equation (3) as follows:

$$P_i(j) = Pr\ (V(Z_{ij}, S_i) + \varepsilon_{ij} \geq V(Z_{im}, S_i) + \varepsilon_{im},\ \forall_m \in C_i, j \neq m) \quad (4)$$

CHAPTER THREE

3.0 CHARACTERIZATION OF CONSUMERS' PURCHASING BEHAVIOUR AND CONSUMPTION OF ORANGE-FLESHED AND CONVENTIONAL SWEET POTATO

3.1 Abstract

Despite the potential role of sweet potato in food security and poverty reduction, detailed information on sweet potato demand relations is unavailable to enable the traders to plan their production and marketing activities. This chapter characterizes the awareness and consumption pattern of both conventional and OFSP sweet potato varieties in urban (Nairobi) and rural (HomaBay) consumers. In addition, the study characterizes the consumers' socio and demographic characteristics. This was achieved through a market survey of 411 sweet potato consumers in Nairobi and HomaBay counties. The results show that the majority of the (40%) respondents consume both conventional and OFSP varieties. Further, more than 80% of the respondents were aware of OFSP products in both study sites. From the pooled sample, majority (70%) of sweet potato consumers buy their sweet potato in open-air markets. The result also indicated that most of the respondents strongly agreed that OFSP has a more appealing color as compared to conventional sweet potato. However, conventional sweet potato has a better taste than OFSP. From the pooled sample results, most of the respondents were aware of OFSP flour, porridge, crisp, bread, and *chapati*, and the main source of information was sweet potato sellers and neighbors or friends. The result implies that as much as most consumers were aware of OFSP and its products, the consumption of OFSP was quite low due to unpleasant taste as compared to the conventional ones in the rural areas. However, in Nairobi, which represents urban consumers, the consumption of OFSP was quite high; this could be attributed to higher nutritional knowledge and educational level in the region. The study concluded that there is a need for vigorous promotion of the distinct nutritional and health properties of sweet potatoes, especially OFSP to increase its consumption and utilization.

Key words: Sweet potato, consumers, value addition, Kenya.

3.2 Introduction

Sweet potato tuber is one of the major food security crops in Sub-Saharan Africa. Sweet potato is regarded as a climate-smart crop with a short growing cycle of three to four months. The crop can thrive in low rainfall areas as well as on marginal lands such as in a saline

environment. The Orange fleshed sweet potato (OFSP) variety is rich in provitamin A carotenoid. Empirically, OFSP is a sustainable and effective source of vitamin A in humans (Wanjuu *et al*., 2019). Sweet potato tuber plays an important role in household food security due to the crop's flexibility in a mixed farming setup and short maturity period. The OFSP forms a vital livelihood strategy for smallholder farmers.

The importance of sweet potato as a source of income, food, and poverty reduction among small-scale farmers has been increasing. This is majorly due to the emergence of new market outlets in urban areas, high living standards, which have prompted people to consume cheaper foods such as sweet potato, and high input costs for cereals such as maize (Were *et al.*, 2013). Despite the highlighted benefits of OFSP, farmers face numerous challenges including perishability and high transportation cost due to the bulkiness of the product. The lack of information on sweet potato market structure and performance constraints development in the industry (Mukras *et al*., 2013). Various non-governmental organizations in partnership with the Ministry of Agriculture have been promoting value addition in sweet potato at the farm level. The value addition involves the processing of sweet potato into products with a longer shelf life, more appealing and less bulky hence easy to transport. Researchers have mainly focused on the marketing of sweet potatoes, and the determinants of value addition in sweet potato. There is little documentation on the purchase and consumption pattern of sweet potatoes, both the conventional and OFSP in Kenya.

This chapter provides information on the consumers' buying behavior and consumption pattern of value-added sweet potato products. The findings will provide information to various stakeholders on the demand for value-added sweet potato products in urban and rural areas. The health benefits associated with OFSP make it critical to understand the value attached to it compared to the white-fleshed sweet potato. Further, the information will assist in the development of marketing strategies aimed at promoting the commercialization of OFSP.

3.3 Methodology

3.3.1 Sampling procedure

The sample size was calculated following Cochran's (1963) formula since the population of OFSP consumers in the counties was unknown. The sample size was determined as:

$$n_o = \frac{Z^2pq}{e^2} \quad \text{----------(5)}$$

where n_o = sample size, z = critical value of desired confidence level, p denotes the estimated proportion of the population of OFSP consumers that would be present during the survey, and e is the acceptable margin of error for the proportion of OFSP consumers' population being estimated. Because the proportion of the population of sweet potato consumers is unknown, this study employed values of z = 1.96, p = 0.5, $q(1\text{-}q)$ = 0.5, and e = 0.05 in the sampling formula; yielding a sample size of 385.

Following (Mutiso, 2017; Mutiso 2018; Ojwang, 2021), the expected sample size was increased by 17% to 450 in order to account for possible non-response that may be caused by psychological and social factors such as time and general concern of respondents about privacy, that characterizes primary data collection. Recent studies on WTP for fortified foods used sample sizes ranging from 220 to 300 for single sites (DeGroote *et al*., 2020 and Chege *et al*., 2019). The aforementioned studies show that sample sizes vary depending on the study context, location, and type of respondents. Based on probability proportionate to size sampling technique, the expected sample size was distributed as 200 for HomaBay and 250 for Nairobi. However, due to nonresponse and incomplete questionnaires, the valid sample size realized dropped to 198 for HomaBay and 213 for Nairobi.

A four-stage sampling technique was applied to select the consumers from the main commercial centres and markets in HomaBay and Nairobi counties. In the first stage, Nairobi and HomaBay counties were purposively selected. Nairobi county was purposively selected because it is the most populated county with 4,397,073 people and it contributes the largest share (21.7%) of Kenya's gross domestic product (GDP) and more than 30% of the urban wage employment of the country (KNBS, 2019). In addition, Nairobi has the lowest poverty rate of 16.7% than other counties relative to the national average level of 36.1% (KIPPRA, 2018). The county represents the urban consumers with higher variability in tastes and preferences. HomaBay County was purposively selected because it is one of the leading producers of sweet potatoes in Kenya after Bungoma County. The county produces an average of 59,612 metric tonnes per year which forms 10 percent of the total sweet potato production in the country, (Republic of Kenya, 2016). The choice of HomaBay county which is one of the major sweet potato producing areas and with pilot processing of OFSP into flour and puree, but with a relatively high poverty level (22.7%) compared to the national average of 36.1% (KIPPRA, 2018) and high stunting prevalence of 26% among the under 5-year-old children (Bernsten and Wiesmann, 2018), was meant to capture the potential of market-driven value addition in addressing rural malnutrition challenges.

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Stage two involved purposive selection of 3 sub-counties in Nairobi and in HomaBay. The three sub-counties (Dagoretti North, Ruaraka and Westlands) selected in Nairobi were based on to a high proportion of middle-class consumers. In HomaBay, three sub-counties (Rachuonyo East, Rachuonyo South and Rachuonyo North) were selected purposively since they are the major sweet potato production areas in the county.

In the third stage, volume or intensity of trade and population density were used to select one main market from each of the selected sub-counties of Nairobi. Based on this, the markets of interest for Nairobi included: Kawangware in Dagoretti North, Korogocho in Ruaraka and Kangemi in Westlands. In HomaBay, the volume of production was used to select one main market from the selected sub-counties. The identified markets in HomaBay were: Oyugis in Rachuonyo South, Oriang' in Rachuonyo North and Ramba in Rachuonyo North. In the fourth step, systematic random sampling was used to select the sweet potato consumers to be included in the survey from each of the selected markets. Every third consumer who came to buy sweet potato was interviewed. Skipping of few consumers was due to limited number sweet potato buyers per day.

There are considerable differences in terms of resource endowment and food preferences between rural and urban consumers. Nairobi is the most populated county with a population of 4.39 million, and close to 60% of this population lives in informal settlements and slums (KNBS, 2019). While some of the sweet potato consumers may produce sweet potato on their rural farms, a great number are net sweet potato consumers. The majority of the population are mainly consumers. On the other hand, HomaBay county represents the rural consumers located in or near the production region. The majority of sweet potato consumers in HomaBay county are producers. The main economic activity in HomaBay county is agriculture (Republic of Kenya, 2018). HomaBay county is one of the major sweet potato production regions in the country. These issues might have a considerable influence on consumer preference for OFSP juice attributes in the two regions.

3.3.2 Data collection methods

Data collection involved both FGDs and a survey of 411 (198 and 213 in HomaBay and Nairobi, respectively) sweet potato consumers. The participants in the FGDs comprised a diverse group (in gender, income, age, education, and nutritionist) of 12 randomly selected sweet potato consumers for each county. The FGDs were carried out to minimize bias in the

data collection. The FGDs provided general information on the preferred sweet potato products and their consumption patterns. Additionally, FGDs were critical for the validation of OFSP attributes to be included in the final CE design. Face-to-face interviews were conducted using semi-structured questionnaires. The face-to-face interviews were preferred over other survey methods, such as telephone and email interviews because it allows for further clarification of the questions to the respondents (Bateman *et al*., 2003). The surveys were conducted by five well-trained enumerators. The questionnaire section consisted of information on sweet potato purchase and consumption patterns, consumers' willingness to pay for OFSP puree *chapati*, and socio-demographic information. Furthermore, the questionnaire consisted of the choice experiment questions with OFSP juice profiles and scenarios for capturing information on preference and willingness to pay for OFSP juice.

3.4 Results and discussions

3.4.1 Socio-demographic characteristics of respondents

Table 1 shows the socio-demographic profile of the respondents. From the pooled sample, 67% of the respondents were female, probably because conventionally food purchases in a typical Kenyan household are carried out by women. The average years of schooling was about 12 years and the respondents from the urban area, Nairobi County, had a higher level of education than their counterparts from the rural site - Homa Bay County.

Table 1: Respondents' socio-economic characteristics

Variable	Urban site - Nairobi (n = 213)	Rural site – Homa Bay (n = 198)	Pooled sample (n = 411)	Test of statistical differences in means between urban and rural sites (*t*-ratio)
Sex of respondent (% male)	31	36	33	-0.94
Average age (years)	36.46[b]	39.34[a]	37.85	-2.22**
Average years of schooling	14.11[a]	10.18[b]	12.21	11.63***
Marital status (% married)	84	88	86	-0.11
Household with children under 5 years old	91	95	93	0.93
Awareness on OFSP benefits (%)	76.53[a]	65.15[b]	71.05	2.5544***
Nutritional training (%)	40.84	44.94	42.82	0.4020
Average household's monthly income (Kshs)	32,697.58[a]	14,836.9[b]	24,093.17	13.67***
Average household size	4[b]	5[a]	4	-7.72***
Sex of household head (%) (1 = male, 0 = female)	80	76	78	0.99
Awareness of sweetpotato products (% of respondents)	84	87	86	-0.96

Note: ***, **, * denote a statistically significant difference in means between study sites at 1%, 5%, and 10% levels, respectively. The superscripts *a, b* denotes the magnitude of difference in descending order.

Source: Survey Data (2020).

The average monthly income for the pooled sample was Kshs 24,093. There was a significant difference in average income levels between the two counties with Nairobi County recording a higher average income of about Kshs 32,697. The income disparity could be attributed to differences in main economic activities in the two counties. In Homa Bay County, about 74% of the labour force is employed in the relatively low paying agricultural enterprises. Most of the households derive their incomes from fishing, crops, and livestock farming activities. On the other hand, according to the Nairobi County Integrated Development Plan (CIDP, 2018-2022), the highest percentage of employment is from the manufacturing industry followed by trade and service industries (Republic of Kenya, 2018). Moreover, the average household size of 4 persons from the pooled sample is consistent with the average household size of 3.9 that was reported in the latest national population and housing census (KNBS, 2019). On the other hand, the average age of the respondents was less than 40 years implying that sweetpotato is mainly purchased by young adults. Further, there was no significant difference in the level of

awareness on OFSP products between the two regions. The OFSP products included in the study were: OFSP flour, puree, crisps, chips, juice, doughnuts, *chapati*, bread and porridge.

The results also showed that 65 and 76 percent of the consumers in HomaBay and Nairobi counties, respectively, were aware of nutritional benefits that are derived from the consumption of OFSP. However, less than half of the consumers in both regions had received nutritional training.

3.4.2 Characterization of sweet potato purchase and consumption patterns

The result of the combined sample in Figure 4 indicated that the consumption of OFSP (27%) is slightly higher than that of conventional sweet potato (25%). However, most of the consumers use both OFSP and conventional sweet potato. From the FGDs results, the consumers explained that the conventional sweet potato (white-fleshed) is mainly preferred because of its better taste, while OFSP is mainly consumed due to its high nutritional value.

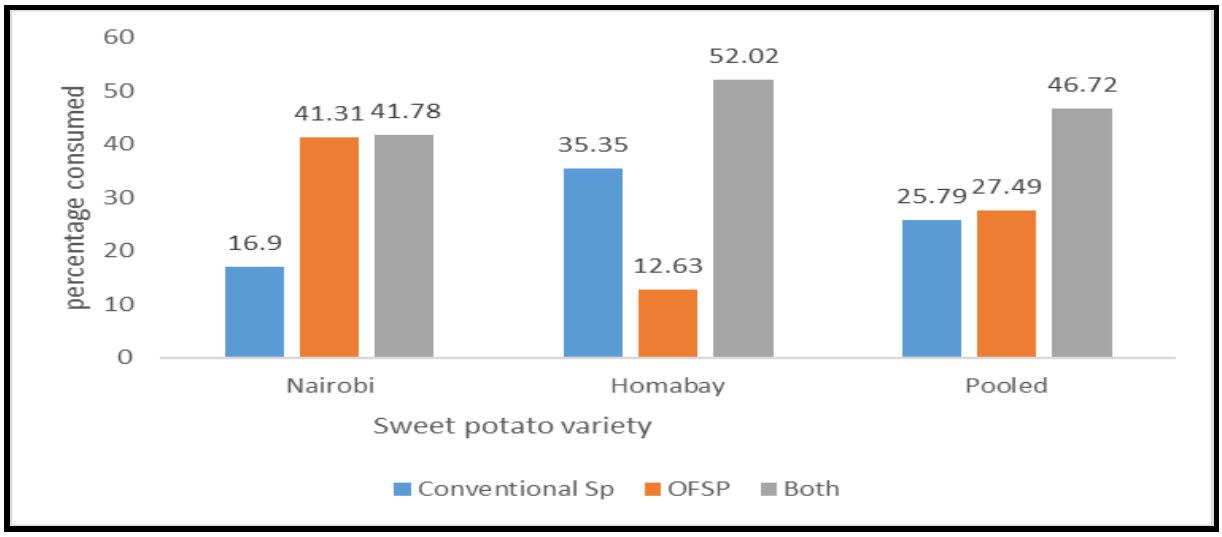

Figure 4: Sweet potato varieties consumed
Source: Survey Data (2020).

The higher consumption of OFSP variety in Nairobi than HomaBay was contrary to the expectations since the consumption and utilization of OFSP was mainly promoted in HomaBay county by NGOs including CIP. In HomaBay County, the consumers of conventional sweet potato (52%) were more than those of OFSP (35%) only. This concurs with the FDG findings in HomaBay where the participants stated that there has been a reduction in OFSP production in the region due to scarcity of the OFSP vines and lack of market due to a higher consumer preference for the conventional sweet potato.

3.4.3 Characterization of sweet potato purchase outlets

Figure 5 gives information on the places where consumers purchased sweet potato. From the pooled sample, majority (70%) of sweet potato consumers buy their sweet potato in open air markets. In HomaBay county, about 20% of the respondents produce their own sweet potato. This could be explained by the rural and urban set-up of the two counties. In Nairobi county, most of the consumers buy their sweet potato from the open-air markets and by the road side.

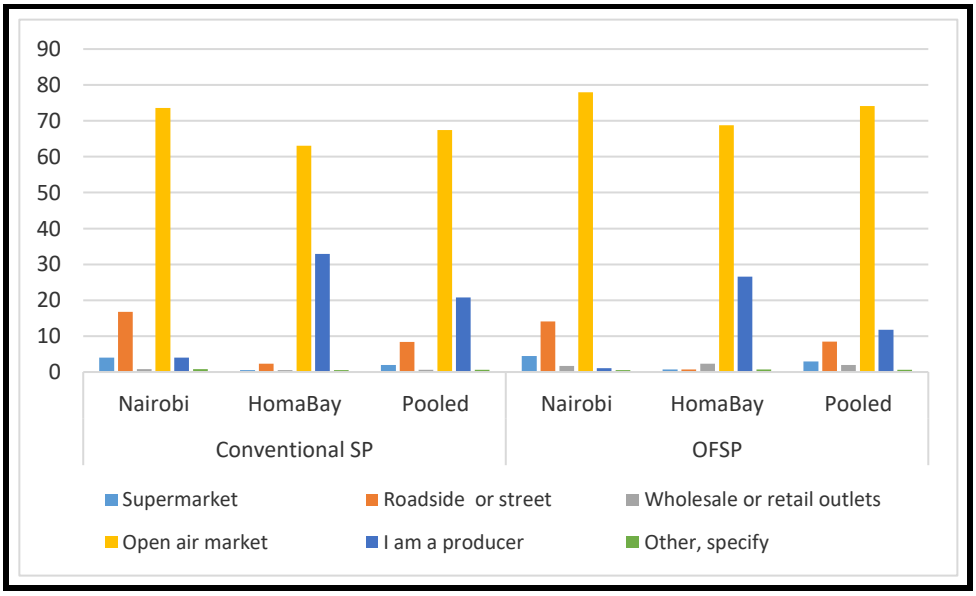

Figure 5: Main sweet potato purchase outlets
Source: Survey Data (2020).

3.4.4.Characterization of consumers perception on orange-fleshed sweet potato

According to the results in Table 2 most of the respondents strongly agreed that OFSP have a more appealing colour as compared to conventional sweet potato. Majority of the respondents reported that conventional sweet potato has a better taste than OFSP. This is consistent with the findings from the FGDs in both regions. However, this was contrary to the findings of (Kanguogo, 2012) who reported that OFSP possesses an attractive sweet taste to children compared to the white-fleshed sweet potato.

Table 2: Consumers' attitudes towards Orange-fleshed sweet potato

Attitude statements	*Scores (percentage)*				
	Strongly disagree	***Disagree***	***Agree***	***Strongly agree***	***Don't know***
OFSP has more appealing colour	5.60	9.00	36.74	42.34	6.33
OFSP is easy to digest	4.38	15.27	50.61	19.55	9.49
OFSP has too much water than conventional	17.27	33.09	23.11	20.19	6.33
OFSP is too light to satisfy someone	18.00	40.39	27.01	9.49	5.11
Against cultural belief	43.80	41.61	4.38	4.14	6.08
OFSP is GMO product	31.87	30.66	17.03	11.44	9.00
OFSP taste better than conventional SP	35.52	32.60	15.57	10.71	5.60

Source: Survey Data (2020)

3.4.5. Sources of information on orange fleshed sweet potato products

The Figure 6 provides results on where the consumers obtain information on OFSP products. The result showed that most of the respondents obtained information on OFSP products from their neighbours or friends and sweet potato product sellers. Close to 20% of the respondents obtained information from the non-governmental institutions including CIP.

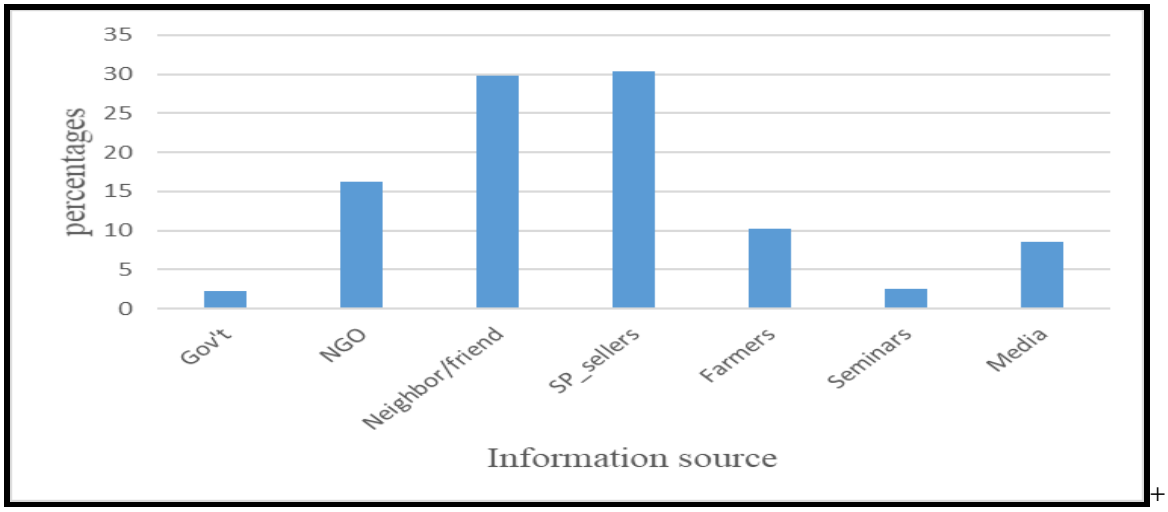

Figure 6: Sources of information on OFSP products
Source: Survey Data (2020).

3.4. 6. Consumption of sweet potato products

Figure 7 shows the result for consumption level of OFSP products. According to the combined sample, most of the respondents have consumed OFSP crisp (18%), porridge (17.7%) and bread (12.5%). A zero-consumption level was recorded for OFSP juice in both counties. The consumption level for crisps and porridge were higher in Nairobi than HomaBay. This could be attributed to the higher awareness level of these products in Nairobi compared to HomaBay County.

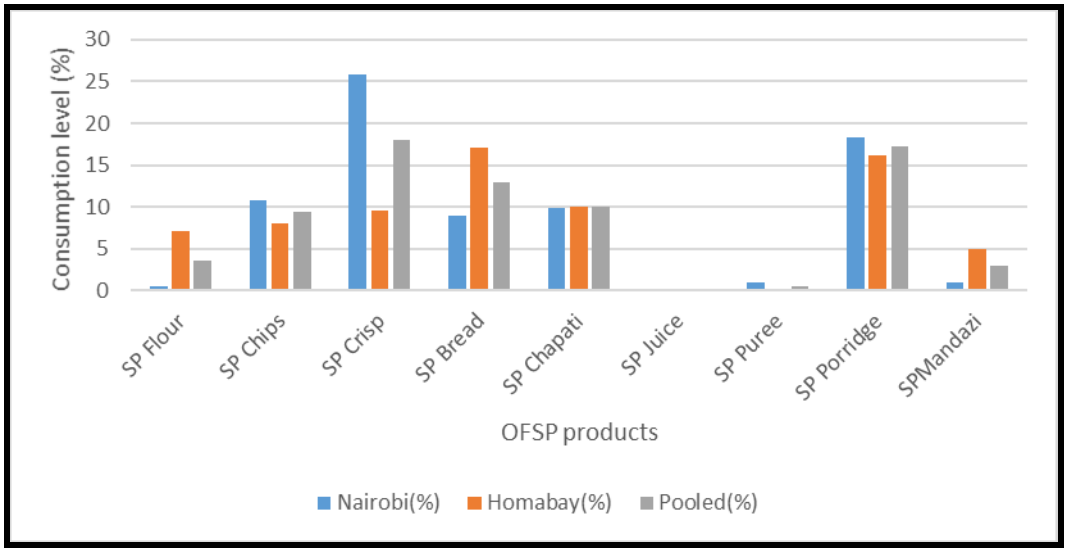

Figure 7: Sweet potato consumption level
Source: Survey Data (2020).

3.4.7. Reasons for not consuming orange fleshed sweet potato products

Figure 8 provides information on reasons for not consuming the OFSP products by the non-consumers. About 30% of respondents who had never consumed any OFSP products reported that they do not like processed OFSP products, 40% posits that they do not know where they can find the OFSP products and close to 20% reported that OFSP products are expensive.

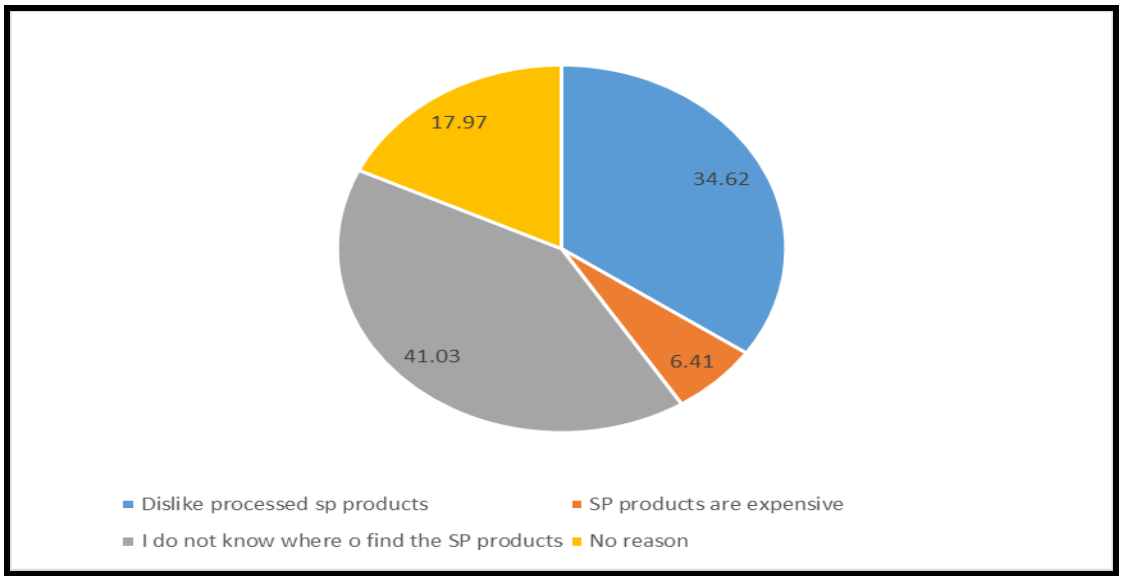

Figure 8: Reasons for not consuming OFSP products

Source: Survey Data (2020).

CHAPTER FOUR

4.0 ANALYSIS OF CONSUMER WILLINGNESS TO PAY FOR ORANGE-FLESHED SWEET POTATO JUICE

4.1 Abstract

Bio-fortified foods including OFSP have been promoted worldwide as a potential mechanism to combat VAD, especially in children and women. Various projects have focused on creating nutritional awareness to promote the consumption of OFSP. One of the ways to promote broader consumption of OFSP is to process it into less perishable products with a wider geographical coverage. The chapter assessed consumer preference and willingness to pay for OFSP juice attributes in rural and urban areas using a choice experiment approach. The OFSP juice attributes included in the study were juice mixture, use of additives, inspection and certification, origin labelling, and price. The consumers from both the rural and urban areas exhibited a positive and significant preference for the juice with OFSP only, the use of additives, and joint inspection and certification. In addition, the consumers in the rural region showed a higher positive preference for origin labelling. Further, the urban consumers were willing to pay higher amounts of Kshs145.82 to 298.7 for additives than any other attribute. The urban consumers were also willing to pay more for joint inspection and certification of the OFSP juice and juice with OFSP only. On the other hand, the rural consumers were willing to pay higher amounts for OFSP juice with OFSP only, origin labelling, additives, and joint inspection and certification. In general, urban consumers were willing to pay more for OFSP juice attributes than rural consumers. The findings imply that the inclusion of the various juice attributes in OFSP juice is a potential way of promoting the consumption of the juice hence increasing the utilization of OFSP.

Keywords: Willingness to pay, OFSP, urban and rural consumers, vitamin A deficiency, Kenya.

4.2 Introduction

Malnutrition in micronutrients including vitamin A remains a key health concern in SSA. Despite the global efforts in promoting the use of food supplements to address this challenge, the number of undernourished people increased from about 785 million to 815 million from the year 2015 to 2018 with Asia and SSA accounting for the largest share (FAO,2019). One major contributor to malnutrition is hidden hunger, which entails deficiency in essential micronutrients and vitamins (Bouis *et al*., 2018), including vitamin A.

Deficiency in vitamin A affects the physical and mental development of infants, causes night blindness, and may eventually result in death (WHO, 2015). Additionally, adults with VAD may exhibit impaired cognitive ability. As noted by (Ruel *et al*., 2017), interventions aimed at reducing VAD should be targeted to women and children because they are the most affected groups.

The consumption of bio-fortified foods including OFSP is one of the most cost-effective and sustainable food-based approaches to addressing micronutrient deficiency including VAD (Low and Thiele, 2020). Recently in Africa, more attention has shifted to the development of the agricultural value chain for industrially processed food as a potential way of increasing the availability of bio-fortified foods mainly to non-farm households and to address the food security needs of the rapidly increasing population in the continent (Low *et al*., 2017).

Various non-governmental organizations including the International Potato Centre (CIP) and Harvest Plus have been promoting the consumption of OFSP by creating public awareness on the nutritional benefits and through value addition. Further, agriculture- nutrition-sensitive programs have been promoted as a potential mechanism to address VAD, especially in SSA (Olney *et al*., 2019). One of the potential ways to increase the consumption of OFSP among the non-farm populations is to process it into other products.

In the last decade, there have been concerted efforts by various non-governmental organizations including the International Potato Centre (CIP) and Harvest Plus to promote consumption of OFSP by creating public awareness on the nutritional benefits through food demonstrations (Bocher *et al*., 2019). However, the extent of value addition and consumption of OFSP has remained low in rural areas where massive production of OFSP takes place and even in the urban areas that are characterized by higher populations, purchasing power and diverse food preferences than the rural areas. This unexpected observation in developing countries such as Kenya where VAD challenges are enormous has largely been attributed to

market uncertainty (Orinda *et al*., 2017). The Kenya Government (2018) noted VAD levels of 29 and 20% in rural and urban populations, respectively. Effective market linkages are considered important motivators for increased value addition and consumption of healthy foods such as the OFSP. However, little is known about consumers' preferences for OFSP juice and the main drivers of its purchase and consumption.

An early study of the demand for processed OFSP products among urban consumers in Rwanda found that they were highly acceptable (Okello *et al*., 2014). This finding spurred interest in developing more processed products from OFSP, especially juice and bread. Consumer demand for OFSP bread and motivations for its purchase have recently been analyzed by Okello *et* al. (2021) and Lagerkvist *et al.* (2021). The extant literature on preferences for bio-fortified foods (see for example, Bocher *et al.,* 2019; de Groote *et al*., 2014; Laurie *et al*., 2018; Lagerkvist *et al*., 2016; Okello *et al*., 2014*;* Okello *et al.,* 2019; Wanjuu *et al*., 2019*)* is also limited to the actual taste and colour of the product presented to consumers in single urban market segments. The evident gap in these kinds of studies is their failure to show variations in consumer preferences for biofortified foods in multiple market segments that are characterized by different socio-economic aspects (Guinard, 2002; Lawless and Heymann, 1999).

While these studies offered useful insights on the psychological and bread quality aspects influencing urban consumers' preference for OFSP bread in supermarkets by focusing on sensory qualities like flavour, colour, and fragrance, they ignored the rural setting and a sensitive intrinsic attribute such as juice mixture and extrinsic aspects such as origin labeling, inspection and certification. The current study addresses the key knowledge gaps regarding rural-urban differences in consumer preferences, and inclusion of extrinsic attributes in the design of OFSP juice. The specific objective pursued was to analyse and compare WTP for OFSP juice attributes in rural and urban areas.

The assessment of consumer preference in both rural and urban regions is important to policy on three grounds: it offers insights on differences between preferences of consumers in a production zone and those in a non-production zone; it provides information on attribute preferences between consumers in different income categories and; helps to guide the design of OFSP juices for consumers in areas with varying levels of access to alternative VAD management interventions. Rural consumers (HomaBay) are generally poorer and have limited access to alternative sources of vitamin A compared to their urban (Nairobi) counterparts. This study thus, contributes to the growing literature on WTP for biofortified

foods by offering insights on the rural-urban nexus of consumer preferences on a mixture of intrinsic and extrinsic attributes of a relatively new product (OFSP juice); with the exception of Bocher *et al.* (2019) who assessed urban consumer preferences for OFSP juice in Rwanda, such an analysis has never been done elsewhere.

4.3 Methodology

4.3.1 Theoretical framework

The choice experiment (CE) method that was originally proposed by Louviere and Hensher (1982) and Louviere and Woodworth (1983) was applied in generating data for assessment of consumers' WTP for OFSP juice. The CE is a discrete choice attribute-based approach that is preferred to other stated preference methods such as contingent valuation (Mitchell and Carson, 1989) because it allows the estimation of trade-offs for different product attributes as opposed to valuing the good or service as a whole (Hanley *et al.*, 2001). Additionally, reduces response bias associated with CVM since the consumer preferences are asked indirectly. Moreover, the CE approach is suitable for the valuation of hypothetical goods or services, and those that are still at the pilot stage (Hicks, 2002), for example, the OFSP juice whose production is still in developing stages of commercialization.

The CE study was anchored on Lancaster's theory of choice (Lancaster, 1966) which posits that a consumer derives utility from the attributes/characteristics of a good and not the good itself. Therefore, the decision to purchase or use a given product is influenced by the attributes of the product and not the product itself. The consumers' decision to purchase OFSP juice is influenced by the juice attributes and not the juice itself. The analysis of CE data follows random utility theory, which assumes that an individual's utility is made of observable/deterministic and random components (McFadden, 1973).

4.3.2 Choice experiment design

The CE design process for OFSP juice began with a review of literature to identify and define the desired attributes. Following Bateman *et al*. (2002), the attributes were validated through FGDs in both HomaBay and Nairobi Counties. Besides, the FGDs provided information on the most preferred OFSP products and consumers' perceptions on the attributes. According to Blamey *et al.* (2002), a good CE design should prioritize attributes that are policy-relevant, measurable, and demand-relevant. Furthermore, the specified attribute levels must be actionable and plausible to the respondent (Bennett and Blamey, 2001).

Two sets of attributes were identified in line with standard CE procedure: compulsory and voluntary attributes. The mandatory or compulsory attributes are those that ensure compliance with set regulations so that the product can be effectively delivered; in this case, strict monitoring of the juice quality and safety to prohibit poisoning or any form of adulteration. Voluntary attributes are those that grant the consumers flexibility to choose based on their tastes and preferences; it is the voluntary attributes that are normally included in the CE design. Five optional attributes were included in the CE design (Table 3). Following the optimal CE design dimensions suggested by (Caussade *et al*., 2005), these attributes were set at two to three levels to minimize respondents' cognitive burden.

Table 3: OFSP juice attributes included in the CE design

Attribute	Definition of attributes	Attribute levels
Juice composition	Desired composition/mixture in the juice	OFSP only, OFSP and lemon, OFSP and mango
Origin labelling	Provision of information about geographic location, climatic conditions of the production environment, and OFSP production methods	Yes, No
Additives	Use of additives such as sugar, flavours, and/or preservatives to enhance appearance and shelf life	Yes, No
Inspection and certification	Which institution should inspect and certify the juice quality and safety	Public, private, joint public, and private
Price	Price of juice per litre (Kshs)*	180, 220, 260

Note: *Kshs 102 were equivalent to USD$1 at the time of the survey.

According to Otieno and Nyikal (2017), *fruit mixture* plays an important role in the identification of contamination. Considering that OFSP is rich in Vitamin *A*, blending its juice with other fruits such as lemon and mangoes enhances nutritional composition as well as the taste of the juice. It was envisaged that a consumer would choose an OFSP juice composition that meets their nutritional needs. Three possible juice compositions were identified; juice made of OFSP only, juice made from OFSP and lemon, and; juice made from OFSP and mango.

Mixing OFSP juice with citric fruits such as lemon would enhance the nutritional content by providing vitamin *C*, carbohydrates, potassium, and folate. Consumption of lemon and lemon juice is a potential way of reducing the risk of heart diseases as well as skin protection (Liu *et al*., 2012). Moreover, as noted by Orisakwe *et al*. (2020) the mixture of lemon with natural spices such as turmeric, ginger and garlic hold promise in the prophylaxis and cure of covid-

19 infection. On the other hand, mango fruit is an important source of vitamins *A, B6,* and *C.* In addition, it is important in digestion, controls constipation, and slows the absorption of sugar into the bloodstream. By consuming juice made from OFSP and mango, the consumer would obtain multiple nutrients from a single product - vitamin *A* from OFSP and vitamins B6 and *C* from mango (Turner *et al*., 2013).

Labelling provides information on the place of production, the name of the product, all the ingredients used in the product, production processes used, recommended storage conditions, and instructions on how to use the product. This attribute provides vital information that can facilitate product traceability and enhance transparency. Effective labelling also informs consumers about the safety of the product and acts as a psychological nudge on consumers' positive attitudes, perceptions, and increased purchase of a product (Reboucas *et al*., 2019; Jung *et al*., 2020; Hernandez-Fernandez *et al*., 2021). In developed countries such as the USA, it is a mandatory legal requirement for producers to provide information on the country of origin for most food products (Xie *et al*., 2016). In Kenya, the Food, Drugs, and Chemicals Act (the Republic of Kenya, 2012) stipulates that the information contained in the labels should be clearly and prominently displayed to enable consumers to make informed choices. The study focused on the origin of OFSP that was used in the OFSP juice processing. In the current study, the **or**igin labelling attribute was included to provide information about geographic location, climatic conditions of the production environment, and OFSP production methods. The focus group discussion conducted for attribute validation revealed that consumers prefer OFSP from specific regions of the country; hence, this might influence the preference for OFSP juice. During the survey, the respondents were told that origin labelling would entail explicitly indicating on the juice package, which part of the country the OFSP was grown in; HomaBay county has naturally fertile soils and suitable climate for potato production unlike other parts of the country where use of artificial fertilizers is inevitable to support growth of most crops. These variations influence the tuber size, taste and other intrinsic traits of the potato.

Food *additives* include any substance that is added to food products to enhance taste, appearance, aroma, colour, and to preserve flavour as well as to increase the shelf life. In addition, food additives alter the nutritional structure and provide perfect processing conditions for the food (Wu *et al.,* 2013). These additives include chemical preservatives, colorants, flavours, and sweeteners such as sugar. However, in recent years, there has been an increasing demand for foods without additives due to concerns on potential health risks from

synthetic food additives (Wang *et al*., 2015). Most consumers believe that as much as additives enhance food taste and shelf life, they are needless and unjustified (Christensen *et al*., 2011). It is therefore essential to evaluate consumers' perspectives on the inclusion of additives in OFSP juice. The study concentrated on two aspects of additives, namely the use of sweeteners to improve the flavour of the OFSP juice and the use of preservatives to extend shelf life.

Certification and inspection are vital in building consumers' confidence in the efficacy of the product generation process. Thus, food certification builds consumers' confidence in the quality of the food that they are purchasing (Wang *et al*., 2018). Public and/or private institutions can inspect and certify food products independently or jointly. In the case of artisanal fruit juices, Otieno and Nyikal (2017) reported a higher consumer preference joint inspection and certification by private and public certification.

The *price* attribute was included in the CE design to facilitate the computation of trade-offs between OFSP juice quality attributes and expected compensation. In line with Hanemann (1984) this attribute permits the estimation of the consumer WTP for the OFSP juice. The use of monitory terms in the estimation of benefits ensures that consistency of CE with welfare economics is achieved (McIntosh and Ryan, 2002). The stated baseline price of Kshs 180 that was obtained by averaging the prices of one litre of juice in the retail market, was validated in the FGDs. Considering the need for rational business enterprises to recover the costs incurred in the provision of goods and services, the successive price levels (220 and 260) were determined using a progressive pricing approach: representing possible values of different improvements in the OFSP juice. Consistent with previous CE studies (for example, Pambo *et al*., 2017; Otieno, 2020) a uniform price interval was adopted to ensure proper scaling of the WTP values.

The NGENE software (Choice Metrics, 2009) was employed in the generation of the CE design. In the first stage, the orthogonal design generated was pretested on 40 respondents, and the pretest data was analyzed in NLOGIT version 6 software. The prior coefficients obtained were used in the second stage to generate a D-optimal design that was used in the final survey (Bennett and Blamey, 2001; Hanley *et al*., 2001).

The final CE design had 36 OFSP juice profiles, which were randomly blocked into 6 choices sets with 6 scenarios. Only one of the six sets were randomly assigned to a respondent. Each choice scenario had two alternative types of OFSP juice descriptions (A and B). The third option with none of the OFSP juice attributes was included in the survey to cater for respondents whose

preferred juice types may not have been fully captured in the design; a neither or opt-out option that ensures completeness of the CE design in representing rational consumers' choice space. During the survey, respondents were reminded that the choice tasks were independent of each other. An example of a choice task presented to the respondents is shown in Table 4.

Table 4: Example of a choice task presented to the respondents

	Juice type A	Juice type B	Neither A nor B
Juice composition	OFSP	OFSP	
Additives	No	Yes	
Origin labelling	Yes	No	
Inspection and certification	Public	Joint public-private	
Price (Kshs/litre)	220	180	
Which one would you choose?	☐	☐	☐

Following Boxall et al. (2009), a third option with none of the OFSP juice attributes was included in the survey to cater for respondents whose preferred juice types may not have been fully captured in the design. The 'neither or opt-out option' ensures completeness of the CE design in representing rational consumers' choice space in unlabeled CE designs like the current study where there is no uniform OFSP juice option that would otherwise be considered as a 'status quo' (Veldwijk *et al*., 2014). Therefore, our analysis does not require the inclusion of an alternative specific constant (ASC) in the model and our results are valid like those of other empirical studies that have used the 'opt-out' option and omitted the ASC term (see for example Otieno and Nyikal (2017), Pambo et al. (2017) and Otieno and Ogutu (2019). Prior to the survey, sufficient information on all attributes was provided to the respondents and they were reminded that the choice tasks were independent of each other.

4.3.3 Model specification

The random parameter logit (RPL) (Revelt and Train, 1998) model was applied to analyse the CE data. The RPL provides unbiased estimates in the presence of heterogeneity in the data (McFadden and Train, 2000). The multinomial logit model assumes homogeneity of unobserved preference across the population hence the model provides biased results. The RPL model generalizes the multinomial logit model by allowing the coefficient of observed variables to vary randomly over the population. On the other hand, latent class method capture heterogeneity at class levels. The latent class analysis method assumes homogeneity

of preference in a given class and heterogeneity of preferences across classes (Greene, 2008). The probability of being is a given class is dependent of the characteristics of the respondent, which indirectly influence their preference through their influence on class membership. The latent class method requires a specification of the number of classes to be included in the model because an objective criterion may lead to few or too many classes. Therefore, a significant judgment is required which may be difficult to explain to the users of such results (Hauber *et al*., 2016). To avoid such complexities associated with class formation, the study used the RPL model.

A consumer is faced with *j* alternatives to choose from. Following Revelt and Train (1998), the utility derived by individual *n* from alternative *j* in choice set *t* is expressed as follows:

$$V_{nj} = \beta_n X_{nj} + \varepsilon_{nj} \quad (6)$$

where *Xnj* represents the observable variables, which are the attributes of alternative *j* that is faced by individual *n*, β_n is the coefficient vector of the observed variable for the individual *n* that represents an individual's taste, and ε_{nj} is a random component that is assumed to be identically independently distributed type *I* extreme value.

The coefficient for every individual in the population varies with a density function of f (β_n/θ), where β_n represent the parameter vectors of each decision-maker *n* (represents a person's taste that varies between individuals), and θ are parameters that explain the distribution (covariance and mean) of β_n in the population. The value of parameter θ is estimated through choice set simulations using a maximum log-likelihood method. The log-likelihood function is specified as:

$$LL(\theta) = \Sigma_n \ln P_n(\theta) \quad (7)$$

The parameters estimated are those that maximize the simulated log-likelihood SLL(θ). The ratio of the coefficient of each attribute and that of price give the *WTP*, which is an equivalent of the trade-off between OFSP juice attributes and the price, which forms the marginal *WTP*. Following Hanemann (1984), the *WTP* was computed as shown below:

$$WTP = -1\ X\ \frac{\beta_j}{\beta_p} \quad (8)$$

where β_j represents the estimated coefficient for a given attribute level in the choice set and β_p represents the coefficient of the price of one litre of OFSP juice. Therefore, WTP is the

marginal rate of substitution that represents the trade-off between OFSP juice attributes and price.

4.4 Results and discussion

4.4.1 Consumers' perceptions on OFSP juice attributes

The respondents were asked to indicate whether the listed OFSP attributes were important in influencing their purchase and consumption decisions. As shown in Table 5, about 90% of the respondents in the pooled sample showed a positive concern on which institution should inspect and certify OFSP juice. Additionally, more than three-quarters of the consumers stated that juice mixture, origin labelling, and additives were important attributes that they consider when purchasing juice. The fact that more than 85% of the respondents in the pooled sample perceived all the OFSP juice attributes to be important indicates that collectively, all these attributes are important in understanding consumers' preferences for the OFSP juice.

Table 5: Respondents' perceptions of the relative importance of OFSP juice attributes

OFSP Attribute	Percent of respondents			
	HomaBay (n =198)	**Nairobi (n=211)**	**Pooled (n = 411)**	**Statistically significant differences between rural and urban areas (z-ratio)**
Juice mixture	79.88^{b}	96.97^{a}	88.00	5.3892***
Origin labelling	71.14^{b}	83.32^{a}	78.50	1.7707*
Additives	77.58^{b}	93.44^{a}	86.00	2.0318**
Inspection and certification	83.33^{b}	*96.97*^{a}	90.59	4.2234***
Price	87.36^{b}	97.47^{a}	92.74	5.0635***

Note: Asterisks ***, **, * denote a statistically significant difference in means between study sites at 1%, 5%, and 10% levels, respectively. The superscripts *a*, *b* denotes the magnitude of difference in a descending order.

Source: Survey Data (2020).

The result depicted a statistically significant difference in rural and urban consumer's perception on the relative importance of the OFSP juice attributes included in the study. This could be explained by the difference in the level of education and level of awareness on OFSP products in the two regions.

4.4.2 Consumers' preferences for OFSP juice attributes

The RPL results on consumer preferences for OFSP juice attributes are reported in Table 6. The improvements in log-likelihoods (from -1015.871, -1023.637 and -2056.79 to -998.71, -999.43 and 2025.91) and the adjusted *pseudo-* R^2 values in all the estimated models (from MNL values of 9.578, 11.69%, and 11.21% to 27.4%, 28.6% and 27.2%) for HomaBay, Nairobi and pooled data, respectively show that the RPL model fits the data better than the restrictive MNL model. From the pooled sample, consumers expressed a significant positive preference for all attributes except private inspection and certification.

Across the two counties and for the pooled sample, consumers had a higher preference for juice with OFSP only than the OFSP juice mixed with lemon. This could be explained by the ease of traceability. This finding is consistent with the findings of Otieno and Nyikal (2017), who reported that consumers preferred artisanal juice prepared from a single fruit for ease of identification compared to those with multiple fruits. Further, the results show that consumers in both counties had significant preference for juice with joint public-private inspection and certification than that conducted by the private sector only.

The higher preference for joint inspection and certification of OFSP juice is consistent with the observations from the FGDs that, consumers have low confidence in a public institution. The negative value on rural consumers' preference for private inspection implies that the rural consumers did not approve of private inspection and certification of OFSP juice at all. The pooled results also indicated that preference for private inspection and certification was not statistically significant. This is supported by the feedback from FGDs in HomaBay where the consumers stated that if inspection and certification of food products is left for private sector only the food prices including OFSP juice are likely to increase.

The significant preference for additives by the consumers in both counties and the pooled sample indicates that consumers prefer the use of additives in the preparation of OFSP juice. This is supported by FGDs results in which three-quarters of the participants reported that they would prefer OFSP juice that contains additives, specifically, small quantity of sugar to enhance the taste. However, the results on preference for additives is contrary to the findings of Otieno and Nyikal (2017) who reported that consumers did not prefer additives such as colorants, flavors, and preservatives in the preparation of artisanal juice in Kenya. Bonilla (2010) also showed that fruit juice consumers in the United States of America (USA) did not prefer the addition of sugar in the juices due to health-related concerns.

Table 6: Estimated RPL results for OFSP attribute preferences

Variable	HomaBay	Nairobi	Pooled
OFSP only	0.398(0.153) ***	0 .586(0.165) ***	0.468(0.112) ***
OFSP and lemon	0.277(0.127) **	0 .517(0.157) ***	0.384(0.099) ***
Use of additives	0.495(0.112) ***	1.-394(0.170) ***	0.901(0.093) ***
Origin labelling	0.560 (0.119) ***	0.198(0.150)	0.376(0.094) ***
Private certification	-0.268(0.123) **	0 .336(0.147) **	0.017(0.099)
Joint public-private certification	0.488(0.127) ***	0.480(0.166) ***	0.455(0.100) ***
Price	-0.008(0.001) ***	-0.006(0.001) ***	-0.007(0.001) ***
Derived standard deviations of parameter distributions			
OFSP only	1.037(0.252) ***	0.197(0.339)	0.790(0.251) ***
OFSP and lemon	0.398(0.392)	0.866(0.332) ***	0.527(0.259) **
Use of additives	0.822(0.209) ***	1.282(0.236) ***	1.027(0.153) ***
Origin labelling	0.426(0.350)	1.254(0.260) ***	0.881(0 .187) ***
Private certification	0.356 (0.404)	0.570(0.364)	0.715(0.184) ***
Joint public-private certification	0 .6437(0.327) **	1.385(0.314) ***	0 .927(0.220) ***
Adjusted *pseudo-R^2*	0.274	0.286	0.272
Log-likelihood	-998.71	-999.43	-2025.91
n(respondents)	198	213	411

Note: Starting MNL *pseudo-R^2* = 9.578%, 11.69% and 11.21%, for HomaBay, Nairobi and pooled samples, respectively. Log-likelihood = -1015.871, -1023.637 and -2056.79 *for* HomaBay, Nairobi, and pooled samples, respectively. Statistical significance levels; *10%, **5%, ***1%.

The consumers in the rural area also exhibited a significant preference for origin labelling. This can be explained by observations from the FGD where they emphasized that provision of information on origin of OFSP used in the preparation of the juice is a potential way of eliminating miscommunication between manufacturers and consumers, about traceability. On the contrary, the preference for origin labelling was insignificant in the urban area. This was contrary to the expectation because Nairobi being one of the major markets for OFSP from different parts of the country, the consumers were expected to be concerned about the origin of OFSP used in juice preparation.

Some previous studies (for example, Insch and Jackson, 2014; Norris and Cranfield, 2019) showed that information on origin labelling is not a primary attribute that influences consumers' purchase behaviour compared to other attributes such as certification and inspection, prices, safety, and use.

As expected, the coefficient estimates on the OFSP juice price attribute had a negative sign and was significant in both counties. This enables the estimation of marginal WTP, which is the monetary value that the consumers attach to the different OFSP juice attributes.

In the pooled sample, the standard deviations of all the variables except OFSP and lemon were statistically significant. The standard deviations of random coefficients of OFSP only, use of additives and joint certification are statistically significant for the rural site. For the urban site, the standard deviations of OFSP and lemon juice, use of additives, origin labelling, and joint certification attributes were highly significant. This implies heterogeneity in the preference for these OFSP juice attributes.

Table 7 provides information on WTP estimates for OFSP juice attributes. The confidence intervals for the WTP were computed from standard errors estimated through the delta approach (Greene, 2007). In the rural area, consumers were willing to pay higher amounts (Kshs 43.38 to 127.16) for juice containing OFSP only compared to OFSP and lemon juice; Kshs 33.79 to 98.59 for additives; Kshs 41.33 to 110.41 for origin labelling and; Kshs 34.09 to 110.21 for joint inspection and certification. Conversely, consumers demanded a discount of between Kshs -57.11 to 5.37 for private inspection and certification.

Table 7: Marginal WTP estimates for OFSP juice

Variable	WTP (at 95% CI)		
	HomaBay	**Nairobi**	**Pooled sample**
OFSP only	58.27*** (43.38 to 127.16)	93.43*** (31.86 to 155.00)	64.92*** (30.31 to 99.53)
OFSP and lemon	38.67 (4.9 to 72.44)	82.42*** (23.34 to 141.48)	53.28*** (22.51 to 84.05)
Additives	66.19*** (33.79 to 98.59)	222.26*** (145.82 to 298.70)	125.10*** (92.29 to 157.91)
Origin labelling	75.81*** (41.33 to 110.41)	31.59 (-17.49 to 80.67)	52.18*** (24.38 to 79.98)
Private inspection and Certification	-25.87 (-57.11 to 5.37)	53.59*** (0.79 to 106.39)	2.37 (-24.60 to 29.30)
Joint inspection and certification	72.15*** (34.09 to 110.21)	76.52** (16.09 to 136.95)	63.20*** (31.72 to 94.68)

Notes: *Kshs 102 were equivalent to USD$1 at the time of the survey. CI = confidence interval. Statistical significance levels: **10%, **5%, ***1%*.
Source: Survey Data (2020).

In Nairobi County, consumers were willing to pay higher amounts of Kshs 92.29 to 157.91 for additives than any other attribute. This could be attributed to consumers' preference for taste-enhanced food products and relatively a higher purchasing power. In addition, consumers were willing to pay higher amounts of Kshs16.09 to 136.95 for joint inspection and certification for the juice compared to the private one. The consumers were willing to pay higher amounts of Kshs 31.86 to 155 for juice with OFSP only than that prepared from OFSP and lemon. Consistent with a *priori* expectation, consumers in Nairobi demanded a discount of Kshs 17.49 to 80.67 for origin labelling. This indicates that the urban consumers did not place much importance on the source of OFSP used in the preparation of OFSP juice; instead, they focused on intrinsic attributes of OFSP juice.

On average, the urban consumers were willing to pay more for all the OFSP juice attributes (except for origin labelling) than their rural counterparts. This can be explained by the relatively higher incomes and thereby purchasing power of urban consumers.

CHAPTER FIVE

5.0 CONSUMERS' WILLINGNESS TO PAY FOR ORANGE-FLESHED SWEET POTATO PUREE COMPOSITE *CHAPATI*

5.1 Abstract

The recognition of nutritional benefits associated with the consumption of OFSP has inspired the processing of OFSP into products such as OFSP puree. Empirical evidence shows that OFSP puree can be used as a functional ingredient in the baking industry, and as a substitute of OFSP flour. The use of OFSP puree in baking industry is encouraged as it is locally available and more affordable, thus cutting production costs. Despite its utilization, there is limited information on consumer demand for OFSP puree as an intermediate product and for OFSP *chapati*. The chapter examined consumer purchasing behaviour and preference for OFSP puree *chapati* in rural and urban areas of Kenya. The chapter was based on random utility theory, and the contingent valuation method was used in eliciting WTP for OFSP puree *chapati*. The double bounded logit model was used to analyse consumers' WTP for sweet potato puree *chapati*. The results showed that more than half of the respondents were willing to pay for the OFSP puree *chapati* in both regions. The mean WTP values were 19 and 35 Kenyan shillings for HomaBay and Nairobi counties, respectively. The difference in mean willingness to pay value was because each region had a different average market price for the conventional *chapati*. The presence of children under five years in a household, consumers' awareness of OFSP benefits and OFSP products, and level of education had a positive and significant influence on WTP for OFSP puree *chapati* products in both regions. Income had a negative influence on consumers WTP for OFSP puree *chapati* in both regions. Additionally, household size was significant in the rural region only while nutritional training in the urban area. In conclusion, consumers were willing to pay for OFSP puree *chapati* in both rural and urban regions of Kenya. The study recommends awareness creation among consumers on the existence of processed OFSP products and the benefits associated with their consumption, to increase their consumption and utilization. This can be achieved through the organization of food demonstration campaigns on benefits of consuming OFSP and OFSP-based products: targeting households with children under five years in both areas.

Keywords: Orange-fleshed sweetpotato, consumer preference, contingent valuation, Kenya.

5.2 Introduction

While micronutrient malnutrition has become a major public health problem in developing countries, the consumption of bio-fortified foods is being promoted especially in African countries as a low-cost strategy for combating micronutrient deficiency (Low and Thiele, 2020). The promotion of OFSP is one of the food-based approaches that is used to complement other efforts in combating VAD, especially in the SSA region. Existing literature shows that vitamin A marker levels in children and adults can be improved through the consumption of boiled OFSP roots (Hotz *et al*., 2012). In recent years, sweetpotato utilization has diversified. Sweetpotato can be processed into various food products such as flour, puree, chips, crisps, and juice. Sweetpotato puree is prepared by steaming or cooking peeled sweetpotato slices or chunks, which are then ground into the puree.

There has been growing interest in the substitution of OFSP flour with OFSP puree as an intermediate product used in the baking industry. Studies in SSA have shown that it is economically feasible to use OFSP puree as a substitute for wheat flour compared to OFSP flour (Awuni *et al.*, 2018). A study on consumer acceptability ranking in Ghana reported that OFSP pureed for baking bread is a suitable substitute for wheat flour if 30% of the puree is added to wheat flour in bread preparation (Bonsi *et al*., 2014).

In Kenya, the promotion and commercialization of the use of OFSP puree in the baking industry have been increasing. Some large retail shops adopted the use of OFSP puree to complement wheat flour in baking cookies, bread muffins and buns. Incorporation of OFSP puree in baking lowers production costs because OFSP is grown locally, and the puree yields healthier and innovative products that could increase consumer demand (Muoki and Agili, 2015). More recently, some households have been practicing value addition in OFSP by processing it into flour or puree as a substitute for wheat flour in the preparation of cakes, *mandazi* (doughnuts), and *chapati* (Stathers *et al*., 2013).

There has been a noticeable increase in the production of OFSP baked products in the SSA countries, including Kenya, purposely to intensify the role of sweetpotato in income generation, food security, and nutrition among smallholder farmers (Bonsi *et al*., 2014). For instance, the SUSTAIN project steered the commercialization of OFSP puree and baked products in the western part of Kenya. The promotion of value addition in OFSP is motivated by the need to enhance market opportunities for sweetpotato farmers and to increase the

utilization of OFSP among non-farm households in the urban areas. This is expected to trickle down to the improvement in the livelihood of OFSP farmers.

Despite the promotion of OFSP products, successful commercialization is heavily dependent on consumer preference and demand for the products. The consumers' demand for a novel product is likely to be high if it is nutritious, appealing, safe, and it is up to the required standards (Bi *et al*., 2016). Studies have been conducted on OFSP puree with most of the researchers focusing on the use of OFSP puree as a substitute for wheat flour in bread preparation at the industrial level (Wanjuu *et al*., 2019; Okello *et al*., 2021; Owade *et al*., 2018; Muzhingi *et al*., 2018; Ombaka, 2018; Bocher *et al*., 2019). However, limited empirical attention has been paid to the use of OFSP puree in the preparation of *chapati*. The current study fills this knowledge gap by estimating consumer WTP for OFSP puree *chapati* in rural and urban areas of Kenya.

5.3 Objective and methodology

The objective of this chapter was to assess consumers' WTP and determinates of consumers WTP for OFSP puree *chapati*. The CVM was used in eliciting WTP for OFSP puree composite *chapati.* The CVM was preferred over other stated preference methods such as CE because it allows for the estimation of WTP of OFSP puree *chapati* as a whole product as opposed to the latter that focuses on the attributes of the product or service. The price bidding technique that allowed OFSP consumers to choose from two bids (double-bounded questions) was used. The double-bounded elicitation approach engages the respondents in two rounds of bidding. If the response to the first bid is positive, the second bid is set at a higher level but if the answer is negative, the second bid is lowered further. The follow-up bid is therefore contingent on the first bid. The bidding process stopped after the second bid.

The respondents were provided with a hypothetical scenario as a basis for eliciting the amount of money that the sweetpotato consumers were willing to pay for OFSP puree composite *chapatis.* The hypothetical scenario was framed as follows: *There are plans to use Orange-fleshed sweetpotato puree (steamed and mashed sweetpotato) in the preparation of chapati. Orange-fleshed sweetpotato is a special type of bio-fortified sweetpotato that contains a high level of vitamin A. It helps in the prevention of vitamin A deficiency, improves digestion, and boosts the immune system. Suppose chapati containing OFSP is introduced in the market today would you buy it at Kshs. 15 (average chapati price for Homa Bay) and at 30 (the average price of chapati for Nairobi County).*

The questionnaire structure provided a bidding procedure in which the initial prices of Kshs. 15 (for Homa Bay) and Kshs. 30 (for Nairobi) were based on the average prevailing prices of one piece of *chapati* in the study regions. If the answer to the first bid was "yes", the prices were increased to Kshs. 20 and 40 for Homa Bay and Nairobi, respectively. If the answer to the first bid was "no" the prices were reduced to Kshs.10 and 20 for Homa Bay and Nairobi, respectively. The questioning process stopped after the second bid. The protest response was accounted for by first asking the respondent if he or she would be willing to pay for the OFSP puree *chapati* or not. The expected outcome from both bids included "Yes, Yes"; "Yes, No"; "No, No" and" No, Yes". The quantitative analysis approach taken is discussed below.

The double-bounded logit model was applied in the estimation of consumers' WTP for OFSP puree composite *chapati*. Following Haab *et al.* (2002), data generated by the double-bounded format can be modeled as shown in equation 9:

$$WTP_{ij} = u_i + \varepsilon_{ij} \tag{9}$$

where WTP_{ij} is the j_{th} respondent's WTP and i =1, 2 represents the first and second equation.

The j_{th} contribution to the likelihood function is given as:

$$L_j(u|B) = \Pr(u_1 + \varepsilon_{1j} \geq B_i, u_2 + \varepsilon_{2j} \geq B_i^u)^{yy} * \Pr(u_1 + \varepsilon_{1j} < B_i, u_2 + \varepsilon_{1j} < B_i^l)^{nn} * \Pr(u_1 + \varepsilon_{1j} \geq B_i, u_2 + \varepsilon_{1j} < B_i^d)^{yn} * \Pr(u_1 + \varepsilon_{1j} < B_i, u_2 + \varepsilon_{1j} \geq B_i^u)^{ny} \tag{10}$$

whereu_1 and u_2 are the means for the first and second responses. The setting $u_{ij} = X'_{ij}\beta_i$ allows the means to be influenced by the characteristics of the consumer and the good. The empirical model for mean WTP estimated using double-bounded logit is as follows:

$$WTP = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 \dots\dots\dots + \beta_n X_n + \varepsilon_j \tag{11}$$

The dependent variable in the double-bounded logit were the two bids and their responses. Coefficients of the model were estimated through the maximum likelihood method. This involved two stages whereby in the first stage, the dependent variable that included the two bids and their responses, were regressed to generate mean WTP. The WTP value represented the amount that consumers were willing to pay. In the second stage, independent variables

were included to determine the factors that significantly influence a consumer's WTP (Fieldman, 2012).

The missing values in the second bid were replaced by the second lower bid and its response, respectively. In double-bounded logit, maximum likelihood estimations were used to estimate the coefficients. There are two stages in the estimation. In the first step, the dependent variables were regressed by to generate mean WTP, which is equal to the amount consumers are willing to pay. In the second stage, independent variables such as education level, awareness on OFSP products, awareness on nutritional benefits of OFSP, income, nutritional training, household size, and Availability of children under 5 years were included to determine the factors that significantly influence a consumer's WTP (Fieldman, 2012).

The hypothesized independent variables that were included in the assessment of factors that influence consumers' WTP for OFSP *chapati* were discussed in table 8. The initial bid which is a continuous variable determined the amount that the consumers were willing to pay for OFSP puree *chapati*. It was a determinant of whether the consumers were willing to pay more or less for the new product in comparison with the existing product. The study hypothesized that the initial bid will have a positive influence on consumer WTP for OFSP puree *chapati.*

Table 8: Description of the variables hypothesized to influence willingness to pay for orange fleshed sweet potato puree *chapati*

Dependent variables		
WTP for OFSP puree *chapatti*	Based on the prices presented to consumers for each region (rural and urban)	
Independent variables		
Variable	**Description of the variable**	**Expected sign**
Bid1 (Initial bid)	Average current price for chapati in the market	+
Education level	The educational level of the respondent in years	+
Awareness of OFSP products	Respondent awareness of other existing OFSP products (1 = aware, 0 = Not aware)	+
Awareness of nutritional benefits of OFSP	Respondent's awareness of nutritional benefits derived from the consumption of OFSP (1 = Yes, 0 = No)	+
Income	Average monthly income of the household in Kshs	+
Nutritional training	Receiving nutritional training (1 = Yes, 0 = No)	+
Presence of children under 5 years	Number of children under 5 years in the household	+
Household Size	Number of people in a household	- / +

Source: Author (2020).

It was also expected that age would have a positive influence on consumer WTP for OFSP puree *chapati*. According to *Wanjuu et al.* (2019) study on consumers' knowledge and attitude towards OFSP bread, age had a positive and significant influence on consumers' preference for OFSP bread. hence the hypothesis that age will have a negative influence on OFSP puree *chapati*. Education was hypothesized to influence consumers' WTP for OFSP puree *chapati*. Educational level is vital in willingness to pay studies. For instance, Muhammad *et al.* (2015) reported that education had a positive influence on consumers' WTP for certified organic food products.

According to Bocher *et al*. (2019) nutritional knowledge positively influenced consumer WTP for OFSP juice. This implied that consumers who were aware of nutritional benefits derived from the consumption of OFSP and its products were willing to pay more for the OFSP juice. Therefore, the current study hypotheses that consumer awareness of the nutritional benefits of consuming OFSP will have a positive influence on WTP for OFSP puree *chapati.*

The study hypothesized that income would have a positive or negative influence on WTP for OFSP puree *chapati.* A consumer with a higher income is more likely to pay for the OFSP puree *chapat*i. According to Mawia (2019), the level of income positively influences consumers' WTP for chicken meat derived from chicken fed on insect-based feeds.

Further, nutritional training is expected to have a positive influence on WTP for OFSP puree *chapati.* Consumers who have received nutritional are expected to be willing to pay more for OFSP puree *chapati*. Consumers' awareness of OFSP products is hypothesized to have a positive influence on WTP for OFSP puree *chapati*. Finally, the study hypothesized that the presence of children under 5 years in a household would influence WTP for OFSP puree *chapati.* This was informed by the vigorous promotion of the consumption of OFSP to curb vitamin A deficiency among children under five.

5.4 Results and discussion

5.4.1 Consumption pattern of *chapati* from the pooled sample

The results indicated that a total of 98% of the respondents consume *chapati*. This implies that the incorporation of OFSP puree in *chapati*, and promotion of OFSP puree in chapati is a good opportunity to increase the consumption of OFSP at household levels. As indicated in Figure 9, half of the respondents consume *chapati* at least once a week and close to 30% consume *chapati* at least once in two weeks.

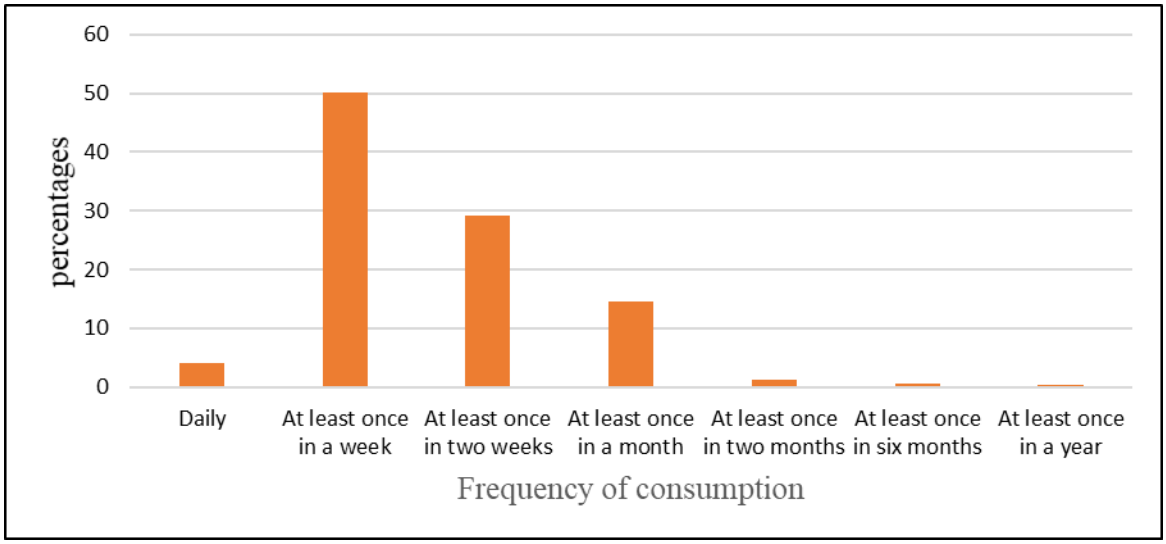

Figure 9: Frequency of consumption of chapati
Source: Survey Data (2020).

5.4.2 Willingness to pay for bid prices

For Homa Bay County, 60% of the respondents accepted the initial bid of Kshs. 15 as shown in Table 9. In Nairobi County, 65 percent of the consumers accepted the initial bid of Kshs. 30. In addition, more than half of the consumers in Nairobi who accepted the initial bid also accepted the higher bid of Kshs. 40. In HomaBay County, 76% of the respondents who said yes to the first bid accepted the second bid/higher bid of Kshs. 20. This was an indication that consumers were likely to accept a higher price for OFSP puree *chapati* than the current market price.

Table 9: Percentage of respondents who were willing to pay for OFSP puree chapati at varying prices

	Nairobi County			Homa Bay County		
	Current market price (CMP in Kshs. 30)	CMP +10	CMP -10	Current market price (CMP Ksh.15)	CMP +5	CMP -5
YES	64.79	52.17	88	59.60	76.74	15.38
NO	35.21	47.83	12	40.40	23.26	84.62

Note: One US dollar was equivalent to Ksh.102 at the time of the survey.

Source: Survey Data (2020).

5.4.3 Mean willingness to pay values for OFSP puree *chapati*

The sweetpotato consumers in Nairobi County were willing to pay an average price of Kshs. 35 for OFSP puree *chapati* which was higher than the average current market price of Kshs. 30. Additionally, the sweetpotato consumers in Homa Bay were willing to pay Kshs. 19 for OFSP puree *chapati*, which is above the average market price of Kshs. 15 in the region. These results imply that respondents had a positive WTP for the OFSP puree *chapati*. Therefore, they are likely to buy if it was to be supplied in the market.

The high average means WTP values implied that consumers would buy OFSP puree *chapati* if it is presented in the market. This could be attributed to the perception that OFSP has high nutritional value hence its products. The result is consistent with a recent study by Alemu *et al*. (2017) on consumer preference and demand for cricket flour buns in Kenya, which reported that consumers were willing to pay more for cricket flour bans. Additionally, the result agreed with the recent study by Wanjuu *et al*. (2019) on consumers' WTP for OFSP bread, which reported that consumers were willing to pay a higher amount for OFSP bread than the conventional bread. This implies that there are chances that there will be a market for OFSP puree *chapati* in Kenya. Therefore, this signals that OFSP puree *chapati* can be used as an alternative source of food to curb malnutrition and food security prevalence.

5.4.4 Factors influencing willingness to pay for OFSP puree *chapati*

Table 10 shows results of the factors hypothesized to influence consumers' WTP for OFSP puree *chapati.* The double bounded logit model proved to be fit since the diagnostic test indicated a prob>chi^2 value of 0.000 for all models in both Homa Bay and Nairobi counties. The wald test gave a value of 65.20 and 29.57 for Nairobi and Homa Bay counties, respectively. The wald test results showed that the explanatory variables had a value greater

than zero. The initial bid, which was the current average market prices for *chapati* had a positive significant influence on WTP for OFSP puree *chapati*. This implied that an increase in the initial bid would translate into a higher probability of an increase in consumer WTP amount. The result means that there could be a starting point bias (Boyle *et al*., 1993).

Consumers' awareness of the benefits of consuming OFSP such as improved vision and boosting of the immune system had a positive significant influence on consumers' willingness to pay OFSP puree *chapati* in both regions. This is consistent with the finding of Bocher *et al*. (2019) who reported a positive relationship between nutritional knowledge and consumers' WTP for OFSP juice.

Nutritional information is a vital determinant of consumers' WTP for OFSP products. In addition, receiving nutritional training had a positive and significant influence on consumers' willingness to pay for OFSP puree *chapatti* in Nairobi County only. Yang *et al*. (2020) also reported that the nutrition information in traditional wet markets significantly boosts consumers' purchasing intention and Consumers' awareness of OFSP products had a positive and significant influence on consumer WTP for OFSP puree *chapati*. Consumers who were aware of existing OFSP products such as crisps, chips, bread, and flour were likely to pay more for OFSP puree *chapati.* The result is consistent with the findings of Adawiyah *et al*. (2021) who reported that an increase in consumer awareness has a positive influence on the consumer interest to purchase a product.

Table 10: Maximum likelihood estimate of factors influencing WTP for OFSP puree chapati

	Nairobi		Homa Bay	
Variable	**Coefficient**	**Std Error**	**Coefficient**	**Std Error**
Bid1 (initial bid)	8.130***	0.003	10.31***	0.021
OFSP_benefits awareness	5.950***	0.365	2.792**	0.351
Marital status	0.390	0.294	1.370	0.563
OFSP products awareness	5.288 ***	1.704	4.798**	0.177
Education in years	0.623***	0.231	0.299**	0.175
Nutrition training	1.909**	0.782	1.746	1.350
Average income	-0.001**	0.346	-0.050**	0.367
Presence of child under 5 years old	3.847***	0.362	6.388***	0.403
Average household size	-0.052	0.069	- 0.741**	0.266
Nairobi: Prob > chi2 = 0.000 Wald chi^2 = 65.20 Log likelihood = -235.55858 n = 213				
Homa Bay: Prob > chi2 = 0.000 Wald chi2 = 29.57 Log likelihood = -235.34636 n = 198				

*Note: Asterisks *, ** and *** denotes significant levels at 10, 5 and 1%, respectively.*

Source: Survey Data (2020).

Further, the presence of a child under five-year-old in the household had a positive and significant effect on willingness to pay for OFSP puree *chapati* in both regions. The implication the WTP for OFSP puree *chapati* increased by 4 and 6 percent in Nairobi and Homa Bay counties respectively. This can be attributed to the fact that OFSP consumption was mainly promoted amongst children under the age of 5 as a probable solution to the VAD problem. The higher impact witnessed in Homa Bay than Nairobi could be linked to vigorous promotion of OFSP consumption and utilization amongst children under five especially in the rural regions of the country including Homa Bay, various NGOs including CIP.

Education level had a positive and significant influence on WTP for OFSP puree *chapati* for both counties. An increase in the level of education increased consumers' awareness of the value of consuming OFSP and its products hence increasing WTP. This result is consistent with the findings of (Nkokelo, 2016) who reported that education level had a positive significant influence on consumers' WTP for OFSP bread, flour, and biscuits. Consumers with a higher level of education are more likely to purchase OFSP puree *chapati.*

Income had a significant negative influence on consumer WTP for OFSP puree *chapati*. This showed that consumers were willing to spend less on OFSP puree *chapati* with an increase in their income. The probability for paying higher amounts for OFSP puree *chapati* decreases with an increase in income. The result for the current paper is similar to that of Umberger *et al.* (2009) who reported that wealthier consumers were not willing to pay for certified meat products in the United States. Further, Joel *et al*. (2019) reported that income had a significant negative effect on consumer WTP for chicken meat derived from insect-based feeds. The negative effect of income on WTP for OFSP puree *chapati* could imply that the wealthier consumers do that attach much value-on-value addition in their *chapati* or OFSP.

Finally, average household size had a negative significant influence on consumer willingness to pay for OFSP puree *chapati.* This implies that household with fewer members were more likely to pay for OFSP puree *chapati*. The result is contrary to the findings of (Alemu *et al*., 2015) that stated that nutrition was valued more by households with more member. The result is consistent with the findings of Joel (2018) that large families were less likely to pay for chicken meat derived from insect-based feeds.

CHAPTER SIX

6.0 CONCLUSION AND RECOMMENDATIONS

6.1 Conclusion

The production and utilization of improved sweet potato varieties especially OFSP with high Vitamin A content has been promoted due to its ability to combat Vitamin A Deficiency (VAD). The increasing yield of OFSP calls for wider utilization and market expansion. Value addition in OFSP is a potential way of increasing consumption, especially among urban consumers. Value addition enhances the shelf life of a product and makes it more appealing to the consumers. The study assessed consumer purchasing behavior and preference for value-added OFSP products including OFSP juice and OFSP puree *chapati*. The specific objectives of the study were to characterize consumers' purchasing behavior and consumption of value-added OFSP and conventional sweet potato products, to assess consumers' WTP for OFSP juice, and to analyze WTP and determinants of consumers' WTP for composite *chapati* made from OFSP puree. The study used CVM in the assessment of consumer' WTP for OFSP puree *chapati*, and CE in eliciting WTP for OFSP juice.

The results of the descriptive statistics showed that the majority of the (40%) respondents consume both conventional and OFSP varieties. Further, more than 80% of the respondents were aware of OFSP products in both study sites. From the pooled sample, majority (70%) of sweet potato consumers buy their sweet potato in open-air markets. The result also indicated that most of the respondents strongly agreed that OFSP has a more appealing color as compared to conventional sweet potato. However, conventional sweet potato has a better taste than OFSP. From the pooled sample results, most of the respondents were aware of OFSP flour, porridge, crisp, bread, and *chapati*, and the main source of information was sweet potato sellers and neighbors or friends. The result implies that as much as most consumers were aware of OFSP and its products, the consumption of OFSP was quite low due to unpleasant taste as compared to the conventional ones in the rural areas. However, in Nairobi, which represents urban consumers, the consumption of OFSP was quite high; this could be attributed to higher nutritional knowledge and educational level in the region.

The study found that both urban and rural consumers were willing to pay for OFSP juice. The urban consumers depicted a higher preference for OFSP juice attributes including joint inspection and certification, use of additives, origin labelling, and juice with OFSP only. In

addition, the result showed that the rural consumers had a higher preference for origin labelling and the use of additives as compared to the urban consumers. Further, the CVM result showed that rural and urban consumers were willing to pay for OFSP puree *chapati*. The study also established the linkage between consumers' awareness of other OFSP products such as OFSP bread, fries, and crisps, and WTP for OFSP *chapati.*

The study concluded that consumers in both areas were willing to pay for OFSP juice and puree *chapati.* Also, the study established that all the attributes considered (except for private inspection and certification) were important in influencing consumers' decisions to purchase and consume OFSP juice. The consumers showed a high preference for joint inspection and certification, use of additives, origin labelling, and juice with OFSP only. The study also established some differences between urban and rural consumers, for instance, the rural consumers exhibited a higher preference for origin labelling and use of additives as compared to the urban consumers.

The study established a linkage between WTP for OFSP puree *chapati* and sociodemographic characteristics such as awareness of benefits derived from the consumption of OFSP, education, and availability of children under five in a household. The promotion of consumption of OFSP in the country has mainly targeted children under five and expectant women. Further, the study established an inverse relationship between income and consumers' WTP for OFSP puree *chapati*. This implied that consumers' WTP for OFSP puree *chapati* decrease with an increase in income.

6.2 Recommendations

6.2.1 Policy recommendations

Generally, WTP values for urban consumers was higher than rural consumers. To increase rural consumers' WTP for OFSP juice, there is a need to establish more OFSP juice pilot or demonstration centers in the rural areas as well as to create awareness among rural consumers and farmers on the various benefits associated with the consumption of OFSP and its products. This can be achieved through the partnership of the ministry of agriculture and NGOs aimed at promoting the consumption of OFSP in the country.

Based on these findings, the study recommends the need for public-private inspection and certification of the OFSP juice should be encouraged to ensure that the OFSP juice is free

from any potential health hazards. This will improve consumers' confidence in the product and assure them of safety. Additionally, regulatory agencies such as the Kenya Bureau of Standards and consumer protection agencies such as the Consumer Federation of Kenya should collaboratively work to ensure that the processed juice meets the required food standards and that comprehensive labelling is done to provide essential information on the origin of OFSP juice to consumers.

Also, to increase rural consumers' WTP for OFSP juice, there is a need to establish more pilot or demonstration centers for OFSP juice in the rural areas as well as to create awareness among rural consumers and farmers on the various benefits associated with the consumption of OFSP and its products. This can be achieved through effective partnerships between devolved agriculture departments and non-governmental organizations.

While this study has demonstrated consumer preferences for various juice attributes, our results are limited by the hypothetical nature of the juice considered. Future studies could offer more insights through sensory evaluation of actual OFSP juice samples, involving the presentation of real juice packages to consumers. Moreover, while our findings offer valuable insights on differences between consumer preferences in a rural potato growing area and an urban non-producing zone, we acknowledge the limitation in making inferences for rural non-producing areas. Future studies of this nature could make comparative analysis of consumer preferences across rural producing and rural non-producing areas, besides the urban nexus.

The findings of the study also showed that consumer awareness of OFSP products and the benefits of consuming OFSP had a positive and significant influence on consumers' WTP for OFSP puree *chapati* in both regions. Therefore, there is a need to create awareness among consumers on the existence of processed OFSP products and the benefits associated with their consumption, to increase their consumption and utilization. The government and NGOs including CIP can achieve this by organization food shows and exhibitions that targets both rural and urban consumers. Also, the CIP may partner with local communities in HomaBay county to conduct food demonstrations with a focus on OFSP-based products in the areas with targeted consumers. This will have a direct effect on the demand for such products including OFSP puree *chapati.*

Nutritional training had a significant influence on consumers' WTP for OFSP puree *chapati* among urban consumers. The government in partnership with the NGOs that promote OFSP utilization and consumption should organize more nutritional training that focuses on

enlightening them on the benefits derived from the consumption of OFSP and the associated benefits. This may increase the demand for OFSP and OFSP-based products.

6.2.2 Suggestions for further studies

While this study has demonstrated consumer preferences for various OFSP attributes, the results are limited by the hypothetical nature of the juice considered. Future studies could offer more insights through sensory evaluation of actual OFSP juice samples, involving the presentation of real juice packages to consumers.

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APPENDICES

Appendix A: Consumer Survey Questionnaire

CONSUMER'S PURCHASE BEHAVIOUR AND PREFERENCE FOR VALUE-ADDED ORANGE-FLESHED SWEET POTATO PRODUCTS IN HOMA BAY AND NAIROBI COUNTIES, KENYA

MARCH/APRIL 2020

INTRODUCTION

This survey is being conducted by a researcher from the Department of Agricultural Economics at the University of Nairobi. The purpose of the survey is to understand consumers' purchasing behaviour and consumption of orange-fleshed sweet potato as well as their preferences for value-added orange-fleshed sweet potato products to improve value addition and nutrition policy in Kenya. Respondents for this survey shall be sweet potato consumers who are at least 18 years old. Respondents will be randomly interviewed at different purchase points including supermarkets and open-air markets. The survey will be done in HomaBay and Nairobi counties and will involve about 450 respondents.

Your responses and opinions will be treated with the utmost confidentiality and will only be used for policymaking. If you have any question please contact Miss. Antonate Owuor (antonateowuor65@gmail.com, 0728671077). The survey interview will require about one hour to complete. I now request your permission to begin the interview.

IDENTIFICATION

Interviewer's name..... Date of interview.....

County..... Sub- County..... Market/Village…….

Point of the interview: 1= Residential area, 2 = Supermarket, 3 = Open air market, 4 = other, specify.....

Screening questions:

I. Do you or your household normally consume sweet potato? (**1 = Yes, 0 = No**). ……

II. Are you one of the main food (sweet potato) shoppers in your household? (**1 = Yes, 0 = No**) ……Proceed with the interview if the answer to the any of the above questions i**s YES.**

SECTION 1: SWEET POTATO PURCHASE AND CONSUMPTION BEHAVIOUR

1. Which sweet potato variety do you and/or your household consume?
   (1) Conventional sweet potato (2) Orange-fleshed sweet potato (3) Both

   For conventional sweet potato,
2. Where do you **mostly** buy your conventional sweet potato?
   (1) Supermarket (2) along the street or roadside market (3) Wholesale or retail outlets (4) other-specify……
3. How frequently do you and/or your household consume the conventional sweet potato?
   (1) Daily (2) At least once in a week (3) At least once in two weeks (4) At least once in a month
4. What quantity of conventional sweet potato do you and/or your household consumer per month in **kilograms**?
5. How do you prepare the conventional sweet potato for consumption?
   (1) Boiled (2) Steamed (3) Roasted (4) Fried (5) Other specify……..
6. Do you mix the conventional sweet potato with other food products? (1=Yes, 0 = No)
7. When do you and/or your household consume the conventional sweet potato?
   (1) Breakfast (2) Lunch (3) Supper (4) other specify…….

   For OFSP,
8. Where do you **mostly** buy your OFSP? (1) Supermarket (2) Along the street or roadside market (3) Wholesale or retail outlets (4) other-specify……
9. How frequently do you and/or your household consume OFSP? (1) Daily (2) At least once in a week (3) At least once in two weeks (4) At least once in a month.
10. What quantity of OFSP do you and your household consume per month in **kilograms**?
    ……
11. How do you prepare the orange-fleshed sweet potato for consumption? (1) Boiled (2) Steamed (3) Roasted (4) Fried (5) Other specify…….
12. Do you mix the OFSP with other food products? (1 = Yes, 0 = No).

13. When do you and your household consume the conventional sweet potato?

(1) Breakfast (2) Lunch (3) Supper/dinner (4) other specify…….

SECTION 2: AWARENESS AND PERCEPTION ON OF ORANGE-FLESHED SWEET POTATO PRODUCTS

14. Which of the following value-added orange-fleshed sweet potato products are you aware of?

Value-added sweet potato products	**Source of Information** **(1) Government agency (2) NGOs (3) Neighbour/Friends (4) Sweet potato sellers (5) Farmers (6) Seminars** **(8) Other specify……**	**Channels of information** **(1) Radio (2) Television (3) Meetings (4) Internet (5) Observation at sale point (6) newspaper (7) Phone SMS (10) Other specify……**
Sweet potato flour (1=Yes, 0 = No)		
Sweet potato chips (1=Yes, 0 = No)		
Sweet potato crisps (1=Yes, 0 = No)		
Sweet potato bread (1=Yes, 0 = No)		
Sweet potato *chapati* (1=Yes, 0 = No)		
Sweet potato juice (1=Yes, 0 = No)		
Sweet potato puree (1=Yes, 0 = No)		
Sweet potato porridge (1=Yes, 0 = No)		
Other specify ……..		

15. Have you and/or your household consumed any of the above value-added sweet potato products?

(1=Yes; 0 = No).

16. If **yes**, which ones?

Type of product consumed	**Frequency** **(1) Daily (2) At least once in a week (3) At least once in two weeks (4) At least once in a month**	**Place of consumption** **At home (2) Hotel (3) At school (4) (5)Transit(6)At work (7) Other specify**	**Quantity consumed**
Sweet potato flour (1=Yes, 0 = No)			
Sweet potato chips (1=Yes, 0 = No)			
Sweet potato crisps (1=Yes, 0 = No)			
Sweet potato bread (1=Yes, 0 = No)			
Sweet potato *chapati* (1=Yes, 0 = No)			
Sweet potato juice (1=Yes, 0 = No)			
Sweet potato puree (1=Yes, 0 = No)			
Sweet potato porridge (1=Yes, 0 = No)			
Other specify …… …..			

17. If **no**, why not?

(1) I do not like processed sweet potato products

(2) The products are expensive

(3) I do not know where the sweet potato products are sold

(4) Other specify…….

18. Please express your attitude statements on OFSP and conventional sweet potato products?

Perceptual statement	**Response**			
	1 = Strongly disagree	Disagree	2 = Agree	3 = Strongly disagree
OFSP products have a better taste than conventional sweet potatoes				
The colour of OFSP products is more appealing than the conventional sweet potato products				
OFSP is easy to digest				
OFSP has too much unnecessary water than conventional OFSP				
OFSP is too light to satisfy me /does not fully address my hunger				
OFSP is against my cultural belief				
OFSP is a GMO product				

19. Have you ever heard of vitamin A? [1 = Yes, 0 = No].

20. In the last 5 years have you and/or household suffered from any of the following effects of VAD?

Effects of VAD		Management methods applied (1) Consumption of vitamin A-rich food (2) Use of oral supplements (3) Other specify……	Number of household members who suffered from the effect in the last 5 years
Night blindness/visual impairment	[1 = Yes, 0 = No].		
Inability to fight infections	[1 = Yes, 0 = No].		
Other, specify	[1 = Yes, 0 = No].		

21. Are you aware of the following benefits consuming orange-fleshed sweet potato?

Benefits of consuming OFSP	Source of information 1.)Government (2) NGOs (3) Neighbour/Friends (4) sweet potato sellers (5) extension officers (6) farmers (7) seminars (8) other specify……	Information channel 1)Radio (2) Television (3) Meetings (4) Internet (5) Observation at sale point (6) Newspaper (7) Phone SMS (8) Other specify ……
Boosting of the immune system **(1=Yes; 0 = No)**		.
Prevent vitamin A deficiency **(1=Yes; 0 = No)**		
Improving digestion **(1=Yes; 0 = No)**		
Prevent dehydration **(1=Yes; 0 = No)**		

SECTION 3: WILLINGNESS TO PAY FOR OFSP CHAPATI

22. Do you/and your household members normally buy/consume *chapati*? **(1=Yes; 0 = No)**

23. If **yes** at what price do you buy one piece of chapati……

24. How frequently do you and/or your household consume *chapati*? (1) Daily (2) At least once in a week (3) At least once in two weeks (4) At least once in a month.

25. Do you mix the *chapati* with other food products? (1 = Yes, 0 = No).

26. When do you and your household consume the *chapat*i?

(1) Breakfast (2) Lunch (3) Supper/dinner (4) other specify…….

PLEASE READ THE FOLLOWING PARAGRAPH TO THE RESPONDENT:

There are plans to use Orange-fleshed sweet potato puree (steamed and mashed sweet potato) in the preparation of *chapati*. Orange-fleshed sweet potato is a special type of biofortified sweet potato that contains a high level of vitamin A. It helps in the prevention of vitamin A deficiency, improves digestion and boosts the immune system. Suppose *chapati* containing OFSP is introduced in the market today;

27. Would you buy it? _____ (1=Yes; 0 = No).

28. If **yes to Q27** would you be willing to pay Kshs _____ per piece of OFSP *chapati*, which is the average market price for chapati? (1=Yes; 0= No) _____.

29. If **yes to Q28,** would you pay Kshs _____ per piece of *chapati* for the same OFSP chapati? (1=Yes; 0 = No) _____.

30. If **no** to **Q27**, would you pay Kshs _____ per piece of chapati for the same OFSP chapati? (1=Yes; 0 = No) _____.

31. If no to **Q27** and **Q 30**, why wouldn't you be willing to pay for OFSP *chapati*?

(1) Expensive

(2) I do not consume orange-fleshed sweet potato

(3) I prefer consuming OFSP alone

(4) Other specify ……..

SECTION 4: PURCHASE AND CONSUMPTION OF CONVENTIONAL JUICE

32. Do you consume juice? **(1=Yes; 0 = No)**

If **yes,**

33. Which type of juice do you consume?

(1) Mango juice (2) Lemon juice (3) Mixed (4) OFSP juice (5) other specify……

34. Where do you buy the juice from?

(1) Supermarket (2) In street or roadside market (4) Wholesale or retail outlets (5) Hotels (6) other specify……..

35. How frequently do you buy the juice? (1) Daily (2) At least once in a week (3) At least once in two weeks (4) At least once in a month.

36. How many litres of juice do you consume in a month? .....

37. How important do you normally consider the following aspects when you buy juice?

	Relative importance			
	1=**Very important**	**2 = Important**	**3 = Not important**	**4= I don't know**
Additives (e.g. sugar, colour)				
Price				
Origin labelling				
Inspection and certification				
Juice mixture				

38. Do the juice you normally buy have labels? [1 = Yes, 0 = No] If no proceed to section 5.

39. Do you normally read the labels on the juice? [1 = Yes, 0 = No].

40. How important are the following institutions/stakeholders in inspection and certification of juice?

Institution/stakeholder	**Relative importance**			
	1 = very important	**2 = Important**	**3 = not important**	**I don't know**
Government authorities e.g. KEBS				
Food scientist and experts				
Health officials				
Farmers				
Processors				
Traders				
Consumer agencies e.g. CoFeK				

41. How important do you normally consider the following juice label aspects when you buy juice.

Label Aspect	**Relative Importance**			
	1=Very important	**2 = important**	**3 = Not important**	**4= I don't know**
Food additives such as preservatives, flavours composition (nutrient content and additives)				
Brand name				
Certification indicator				
Location of production				
Use Instruction				
Expiry date				
Price				
Producer Identity				
Production methods and processes				

SECTION 5: CHOICE EXPERIMENT ON OFSP JUICE

Suppose you are asked to give your views on how OFSP juice should be prepared. The respondent is expected to choose a combination of voluntary attributes that should be considered in the preparation of OFSP juice.

OFSP JUICE ATTRIBUTES TABLE

Attribute	Description of Attributes	Attribute levels
Juice composition	Desired composition/mixture in the juice	OFSP only OFSP and lemon OFSP and Mango
Origin labelling	Provision of information about geographic location, climatic conditions of the production environment and OFSP production methods	Yes No
Additives	Use of additives such as sugar, flavours and/or preservatives to enhance appearance, shelf life	Yes No
Inspection and certification	Which institution should inspect and certify the juice quality Product quality and safety	Public institution such as Kenya Bureau of Standards (KEBS) Private institutions such as the Consumer Federation of Kenya (CoFeK) Joint inspection by public and private institutions
Price	Price of juice per litre (Kshs)*	250 220 190

<u>Validation Questions on Choice Experiment Responses</u>

42. How sure are you about the choices you made in the OFSP juice options (types)? [1 = Very sure, 2 = sure 3= Not sure

43. Were you considering and comparing all attributes before you made a choice? [1= Yes, 0 = No]

44. Were there specific attributes you were looking for in each choice option before you made each decision? [1 = Yes, 0 = No]. If yes, list the lead/focus attributes in the order of priority; ……

45. Were there specific attributes that you ignored in each choice option before you made your choices? [1 = Yes, 0 = No]. If yes, list the ignored attributes in the order of priority; ……

46. Is there any other factor that influenced your responses to the choice experiment questions besides the information given? [1= Yes, 0 = No] If yes, please specify……

…….

SECTION 6: SOCIO-DEMOGRAPHIC CHARACTERISTICS

47.

Age of the respondent in years	
Gender (1 = Female,0 = Male)	
Household composition	
Male members	
Female members	
Number of children under 5 years old	
Number of children between 5-12 years old	
Members aged 12-17 years	
Members aged 18-35 years	
Members aged 35-60 years	
Members aged above 60 years	
Formal education level completed; 1= No formal education, 2 = primary, 3 = secondary, 4 = college, 5 = University	
Marital status 1= Single, 2 = Married, 3= Separated/Divorced, 4 =Widow/widower, 5 = Cohabiting	
Type of household 1 = Male-headed 2 = Female-headed	

48. Have you and/or your household received education/training on nutrition? [1 = Yes, 0 = No]

49. If **yes** what was the source of information?

(1) Government/extension officers (2) NGOs (3) Neighbour/Friends (4) sweet potato sellers' officers (5) farmers (6) seminars (8) other specify……

50. Main occupation of the respondent 1= Farmer; 2 = civil servant; 3 = trader; 4 = Boda-boda operator 5 = fisherman; 6 = Building and construction; 7 = other, specify……

51. Do you produce sweet potato? [1 = Yes, 0 = No].

52. If **yes,** what quantity do you consume and how much to you sell in **kilograms**?

……..

53. On average, what quantity do you produce per season? .....

54. Average household net monthly income……

Income category (Kshs)	Tick category	Average income (Kshs)
Less than 10,000		
10000-20000		
20001-30000		
30001-40000		
40001 -50000		
50001-60000		
60001-70000		
70001 and above		

Appendix B: NGENE choice experiment design syntax

a) Orthogonal design for preliminary survey

Design
Design
; alts=alt1, alt2
; rows=36
; block=6
; orth=sim
; model:
U(alt1) =b0+b1*x1[0,1,2] +b2*x2[0,1] +b3*x3[0,1] +b4*x4[0,1,2] +b5*x5[0,1,2]/
U(alt2) =b1*x1 +b2*x2 +b3*x3 +b4*x4 +b5*x5$

Attributes are listed in this order:
X1 = Juice Mixture
X2 = Additives
X3 = Origin Labelling
X4 = Inspection and certification
X5 =Price

Appendix C: List of all choice sets used in the CE Survey

Profile 1

Scenario 1

	Juice type A	**Juice type B**	**Neither A nor B**
Juice mixture	OFSP	OFSP and mango	
Additives	Yes	Yes	
Origin labelling	No	Yes	
Inspection and certification	Joint	Joint	
Price	260	180	
Which one do you prefer			

Scenario 2

	Juice type A	**Juice type B**	**Neither A nor B**
Juice mixture	OFSP and mango	OFSP and mango	
Additives	No	Yes	
Origin labelling	Yes	No	
Inspection and certification	Joint	Private	
Price	180	260	
Which one would you prefer?			

Scenario 3

	Juice type A	**Juice type B**	**Neither A nor B**
Juice mixture	OFSP and mango	OFSP and lemon	
Additives	Yes	No	
Origin labelling	Yes	Yes	
Inspection and certification	Joint	Public	
Price.	220	220	
Which one would you prefer?			

Scenario 4

	Juice type A	**Juice type B**	**Neither A nor B**
Juice mixture	OFSP and lemon	OFSP	
Additives	No	No	
Origin labelling	No	No	
Inspection and certification	Private	Private	
Price	260	180	
Which one would you prefer?			

Scenario 5

	Juice type A	Juice type B	Neither A nor B
Juice mixture	OFSP	OFSP	
Additives	Yes	Yes	
Origin labelling	Yes	Yes	
Inspection and certification	Private	Public	
Price	220	220	
Which one would you prefer?			

Scenario 6

	Juice type A	**Juice type B**	**Neither A nor B**
Juice mixture	OFSP and lemon	OFSP and mango	
Additives	No	No	
Origin labelling	No	Yes	
Inspection and certification	Public	Private	
Price	220	220	
Which one would you prefer?			

Profile 2

Scenario 1

	Juice type A	**Juice type B**	**Neither A nor B**
Juice mixture	OFSP and lemon	OFSP and lemon	
Additives	Yes	Yes	
Origin labelling	Yes	Yes	
Inspection and certification	Joint	Private	
Price	260	260	
Which one would you prefer?			

Scenario 2

	Juice type A	**Juice type B**	**Neither A nor B**
Juice mixture	OFSP	OFSP	
Additives	No	Yes	
Origin labelling	Yes	No	
Inspection and certification	Public	Joint	
Price	220	180	
Which one would you prefer?			

Scenario 3

	Juice type A	**Juice type B**	**Neither A nor B**
Juice mixture	OFSP and lemon	OFSP	
Additives	Yes	Yes	
Origin labelling	No	Yes	
Inspection and certification	Public	Public	
Price	180	220	
Which one would you prefer?			

Scenario 4

	Juice type A	**Juice type B**	**Neither A nor B**
Juice mixture	OFSP	OFSP and mango	
Additives	Yes	No	
Origin labelling	Yes	No	
Inspection and certification	Public	Private	
Price	260	260	
Which one would you prefer?			

Scenario 5

	Juice type A	**Juice type B**	**Neither type A or B**
Juice mixture	OFSP and mango	OFSP and lemon	
Additives	No	No	
Origin labelling	No	No	
Inspection and certification	Joint	Joint	
Price	180	220	
Which one would you prefer?			

Scenario 6

	Juice type A	Juice type B	Neither A or B
x1 Juice mixture	OFSP and mango	0 OFSP	
x2 Additives	No	No	
x3 Origin labelling	No	Yes	
x4 Inspection and certification	Private	Joint	
x5 Price	260	260	
Which one would you prefer?			

Profile 3

Scenario 1

	Juice type A	Juice type B	Neither A nor B
Juice mixture	OFSP and mango	OFSP and lemon	
Additives	Yes	Yes	
Origin labelling	No	Yes	
Inspection and certification	Private	Private	
Price	220	260	
Which one would you prefer?			

Scenario 2

	Juice type A	Juice type B	Neither A nor B
Juice mixture	OFSP	OFSP and lemon	
Additives	No	No	
Origin labelling	No	Yes	
Inspection and certification	Joint	Public	
Price	180	180	
Which one would you prefer?			

Scenario 3

	Juice A	Juice B	Neither A or B
Juice mixture	OFSP and lemon	OFSP	
Additives	Yes	No	
Origin labelling	Yes	No	
Inspection and certification	Private	Joint	
Price	180	180	
Which one would you prefer?			

Scenario 4

	alt1	**alt2**	**Neither A nor B**
Juice mixture	OFSP	OFSP and mango	
Additives	No	No	
Origin labelling	No	No	
Inspection and certification	Yes	Yes	
Price	220	260	
Which one would you prefer?			

Scenario 5

	Juice type A	**Juice type B**	**Neither A nor B**
Juice mixture	OFSP and mango	OFSP and mango	
Additives	Yes	Yes	
Origin labelling	Yes	Yes	
Inspection and certification	Public	Joint	
Price	180	180	
Which one would you prefer?			

Scenario 6

	Juice type A	**Juice type B**	**Neither A nor B**
Juice mixture	OFSP and lemon	OFSP and lemon	
Additives	No	Yes	
Origin labelling	Yes	No	
Inspection and certification	Private	Public	
Price	260	220	
Which one would you prefer?			

Profile 4

Scenario 1

	Juice type A	**Juice type B**	**Neither A nor B**
Juice mixture	OFSP and mango	OFSP	
Additives	No	Yes	
Origin labelling	No	Yes	
Inspection and certification	Public	Public	
Prices	180	260	
Which one would you prefer?			

Scenario 2

	Juice type A	**Juice type B**	**Neither A nor B**
Juice mixture	OFSP	OFSP and lemon	
Additives	No	No	
Origin labelling	Yes	Yes	
Inspection and certification	Private	Joint	
Price	180	260	
Which one would you prefer?			

Scenario 3

	Juice type A	**Juice type B**	**Neither A nor B**
Juice mixture	OFSP and lemon	OFSP and lemon	
Additives	Yes	Yes	
Origin Labelling	No	No	
Inspection and certification	Public	Private	
Price	180	180	
Which one would you prefer?			

Scenario 4

	Juice type A	**Juice type B**	**Neither A nor B**
Juice mixture	OFSP and mango	OFSP and mango	
Additives	Yes	No	
Origin labelling	No	No	
Inspection and certification	Private	Public	
Price	260	180	
Which one would you prefer?			

Scenario 5

	Juice type A	**Juice type B**	**Neither A nor B**
Juice mixture	OFSP and lemon	OFSP	
Additives	Yes	No	
Origin libelling	Yes	Yes	
Inspection and certification	Joint	Joint	
Price	220	260	
Which one would you prefer?			

Scenario 6

	Juice type A	**Juice type B**	**Neither A nor B**
Juice mixture	OFSP	OFSP and lemon	
Additives	No	Yes	
Origin labelling	Yes	No	
Inspection and certification	Public	Joint	
Price	260	220	
Which one would you prefer?			

Profile 5

Scenario 1

	Juice type A	**Juice type B**	**Neither A nor B**
Juice mixture	OFSP and mango	OFSP and mango	
Additives	Yes	Yes	
Origin labelling	No	No	
Inspection and certification	Private	Joint	
Price	220	220	
Which one would you prefer?			

Scenario 2

	Juice type A	**Juice type B**	**Neither A nor B**
Juice mixture	OFSP	OFSP	
Additives	Yes	No	
Origin labelling	No	No	
Inspection and certification	Joint	Private	
Price	180	220	
Which one would you prefer?			

Scenario 3

	Juice type A	**Juice type B**	**Neither A nor B**
Juice mixture	OFSP and mango	OFSP and lemon	
Additives	Yes	No	
Origin labelling	Yes	Yes	
Inspection and certification	Public	Public	
Price	260	180	
Which one would you prefer?			

Scenario 4

	Juice type A	**Juice type B**	**Neither A nor B**
Juice mixture	OFSP and lemon	OFSP and mango	
Additives	No	Yes	
Origin labelling	Yes	No	
Inspection and certification	Private	Public	
Price	180	260	
Which one would you prefer?			

Scenario 5

	Juice type A	**Juice type B**	**Neither A nor B**
Juice mixture	OFSP	OFSP and lemon	
Additives	No	Yes	
Origin labelling	No	Yes	
Inspection and certification	Private	Private	
Price	220	180	
Which one would you prefer?			

Scenario 6

	Juice type A	**Juice type B**	**Neither A nor B**
Juice mixture	OFSP and lemon	OFSP and mango	
Additives	No	No	
Origin labelling	Yes	Yes	
Inspection and certification	Joint	Public	
Price	220	180	
Which one would you prefer?			

Profile 6

Scenario 1

	Juice type A	**Juice type B**	**Neither A nor B**
Juice mixture	OFSP and lemon	OFSP	
Additives	No	Yes	
Origin labelling	No	Yes	
Inspection and certification	Joint	Joint	
Price	260	220	
Which one would you prefer?			

Scenario 2

	Juice type A	**Juice type B**	**Neither A nor B**
Juice mixture	OFSP and lemon	OFSP and lemon	
Additives	Yes	No	
Origin labelling	No	No	
Inspection and certification	Public	Joint	
Price	220	260	
Which one would you prefer?			

Scenario 3

	Juice type A	**Juice type B**	**Neither A nor B**
Juice mixture	OFSP	OFSP and mango	
Additives	Yes	No	
Origin labelling	Yes	Yes	
Inspection and certification	Private	Private	
Price	180	220	
Which one would you prefer?			

Scenario 4

	Juice type B	**Juice type B**	**Neither A nor B**
Juice mixture	OFSP and mango	OFSP	
Additives	No	Yes	
Origin labelling	Yes	No	
Inspection and certification	Joint	Private	
Price	220	180	
Which one would you prefer?			

Scenario 5

	Juice type A	**Juice type B**	**Neither A nor B**
Juice mixture	OFSP and mango	OFSP	
Additives	No	No	
Origin labelling	Yes	Yes	
Inspection and certification	Public	1Private	
Price	260	220	
Which one would you prefer?			

Scenario 6

	Juice type A	**Juice type B**	**Neither A nor B**
Juice mixture	OFSP	OFSP	
Additives	Yes	Yes	
Origin labelling	No	No	
Inspection and certification	Joint	Public	
Price	260	260	
Which one would you prefer?			