

**CONSUMER ACCEPTABILITY AND WILLINGNESS TO PAY FOR SELECTED
PROCESSED ORANGE FLESHED SWEET POTATO PRODUCTS IN
MOROGORO MUNICIPALITY**

UTONI NKOKELO

**A DISSERTATION SUBMITTED IN PARTIAL FULLFILMENT OF THE
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ABSTRACT

Sweet potato with a negligible amount of vitamin A has been consumed for a long time in Sub-Saharan African (SSA) countries including Tanzania. The production and consumption of improved sweet potato varieties including orange fleshed sweet potato (OFSP) with high Vitamin A content has been promoted due to its potential to combat Vitamin A Deficiency (VAD). Adding value to OFSP will increase both its shelf-life and market demand. This study was conducted to assess consumer acceptability and willingness to pay (WTP) for selected processed OFSP products. Specifically, the research rated the attributes of the selected processed OFSP products for consumer acceptability, estimated the value consumers are willing to pay for selected processed OFSP products in the study area and determined factors influencing WTP for selected processed OFSP products. The study used the contingent valuation method (CVM) to estimate the populations' WTP for the selected processed OFSP products. The survey was administered to 120 respondents who were characterized by having the behavior of purchasing packaged flour, breads and biscuits for their family consumption. Data were collected using questionnaires and analyzed using descriptive statistics, Principal Component Analysis (PCA) and Logistics Regression. Results from the study show that OFSP bread (30%) and OFSP bread (20%) were accepted in association with colour, taste and aroma attributes while acceptance of OFSP biscuits was associated with texture attribute. Results further show mean WTP of TZS4106.26 per kg for OFSP flour, TZS1568.67 per one-quarter kg for OFSP bread (30%), TZS1592 per one-quarter kg for OFSP bread (20%) and TZS973.84 per one-tenth kg for OFSP biscuits. Results from Logistic Regression analysis established that bid/price, education level, income, nutrients and packaging as the factors influencing significantly consumers' WTP for the OFSP products under study at $P < 0.05$ level. In addition household size was found to

influence WTP for OFSP flour and OFSP bread (30%) while age was found to influence WTP for OFSP biscuits at $P < 0.05$ level of significance. Moreover, sex was found to influence WTP for OFSP flour at the same level of significance. In conclusion, the study indicates that colour, aroma, taste and texture are important attributes in acceptability of OFSP products. Consumers are willing to pay for OFSP products at the available market price with exception of OFSP biscuits. Thus, the general recommendation in this study is for all stakeholders to get involved in promoting the OFSP products to be consumed significantly as it will reduce the existing morbidity and mortality among children and pregnant women as well as the leading cause of preventable blindness caused by effect of VAD.

DECLARATION

I, UtoniNkokelo, do hereby declare to the Senate of Sokoine University of Agriculture that this dissertation is my own original work and that it has neither been submitted nor being concurrently submitted to any other institution.

UtoniNkokelo
(MSc. Candidate)

Date

The above declaration is confirmed by;

Dr. Betty Waized
(Supervisor)

Date

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DEDICATION

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LIST OF ABBREVIATIONS AND SYMBOLS

AFIDEP	African Institute for Development Policy
CE	Choice Experiments
CIP	International Potato Centre
CV	Contingent valuation
CVM	Contingent Valuation Method
DBCV	Double-bounded contingent valuation
DCE	Discrete choice experiments
DONATA	Dissemination of new agricultural technologies in Africa
EPI	Expanded Programme of Immunisation
FAO	Food and Agriculture Organization
GDP	Gross Domestic Product
HKI	Helen Keller International
IFPRI	International Food Policy Research Institute
LZARDI	Lake Zone Agricultural and Development Institute
MMCSEP	Morogoro Municipal Council Socio-Economic Profile
MT	Metric tonne
NBS	National Bureau of Statistics
NGOs	Non-Governmental Organizations
OFSP	Orange Fleshed Sweet Potato
PCA	Principal Component Analysis
PLSR	Partial Least Square Regression
SNAL	Sokoine National Library
SPSS	Statistical Package for Social Science
TZS	Tanzania Shillings

UNIDO	United Nations Industrial Development Organization
URT	United Republic of Tanzania
VAD	Vitamin A deficiency
VAS	Vitamin A supplementation
WFSP	White Fleshed Sweet Potato
WTP	Willingness to pay
α	Coefficient of intercept term
ρ	bid price

CHAPTER ONE

1.0 BACKGROUND AND STATEMENT OF RESEARCH PROBLEM

1.1 Background Information

Agriculture is the largest employer of labour in Africa, it is responsible for over half of export earnings and this means it has the potential to play a major role in the continent's development (Adekunle *et al.*, 2012). The World Bank and the United Nations are among those who have pointed out that the agricultural sector can have the biggest impact on reducing rural poverty (Nkomo *et al.*, 2014) due to the labour force which is employed in the agricultural sector. Furthermore, Van Rooyen (2014) argued that Africa has the land and space for farm production to grow significantly, which counts in its favor. All these provide an opportunity for continent to develop because almost all resources necessary for development are available.

Population growth in Africa is occurring more rapidly than other regions of the world (AFIDEP, 2012) and this means the agricultural products and food demand in general is also increasing. The increase in per capita incomes, higher urbanization and the growing numbers of women in the workforce stimulate greater demand for high-value commodities, processed products and ready-prepared foods (FAO and UNIDO, 2009). Since agribusiness sector is an important catalyst for the development of efficient value chains, a contributor to improved product quality and safety and a provider of services that allow food to flow from production to consumption (Gabor *et al.*, 2013) then, as the rural inhabitants who are connected to infrastructure adopt more urbanized lifestyles, food consumption is becoming both more varied and more similar around the world (IFPRI, 2008). Tanzania as one of the developing countries, its economy is still and will for a long

time depend on agriculture. According to URT (2013) agriculture in Tanzania is contributing to about 24.1 percent of GDP, 30 percent of export earnings and employs about 75 percent of the total labour force. Agriculture is still dominated by small-scale subsistence farmers and the major staple foods are maize, paddy rice and cassava while sorghum, wheat, millet and sweet potatoes are categorized as other staples (HKI, 2012).

Tanzania ranks fifth in the world in terms of sweet potato (*Ipomoea batatas Lam.*) production and among the African countries, only Uganda and Nigeria produce more (Jones *et al.*, 2012). Tanzania is the second largest producer of sweet potato in East Africa (URT, 2012) and in 2007 Tanzania produced a total of 1 322 000 MT of sweet potatoes FAO (2007), cited by Mmasa *et al.* (2013). Sweet potato is the third most important root and tuber crop after cassava and Irish potato, and the crop is marketed and consumed in both rural and urban areas. The crop is grown almost in all agro-ecological zones because of its hardy nature and broad adaptability, hence providing a sustainable food supply when other crops fail. According to Sindi and Wambugu (2012), sweet potato is one of the top four most important crops in the Lake Zone. It is also considered among the top two crops that farmers rely on for food security together with cassava. In terms of volume produced, sweet potato is the most important in the Lake Zone (330 600 tons/year), Southern Highlands Zone (271 000 tons/year), Eastern Zone (107 400 tons/year) and Southern Zone (37 400 tons/year) URT (2011b), cited by HKI (2012).

As agriculture becomes more market-oriented, sweet potato is one of the several crops that farmers can produce to obtain cash income in addition to subsistence food security. Supply and demand factors are therefore increasingly important in determining the role sweet potatoes will play in a more market-oriented smallholder farm sector (Low *et al.*, 2009). However, for a long time in eastern and southern Africa, white fleshed sweet potato

(WFSP) varieties that contain negligible amount of Vitamin A has been produced and consumed. Research has been done to come up with orange fleshed sweet potato (OFSP) with high Vitamin A which reduces significantly the health problem which has been caused by vitamin A deficiency (VAD) in human body. Under the project called Dissemination of New Agricultural Technologies in Africa (DONATA), the promotion for production and consumption of OFSP variety was introduced in 2008 in the Lake Zone (Mafuruet *al.*, 2009). The adoption in Sub-Saharan Africa is expanding slowly and as stakeholders continue to provide education on opportunities available; the adoption is expected to expand. However, expansion of adoption has to go hand in hand with the increased demand of OFSP consumption and one of the approaches for increasing consumption of the agricultural products including OFSP is through value addition.

The majority of crops in Tanzania are marketed in their raw forms, losing opportunities for higher earnings and generating employment (Mmasa, 2013). The main constraints facing the agro processing industry include high operational costs mainly because of high prices of imported fuel and spare parts, unavailability of appropriate processing machines and spare parts and limited knowledge in operation of the machines (Ibid). All these in one way or another leads many farmers to sell their produce unprocessed leading to the majority obtaining low prices. According to Mmasa (2013), agro processing has a tremendous potential for increasing income through value addition and increasing shelf-life of the processed products. Thus, the establishment of solartunda agro processing incubator at Sokoine University of Agriculture provides both opportunities for researchers and smallholders farmers to do research and learn respectively on value addition of agricultural products in order to meet the consumer satisfaction.

One of the products which the Solartuda agro processing incubator is engaging in adding value is the orange fleshed sweet potato. This sweet potato is being processed into flour,

bread and biscuits. These products are new to most of the markets in Tanzania as there is no literature showing the availability of these products in the markets. Since one of the markets aimed to be supplied with these new products by Solartunda agro processing industry is Morogoro Municipality, then this led the present study to be undertaken in order to assess the consumer acceptability and willingness to pay (WTP) for the processed OFSP products in Morogoro Municipality. The study has come up with the real picture of the consumer acceptability as well as the amount they are willing to pay for the processed OFSP products.

1.2 Statement of the Research Problem

Tanzania is one of the African countries whose children under the age of five years and pregnant women suffer from the effect of vitamin A deficiency (VAD). This effect increases morbidity and mortality among children and pregnant women, and is the leading cause of preventable blindness (URT, 2011). Vitamin A is an essential micronutrient for vision, for the maintenance of epithelial cells and for regulation of systemic functions such as cellular differentiation, growth, reproduction, bone development and modulation of the immune system (NBS, 2011). Apart from severe VAD which leads to eye blindness, it can also increase the severity of infections, such as measles and diarrheal diseases in children, and slow recovery from illness. It is estimated that 39% of Tanzanians are malnourished and 44% of children under five years of age are stunted while approximately 600 000 children aged below 5 years die as a result of inadequate nutrition (CIP and HKI, 2014). All these problems could have been reduced significantly if vitamin A intake through food consumption among children and other individuals such as lactating mothers is increased. The increased intake of micronutrient of vitamin A helps young children grow, develop normally and stay healthy. However, there are various efforts which have been done by government of Tanzania to reduce the effect of VAD. For example, according to Mullins

et al. (2011) in 1987 Tanzania began including vitamin A capsules (VAC) in kits distributed through the Essential Drugs Program to government-run primary health care facilities. To increase coverage, vitamin A supplementation (VAS) was introduced into routine immunization services called the Expanded Programme of Immunisation (EPI) in 1997 and the sub-national measles immunization campaigns in 1999 and 2000. Moreover, the bi-annual distribution of VAS was initiated in 2001 for children aged 6-59 months as part of two popular annual events: Day of the African Child (June) and World AIDS Day (December).

The adoption of OFSP production and consumption is seen as the opportunity which could not only provide the significant micronutrients of vitamin A but also more cost-effective compared to the VAS programme. The cost-effectiveness is based on the fact that it can be grown in all agro-ecological zones in Tanzania and can easily be accessed and utilized by most poor households who are mostly affected by VAD due to poor dietary intake. After the OFSP has been introduced in Lake Zone, the adoption of OFSP technology is spreading to other parts of Tanzania including Morogoro region. Currently Solartunda in Morogoro region has gone further by processing OFSP into breads and biscuits compared to Usagara factory which is still producing OFSP flour under supervision of Lake Zone Agricultural and Development Institute (LZARDI). The high enrichment of Vitamin A in OFSP can reduce the problems caused by VAD in human body as researchers have proved that a small root (100-125grams) is able to supply the recommended daily allowance of vitamin A for children under-five years of age Low *et al.* (2007), cited by HKI (2012).

Notwithstanding this enormous advantage there is still low demand and hence the low consumption of OFSP. This low demand of OFSP which also imply low consumption of the product is supported by OFSP situation analysis report by HKI (2012) which

concluded that there is low demand, low production and low adoption of OFSP which in turn provides the great opportunity for production, demand and adoption of OFSP due to its high in vitamin A content. Understanding consumer acceptability and WTP for the OFSP products could play a very big role towards future demand prediction and thus increase the consumption of the nutritious crop. Thus, this study is important as it has come-up with the real picture of the consumer acceptability and WTP for the OFSP flour, OFSP breads and OFSP biscuits.

1.3 Justification of the Study

Sweet potatoes play a big role in various economies and they act as a staple food crop in many countries (Mmasa *et al.*, 2013). The OFSP adoption is expanding in Sub-Saharan African countries with its opportunities available for both smallholder farmers engaging in OFSP production and for consumers. The market for OFSP products is expected to expand. After harvesting sweet potato roots, farmers do process sweet potato at local levels to “*Michembe*” and “*Matobolwa*” which reach consumers through selling directly to the consumers or through middlemen, village hawkers or open markets (Mmasa *et al.*, 2013). This indicates that there is need to capture the niche market for sweet potato value added products. Thus, the demand of OFSP products can be significant when more value addition of sweet potatoes such as flour; breads and biscuits are added to the OFSP range of products.

Research findings for this study will be useful feedback to agro-processors in making decisions on which product option from the selected processed OFSP products should be intensified in its production. Planners, policy makers and NGOs who are in one way or another stakeholder in creating demand for OFSP products will have the viable ground to trigger consumers’ acceptability and WTP for the processed OFSP products which

ultimately will lead to consumption of the processed OFSP products. In this case, the findings will be useful basis for efficient allocation of the resources.

1.4 Study Objectives

1.4.1 General objective

The general objective of this study is to assess the consumer acceptability and willingness to pay (WTP) for selected processed OFSP products in Morogoro Municipality.

1.4.2 Specific objectives

- i) To rate the attributes of the selected processed OFSP products for consumer acceptability.
- ii) To estimate the value consumers are willing to pay for selected processed OFSP products in the study area.
- iii) To determine factors influencing WTP for selected processed OFSP products.

1.4.3 Study hypothesis

- i) Age, education, income, sex, marital status, household size, price, Nutrients, and packaging do not influence consumers' willingness to pay for processed OFSP products.

1.4.4 Research questions

- i) What are the important attributes that consumers consider for accepting selected processed OFSP products.
- ii) What monetary values are consumers willing to pay for selected processed OFSP products.

1.5 Organization of the Dissertation

This study addresses both theoretical and empirical issues pertaining to consumer acceptance and WTP for a new product as it reaches consumer accessibility environment. Since the OFSP has ability of producing various products, only four products made from OFSP were selected in this study namely flour, bread(30%), bread(20%) and biscuits in order to assess the consumer acceptability and WTP for these selected processed OFSP products in Morogoro Municipality. This dissertation is organized into five chapters. Chapter one is mainly introducing the study. Chapter two provides the relevant literature reviewed to the study. This chapter reviews some of the related literature on consumer acceptability and willingness to pay studies. The chapter has been categorized into sections; the first section attempts to give an overview in a nutshell and the second section tries to give the meaning of the key words; consumer acceptability and WTP. The third section describes the empirical studies on consumers' WTP while the fourth section describes the theoretical framework of this study. The fifth section highlights the agribusiness sector specifically the agro-processing challenges. The research methodology used in this study has been described in the third chapter and the findings of this research are presented and discussed under chapter four. The last chapter (i.e chapter five) gives the conclusions as well as the recommendations.

CHAPTER TWO

2.0 LITERATURE REVIEW

2.1 Overview

This Chapter presents a review of literature related to the consumer acceptability and willingness to pay. The literature shows that consumer acceptability and willingness to pay studies have been done extensively on different non-market products and to marketed products as well. However there is none studies have been done on consumer acceptability and willingness to pay for the selected processed OFSP products which is the aim of this study.

2.2 Consumer Acceptability

There is an extensive body of literature in which, researchers have used one or sometimes even a combination of the acceptance/adoption theories aiming to find an answer to contribute to the understanding of the acceptance and sustainable usage of the product or services(Ghazizadeh, 2012). Sensory Evaluation is a scientific methodology which is integrated in several research areas by using human beings as tools for analysis(Gámbaro, 2012).Even though there are various classifications in sensory analysis as a field, most authors agree to differentiate two main areas with different methodologiesand which are not supposed to overlap(Ibid).

- Analytical Tests:These tests use the human senses as analytical tools to measure products' sensory properties under controlled conditions. Human beings used as analytical tools for these tests are called sensory judges and are generally individuals who have higher sensory skills than the rest of the population and who have been trained to further develop these innate skills

- **Affective Tests:** These tests use consumers who have not been trained to participate in research studies and who normally consume or use food products. The main purpose of affective studies is to assess the response to a product, a product idea or feature from real or potential consumers. These types of studies are essential for the industry during the product development stage to be able to determine the potential market for a certain product, so as to be able to optimize processes, assess new ingredients and technologies as well as to decide whether or not to keep a product in the market.

Thus, the consumer acceptance, preference, and hedonic (degree of liking) tests are used to determine the degree of consumer acceptance for a product (Singh-Ackbarali and Maharaj, 2014). Generally, research of consumer acceptability of the product is crucial to all new products before entering the new market (Tamin *et al.*, 2015). Consumer acceptability refers to the consumer being ready to accept the presented product or service to him or her. Consumer acceptability for a product depends on the number of factors such as sensory characteristics of the particular product for example; general appearance or colour, aroma or flavor, taste and texture. Other factors include previous information acquired by a consumer about the product, the past experience, attitudes and beliefs of consumer to that product. However, as the acceptability of the product by the consumer can directly be linked to satisfaction, still does not guarantee the consumers' WTP for that product.

2.3 Willingness to Pay(WTP)

The concept of consumer' WTP according to Sylvia (2014) refers to the maximum amount a person would be willing to pay or sacrifice in exchange for a good. It is the premium price to be paid by consumers to purchase a product or to enjoy a service (Hui *et*

al., 2013). The aim of a consumer is to maximize utility. Therefore, if the good or service has high utility to the consumer, then the consumer will be willing to pay for such good or service for his satisfaction; and if the good or service has little and does not satisfy the consumer's utility, then he willing not be willing to pay for such good or service(Mussa,2015).

Elicitation of food valuation is often done with contingent valuation and choice experiments estimating WTP for specific attributes of foods (Williams, 2013). While contingent valuation, (i.e. hypothetical valuation), is often used to evaluate a product as whole, conjoint choice experiments are able to evaluate bundles of attributes that define a good (Ibid).Studies conducted by Lusk and Schroeder (2004), as cited by (Williams, 2013) suggest that hypothetical choices overestimate willingness to pay. Others have found when comparing the hypothetical survey choices to more realistic experiment-based designs that stated preference holds up quite well (Carlsson, 2010). In any case it is important to be cautious when making statements about stated preference results in terms of actual behavior, but generating a WTP value for transitional organic produce is valuable for future environmental protection.

2.3 Empirical Studies on Consumers' WTP

Several studies have been carried out on consumers' WTP for various food commodities. For example, Adepoju and Oyewole (2013)analyzed factors affecting households' WTP for bread with cassava flour inclusion using logistic regression method, they foundhouseholds' WTP negatively related with the premium price and a positive significant relationship with household income.According to the database of 40 studies on factors influencing WTP reviewed by Moser *et al.* (2011) using quantitative methods,contingent valuations (CV) and choice experiments (CE) grounded on consumer

utility theory to measure the WTP for specific attribute of a good, results show that the significance of attributes does not change using different evaluation techniques, instead the methodology affects the magnitude of attributes, but not their significance. However, price, brand and packaging from 16 studies, 10 studies and two studies respectively were considered as an attributes influencing Consumer WTP. Furthermore, five studies showed price was significant at 5%, one study showed brand was significant at 5% and none indicated significance of packaging.

Another study by Anyamet *et al.* (2013), analyzed the factors driving WTP, the effect of attributes on WTP and mean WTP for improved bread by using descriptive statistics and conditional logit regression model. The results revealed that price and the non-monetary attributes namely, bromate label, certification, nutritional label, flavor and texture were significant in explaining consumer's choices. Although price was significant, it was negative and that indicated the consumers' utility for improved bread option decreases with price increase. The brand name in the same study was not significant. The study by Mmasa and Mlambiti, (2012) on factors that influences consumption of processed sweet potato products in Tanzania revealed that two factors mostly influences one to consume processed sweet potato were attractive packaging (51.0%) and nutritional value (34.7%). Other factors mentioned included; taste (95.0%), freshness (80.8%), shelf life (85.8%), texture (57.5%), economy (price) (57.5%), Nutritional factor (72.5%) and color (50.8%).

The study by Yang *et al.* (2012) on consumers' WTP for fair trade coffee for Chinese as the coffee consumption rose significantly in recent years in China, used interval regression to investigate individual demographic and consumption characteristic impacted on WTP. Different attribute dimensions when a customer purchases coffee, such as brand, flavor, ethical, and price were assessed in order to understand how customers

choose coffee and on what information they base for their choices. The payment card contingent valuation question was adopted to elicit consumers' WTP. The results revealed that ethical and environmental concerns were not significant in influencing consumers' WTP. However many demographic and consumption variables had a significant impact to fair trade coffee WTP and were mostly consistent with previous studies.

According to Emunuet *al.* (2012), researchers have used various methods to obtain people's WTP e.g. bidding games, payment cards, open-ended questions, single-bounded and double-bounded dichotomous choice valuations methods also called referendum method. However in his study, the double-bounded choice valuation method was employed and results showed that price was significant regardless of its negative coefficient which implies that as price increases households are less willing to pay. The age and education level of the household head was not statistically significant and that imply no impact on households' WTP. Household size was statistically significant although its coefficient was negative and that implied larger-sized household is less likely to be willing to pay more. Another significant variable was income level whose coefficient was positive and that implied as the household income increases, the households' WTP also increases. In case of the purchased experience shows the households that had purchased the product before were willing to pay a higher premium compared to those households that had never purchased the product.

The study by Hirogaki (2013) on estimating Consumers' WTP for Health Food Claims employed choice-based conjoint experiment (CBC) method to analyze preferences for different profiles of functional products. The health claims, country of origin, size and price of food products were the attributes considered for preference analysis. The results

showed that health coefficient for volume was negative and significant at 5% level indicating that consumers do not place high value on volume and may perceive functional food as nutritious but not tasty; in other words, they face a trade-off between taste and nutrition. Further results show that coefficient for size is negative but not significant. This result implies that this factor will not affect consumers' choice of products; in addition, the coefficient for price is negative but not significant and indicates that price does not have a significant effect on purchase intention.

Laurie and Van Heerden (2012) in their study in South Africa to determine the consumer acceptability of four products namely OFSP juice, OFSP chips, OFSP doughnuts and the OFSP green leaves made from β -carotene-rich sweetpotato, frequency tables were generated and used to assess distribution by region, gender, age group, region by age group and region by gender. Also chi-square test for equal proportions was employed to detect associations between them. In order to investigate the comparative acceptability of the different products, scores were allocated according to the degree of liking. Analysis of variance (ANOVA) was conducted and t-least significance differences (LSD) was calculated at a 5% significance level to compare means. The results revealed an existence of a notable acceptability varying between 85% and 95% for the four beta-carotene-rich sweetpotato products in the six regions under study.

Hence in general, the literature shows mainly two methods: Discrete Choice Experiment and Contingent Valuation methods have been used in various studies. According to Yeo *et al.*, (2012), Discrete Choice Experiments (DCE) are based on economic theory that assumes people have clear preferences for goods or services and are able to choose one type of good or service in preference to another. Contingent valuation method (CVM) is a questionnaire based valuation technique whereby WTP is directly obtained from the

respondents with respect to a specific good (Holvad, 1999). Contingent Valuation Method is a survey based technique used to examine how consumers evaluate goods and services not found in the market place (Baker and Ruting, 2014). Since in this study the aim was to assess the consumer acceptability and estimating consumers' WTP for selected processed OFSP products as new products in the market, then contingent valuation method was chosen as an appropriate method to be employed in this study.

2.4 Theoretical Framework

The present study was guided by the consumer theory. In this theory, the rational consumer always seeks to maximize the utility under a given budget. Hence the choice of the products done by the consumer were based on the attached attributes to the product of which would make the consumer to get maximum satisfaction when consuming the product. Olynket *al.* (2010) argued that random utility theory assumes that economic agents seek to maximize their expected utility, subject to the given choice set. Utility maximization is the objective of the decision process and leads to observed choice in the sense that the consumer chooses the alternative for which utility is maximal (Baltas and Doyle, 2001). Consumer preferences or choices on product depend on different characteristics. Since the analyst cannot observe all the factors affecting preference as they will lead to consumer acceptability and willingness to pay for a product, then those factors are treated as random variables. The relation $U_{ij} = V_{ij} + e_{ij}$ presents the utility function and is assumed to be composed of a deterministic component V_{ij} and a random component e_{ij} . The deterministic component can be measured, as this component is related to the alternatives in the choice set.

CHAPTER THREE

3.0 RESEARCH METHODOLOGY

3.1 Conceptual Framework

Consumers' WTP for a given product is a function of, among other things, knowledge and awareness on the presence of the product in the market. Demographic and socio-economic characteristics such as age, gender, income, household size also shape consumers' WTP because these factors affect the product acceptance (Akankwasa *et al.*, 2013). The product/sensory attributes also influence the customers' perceived quality of sweet potato products (Ragaert *et al.*, 2004). According to Sudhalakshmi and Chinnadorai (2015), consumers' WTP for organic produce is correlated with age, family income and educational level. The market characteristics such as availability and prices affect purchase behavior and ultimately consumers' acceptance and WTP. Hence there are different factors affecting consumer' acceptability and WTP for a product. The variation of product attributes leads to variation in choices for consumer. Therefore as consumers are subjected to different products, their choice are based on random utility theory in such a way that, decision making on purchasing is based on preference of the attribute attached, previous information and social economic characteristics of the consumer as indicated in the Fig.1.

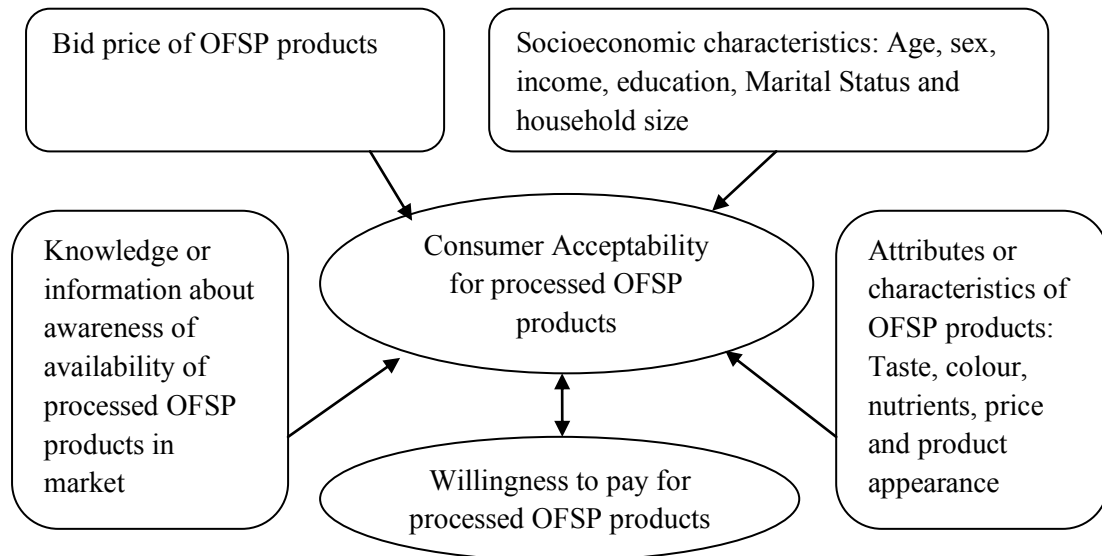


Figure 1: Conceptual framework showing factors affecting consumers' acceptance and WTP for OFSP products

Source: Adapted with some modifications from Pouratashi (2012)

3.2 Description of the Study Area

The research was conducted in Morogoro Municipality because of its prospective market for the OFSP products which will be produced by the Solartunda incubator engaging in processing some of agricultural products under the School of Agricultural Economics and Business Studies (SABS) at Sokoine University of Agriculture. The Municipality is one of the seven districts in Morogoro region where other districts include Kilosa, Gairo, Kilombero, Mvomero, Ulanga as well as Morogoro Rural and it lies at the crossings of Longitudes 37.0 East of the Greenwich Meridian and Latitude 4.49 South of Equator. It is about 195 Kilometers west of Dar es Salaam and borders Mvomero district on the North and West; and Morogoro Rural District on the East and the South. Morogoro Municipal Council is the smallest district in terms of land area in the region and it has a total surface area of 531.4 Square Kilometers. Currently, it is divided into one division with 29 wards subdivided into 272 *Mitaa* (Streets) distributed unevenly. However, only 12 wards namely Boma, Kilakala, Kichangani, Sultani area, Saba Saba, Mafiga, MjiMkuu, Kiwanja cha

Ndege, KihondaMaghorofani, Mazimbu, Mlimani and MjiMpya were selected for the study as shown in Fig. 2.

According to Morogoro Municipal Council Socio-economic Profile (2010), the Municipality experiences an average daily temperature of 30°C degrees centigrade with a daily range of about 5°C degrees centigrade. The highest temperature occurs November and December, during which the mean maximum temperature is about 33°C degrees centigrade. The minimum temperature occurs between June and August when the temperatures go down to about 16°C degrees centigrade. The mean relative humidity is about 66 percent and decreases to 37 percent. The total average annual rainfall ranges between 821mm to 1 505mm. The district receives rainfall twice a year, namely short and long rain seasons. Long rains occur between March and June and short rains occur between October and December in each year.

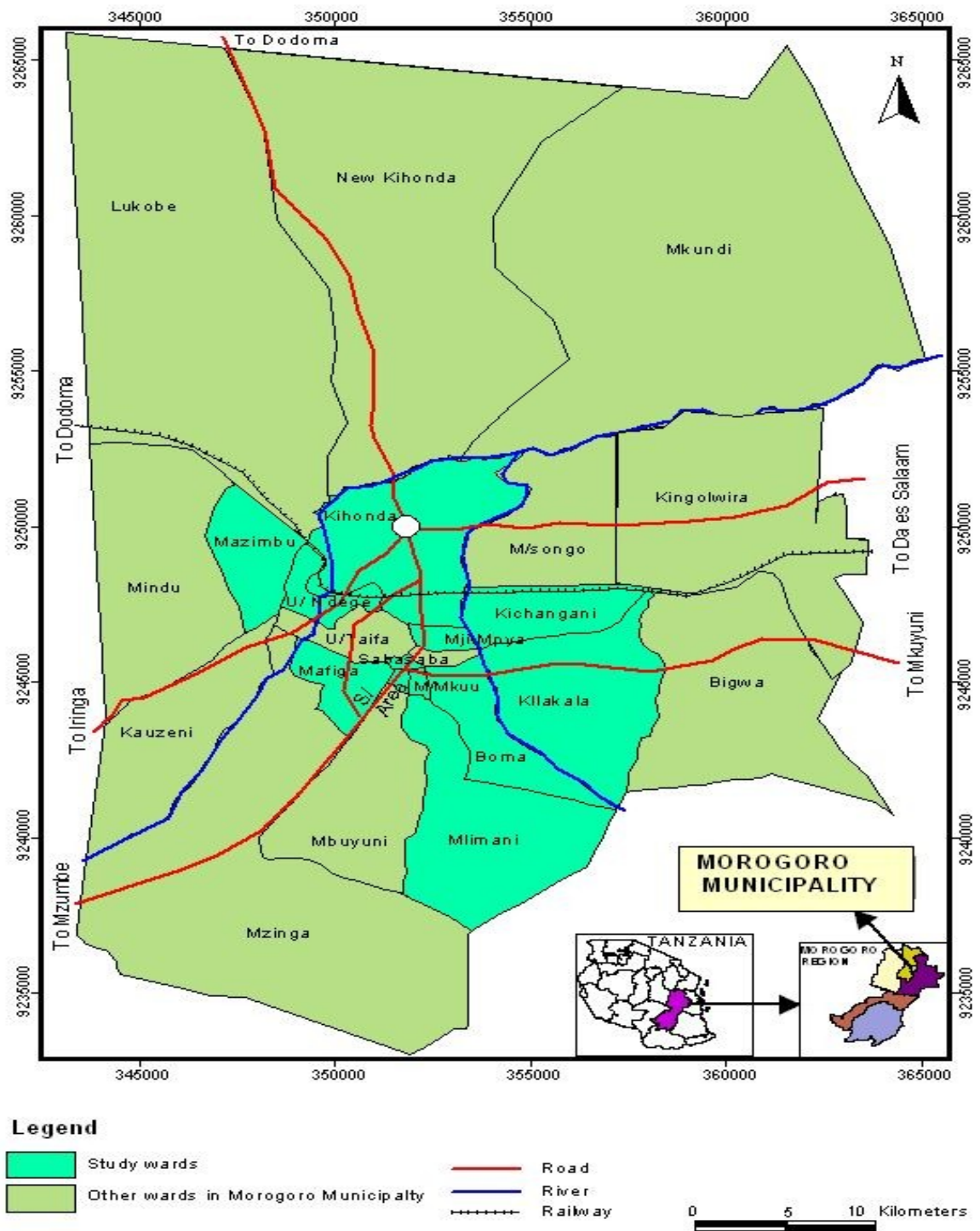


Figure 2: Morogoro Municipal Council’s map showing study area

3.2.1 Population

According to Population and Housing Census (2012) which was done in Tanzania, Morogoro Municipality had a total population of 315 866 whose 48.02% were male and 52% were female with the average household size of 4.1. Now if the total population is divided to household size, the estimated 77 040 households exist in the Municipality and that becomes the target population for this study. Since the study was carried out in Morogoro Municipality, then the target population was However, according to Morogoro Council Socio-economic Profiles (2010), there are three main ethnic groups namely Waluguru, Wapogoro and Wakutu. The majority of Waluguru occupy the largest part of the district area which covers all wards, followed by Wapogoro occupying some parts of the Municipal wards. In addition, the district is also inhabited by other ethnic tribes including Wazaramo, Wakwere, Wachaga, Wasukuma, Wanyakyusa and Masai.

3.2.2 Agriculture

The urban nature of Morogoro Municipality is characterized by rapid expansion of human settlements and business centres according to Morogoro Municipal Council Socio-economic Profile (2012) and this to a large extent limits the availability of cultivated land in the study area. Based on this, off-farm activities such as business activities, office work, elementary occupations and plant operations assemblers happened to be the main source of employment.

3.3 Data and Data Collection

A field survey was conducted using a questionnaire (Appendix 3) which was developed and pre-tested to 12 respondents who were students pursuing theology at Anglican Bible College located at Boma road in Morogoro in order to identify any shortcomings of the questionnaire before administering it to the targeted respondents. Data collection involved

both primary and secondary data. The primary data were collected during field survey from respondents using well-structured questionnaire containing DBCV questions for eliciting Consumer WTP while the secondary data to supplement the primary data were obtained from different sources such as Sokoine National Agricultural Library (SNAL), internet, published and unpublished dissertations as well as other relevant literatures. However double bounded contingent valuation methods was used to get the information for estimating the value consumer is willing to pay for a particular product in the study area.

Hence, in short the questionnaire was comprised of four parts: first part of the questionnaire constituted questions on household characteristics such as age, sex, household size, education level, occupation and income. The second part comprised of questions on sweet potato purchasing and consumption behavior such as how many times the sweet potato was eaten per month, where the sweet potato was normally eaten, ever heard about processed OFSP products into OFSP flour, OFSP breads and OFSP biscuits. The third part included questions specific on Sensory Evaluation for selected processed OFSP and fourth part included questions on willingness to pay for the three products presented to the respondents.

3.3.1 Sampling technique and sample size

The study was done in Morogoro Municipality. This study area was purposively selected based on presence of established solartunda engaging in processing some of agricultural products including OFSP into finished goods such as bread and biscuit. The target respondent in this study was the household head or household member aging above 18 years old and who could give some economic information of the household on behalf of the household head.

In each ward two streets were selected randomly followed by a random selection of five household in each street. Each respondent had to be involved in the study after answering 'YES' to all the three screening questions posed to each respondent before being allowed to get involved in the study. The screening questions were asking "Do you have the behaviour of purchasing packed flours from supermarkets or any other outlets for your family consumption?" "Do you have the behaviour of purchasing packed bread from supermarkets or any other outlets for your family consumption?" "Do you have the behaviour of purchasing packed biscuits from supermarkets or any other outlets for your family consumption?" Those who answered 'YES' to each product were involved in the study and those who answered 'NO' at least to one product were not involved in the study.

Since the Morogoro Municipality has 29 wards currently, then 12 wards as mentioned above were randomly selected and in each ward 10 respondents were randomly obtained from two streets to make a total of 120 sample size. Due to lack of enough fund and time constraint, the sample size of 120 was enough for this study and this is supported by Meilgaard *et al.* (1999) who argued that, for social science studies, standard sample size of 100 consumers or respondents for a central location test are enough to represent the studies population.

3.3.2 Experimental design

The study was designed in English and since Swahili language is the national language of Tanzanian which is widely spoken, the completed survey was translated into Swahili for better understanding by the respondents. Thus survey method to obtain the information and opinion from the respondents in Morogoro Municipality was conducted. The potential consumers of the processed OFSP products and those with the behavior of purchasing

flour, bread and biscuit for their family consumption from different outlets available in Morogoro Municipality were interviewed.

The samples were marked with a three-digit random code (i.e 795, 814, 843 and 625) and each respondent had to view, feel, taste and sniff each of the four(4) coded samples from left to right. Water was available to rinse their mouth between samples. Since the flesh sweet potato can be eaten as raw sweet potato, then the raw flour of OFSP had no problem of being tasted as raw flour. When performing affective tests, also called acceptance tests, an adequate sample size of around 75-150 individuals are acceptable (Lawless and Heymann, 2010), cited by Svensson (2012). Hence in this study each respondent interviewed was also involved in sensory evaluation after being presented with the four products followed by few questions basing on products' attributes assessed. The sensory evaluation study was conducted in either shade area or ward offices after displaying products.

The researcher and the other two trained assistants had to ask products attribute preference and WTP questions in face to face interview followed by recording of the respondents' preferences. The 9-point hedonic scale used was: 9 – Like extremely: 8 – Like very much: 7- Like moderately: 6- Like: 5- Neither like nor dislike: 4- Dislike: 3- Dislike moderately: 2- Dislike very much: 1- Dislike extremely. However, respondent had also to indicate the mean hedonic scores for overall acceptability of the products using the other 6-point hedonic scale: 9. Completely acceptable, 8. Moderately acceptable, 7. Acceptable, 6. Neither acceptable nor unacceptable, 5. Moderately unacceptable, and 4. Completely unacceptable.

3.3.3 Data analysis

The data were collected using structured questionnaire and were coded before being analyzed. However, data cleaning was done by running frequencies of individual

variables and analyzed using Statistical Package for Social Science (SPSS) for window version 16.0. XLSTAT 2015 software was used to analyze the Likert scale data where preference mapping was obtained. Furthermore, binary logistic regression was used in estimating the WTP value for each product and in estimating factors assumed to influence WTP.

3.3.4 Model specification

Based upon random utility theory, the utility that an individual i assign to some alternatives can be described as $U_{ij} = V_{ij} + e_{ij}$ where U_{ij} is unobservable, but true utility of alternative i . V_{ij} is observable component of utility, where in this case the stated amount in monetary terms by respondent to be paid to a specific product presented to him/her was treated as 1 and 0 for otherwise and e_{ij} is a random component or part of the utility which cannot be observed by the researcher and includes unobserved attributes, unobserved peculiarities of individual tastes and measurement errors (Klein *et al.*, 2009). The following is the specific model employed binary logistic regression to analyze the indicated variables. The binary logistic regression analysis results provided the alpha (α) and rho (ρ) coefficients which was used to estimate the mean WTP using the relation in equation (9).

$$V_{ij} = \alpha + \beta_1 \text{Price}_{ij} + \beta_2 \text{Packaging}_{ij} + \beta_3 \text{BrandName}_{ij} + \beta_4 \text{Colour}_{ij} + \beta_5 \text{Nutritional}_{ij} + \beta_6 \text{Flavour}_{ij} + \beta_7 \text{Texture}_{ij} + \epsilon_{ij} \dots \dots \dots (1)$$

Where $i = 1, 2, \dots, 120$; and $j = 1, 2, 3$. Thus the index function which shows linearity in the price or bid B becomes

$$V = \alpha - \rho B \dots \dots \dots (2)$$

Hence, the probability density function for accepting the bid is expressed as

$$P(\text{WTP} = B) = \frac{e^V}{1 + e^V} \dots \dots \dots (3)$$

While the probability density function for not accepting the bid is expressed as

$$G(B) = (WTP < B) = \frac{1}{1 + e^V} \dots \dots \dots (4)$$

In the double-bounded contingent valuation, four outcomes or probabilities were expected after consumer has been presented with bids or price. The outcomes were yes-yes (yy), yes-no (yn), no-yes (ny) and no-no (nn) and consumer who accepts to pay B, WTP becomes greater than B and its probability is given as:

$$P (WTP>B) = \Pi^y(B)= 1 - G(B).....(5)$$

Thus, the four probabilities becomes as follows:

$$\Pi^{yy}(B_0,B_1) =Pr(Max.WTP\geq B_1) = 1 - G(B_1).....(6)$$

$$\Pi^{yn}(B_0,B_1) =Pr(B_0\leq Max.WTP<B_1) = G(B_1) - G(B_0)(7)$$

$$\Pi^{ny}(B_0,B_i) =Pr(B_i\leq Max.WTP< B_0) = G(B_0) -G(B_i).....(8)$$

By combining these probabilities from the four outcomes, the log-likelihood function becomes:

$$Ln(L)= \Sigma\{d^{yy}ln(\Pi^{yy}) + d^{yn}ln (\Pi^{yn}) + d^{ny}ln (\Pi^{ny}) + d^{nn}ln (\Pi^{nn})\}.$$

Where d^{yy} , d^{yn} , d^{ny} and d^{nn} are binary variables with 1= Occurrence of a particular outcome and 0 otherwise. Thus Mean WTP has been estimated using the following relation:-

$$Mean WTP= \alpha/\rho(9)$$

Where α =Coefficient of intercept term and ρ = bid price.

3.3.5Regression analysis

A Logistic Regression model was used in testing factors assumed to influence willingness to pay for selected processed OFSP products among the interviewed respondents. The binary logistic regression was used to estimate the model that:

$$WTP (1, 0) = \beta_0+ \beta_1Bid_{ij} + \beta_2Age_{ij} + \beta_3Sex_{ij} + \beta_4Hhsize_{ij}+ \beta_5Education_{ij} + \beta_6Income_{ij} + \beta_7MaritalStatus_{ij} + \beta_8Nutrients_{ij}+ \beta_9Packaging_{ij} + \epsilon_{ij}.$$

The description of the hypothesized variables with the expected signs is as shown in Appendix 2 while Table 1 shows how the variables were measured and the expected signs.

Table 1: List of Variables and Measurements

Variables	Measurement	Expected sign
WTP	1= willing to pay, 0 = Otherwise	+
Bid/Price	Bid price stated by respondents (TZS)	-
Age	Years	+/-
Gender(sex)	1=Male, 2=Female	+/-
Household size	Number of household members	-
Education level	1=Informal education, 2=Primary education, 3=O-Level, 4=A-Level, 5=Diploma, 6=Higher education, 7=Others	+
Income	1=<100000, 2=200000-199999, 3=200000-399999, 4=400000-1000000	+
Marital Status	1=Married, 2=Single, 3=Divorced, 4=Widowed	+
Vitamin Knowledge	1= Vitamin A, 2=Don't know	+
Packaging	1=Prefer packaging, 2=Don't prefer packaging	+/-

3.4 Limitation of this Study

Some of the encountered limitations in this study include:

- Researches related to this study specifically in processed orange fleshed sweet potato into flour, breads and biscuits have not been carried out in Tanzania. Thus, it was difficult to access pertinent materials directly related to the theme of this study.

- The obvious way to measure nonmarket values is through directly questioning individuals on their WTP for a good or service (Rahim, 2008) which is known as contingent valuation method. However there are some limitations of using this method such as: the stated WTP may exceed the true feelings, Respondents may fail to take questions seriously because the financial implications of their responses are not binding and unfamiliar with a good or service being valued may lead to inadequacy basis for articulating its true value.
- This research investigated only four products namely OFSP flour, OFSP bread (30%), OFSP bread (20%) and OFSP biscuits due to time and budget constraints. Therefore, since the orange fleshed sweet potato can also be used to produce other products such as OFSP juice, OFSP cakes etc, conclusions drawn from the study could be different if generalized to the whole set of OFSP products in other parts of Tanzania.
- The experimental design in this study overlooked the blocking which could control the order effect. Thus the overlooking of the blocking in this study has been acknowledged that in that way it did not control for any order effect.

CHAPTER FOUR

4.0 RESULTS AND DISCUSSION

4.1 Overview

This part presents and discusses the results of the study. It covers the Socio-economic and demographic characteristics of the respondents interviewed. The chapter presents also the rated attributes by respondents for accepting processed OFSP products, the value respondents are willing to pay for the processed OFSP products and factors influencing WTP for processed OFSP products in the study area.

4.2 Respondents' Socio-economic Characteristics

In this study, the socio-economic and demographic characteristics of respondents considered include sex, age, marital status, education, household size, occupation, income and knowledge about sweet potatoes and processed OFSP products. A total of 120 respondents were interviewed of which 34.2% were male and 65.8% female. In terms of education, most of the respondents interviewed were found to have completed primary school (49.2%) followed by 22.5% respondents who had completed O-level education. Those who had completed Diplomas and Higher education were 8.3% in each case while 1.7% had a certificate of community development and 0.8% of respondents had completed A-level education. Other 8.3% of respondents had informal education and 0.8% of respondents' did not attend formal schooling as indicated in Table 1.

These results show that the majority (90.9%) of the respondents had completed their education through the formal system and it is consistent with MMCSEPR (2012). For marital status, Table 2 shows that about 74.2% of the respondents were married, 17.5% single, 4.2% divorced and 4.2% were widowed. But also respondents' age, member compositing the household and household with children with less or equal to five years old is indicated in Table 2. However the mean household

size of 4.5 is almost the same as that of 4.2 reported by the MMCSEPR (2012). According to Addai and Danso-Abbeam (2014) the mean age of 38.42 years old is an indication that most of the respondents were in their active years and probably due to their age, they made more mature decisions related to acceptability of the products presented to them and other issues leading them to express the WTP value.

Table 2: Distribution of Respondents' Socio-economic Characteristics

Variable	Categories	Respondents(n=120)	Percentage
Sex	Male	41	34.2
	Female	79	65.8
Total		120	100.0
Level of Education	Informal education	10	8.3
	Primary education	59	49.2
	O-Level education	27	22.5
	A-Level education	1	0.8
	Diploma	10	8.3
	Higher education	10	8.3
	Certificate of com.dev	2	1.7
	Did not attend School	1	0.8
Total		120	100.0
Marital status	Married	89	74.2
	Single	21	17.5
	Divorced	5	4.2
	Widowed	5	4.2
Total		120	100.0
Respondents' age		Age	
Minimum age	19		
Maximum age		75	
Mean age		38.42	
Household sizeHhMembers			
Minimum Hhsize		1	
Maximum Hhsize		12	
Mean Hhsize		4.5	
Household with children \leq 5 years old		58.3%	

4.3 Occupation of the Respondents

The occupation of the respondents was mainly categorized into three sectors as indicated in Table 3. The 12.5% of respondents had government employment, 13.3% had private employment while 74.2% had self-employment. The major economic activities engaged by the respondents are both farm and off-farm activities. This result is consistent with the Morogoro Municipal Council Socio-Economic Profile (2012) whose report shows that off-farm activities such as business activities, office work, elementary occupations and plant operations assemblers happened to be the main source of employment of the municipal residents. Most of the respondents have monthly income ranging from TZS200 000 to TZS399 999 (Table 4) and this is roughly complying with the medium GDP per capita ranging from TZS 900 001 to TZS1 200 000 (i.e. TZS175 000 per month) which was also reported by the Tanzania Human Development Report (2014). The implication of this result is that the respondents are economically active and due to that fact of engaging in different productive activities, the real picture on consumers' WTP in the study area has been expressed by the respondents.

Table 3: Respondents' Occupation

Occupation Status	Respondents(n=120)	Percentage
Government employed	15	12.5
Private employed	16	13.3
Self-employed	89	74.2
Total	120	100.0

4.4 Respondent's Income Level

The respondents' income level was merely categorized into four groups as Table 4 shows. Among of the 120 respondents, 34.2% had the income ranging from TZS 200000 to TZS 399 999, 30.8% had the income ranging from TZS 100 000 to TZS199 999, and those with the income ranging from TZS 400 000 to TZS1000 000 were 17.5% while those with the

income less than TZS100 000 were 17.5% of the respondents. These results show that most of the respondents' income comply the per capita income reported by the Tanzania Human Development Report (2014) that Morogoro is one of the region with medium GDP per capita income ranging from TZS900 001–TZS1 200 000.

Table 4: Respondents' Income per Month

Income level (TZS)	Respondents(n=120)	Percentage
Less than 100 000	21	17.5
100 000 to 199 999	37	30.8
200 000 to 399 999	41	34.2
400 000 to 1000 000	21	17.5
Total	120	100.0

4.5 Respondents' Sweet Potato Awareness

Since the sweet potato is grown in all agro-ecological zones in Tanzania, then all respondents were asked to mention types of the sweet potato known to be consumed or cultivated in the study area as well as in Tanzania in general. The results showed that 98.3% of the respondents were able to mention two major types of sweet potato consumed or cultivated in Tanzania namely white fleshed sweet potato (WFSP) and OFSP while 1.7% of the respondents happened to know only WFSP as shown in Table 5. These results established that most of the respondents were aware about the types of sweet potato cultivated and consumed in the study area and Tanzania in general.

Table 5: Respondents' Awareness of Sweet Potato Types Cultivated

Ward's Name	**White/Cream and Orange/Yellow Sweet Potato	* White/Cream Sweet Potato
Boma	10	0
Kilakala	9	1
Kichangani	10	0
Sultani Area	10	0
Saba Saba	10	0
Mafiga	10	0
Mji Mkuu	10	0
K/Ndege	10	0
K/Maghorofani	10	0
Mazimbu	10	0
Mji Mpya	9	1
Mlimani	10	0
Total	118 (98.3%)	2 (1.7%)

**Respondents who stated to know two types of sweet potato cultivated in the study area or in Tanzania.

*Respondents who stated to know only white/cream sweet potato type cultivated in the study area or in Tanzania.

4.6 Respondents' Awareness of Major Vitamin Available in OFSP

Most of the respondents (81.7%) in the study area don't know the major vitamin available in OFSP. It is only 18.3% of the respondents in the study area who were able to state clearly the major vitamin available in the OFSP. According to HKI, (2012), OFSP are high in vitamin A content. The implication of this result is that most of the respondents although they are aware of availability of the OFSP as stated in Table 5, they don't know the advantage of consuming OFSP to their health as the major vitamin A content found in OFSP is not known by 81.7% of the respondents as shown Table 6.

Table 6: Respondents' Awareness of Major Vitamin Content in OFSP

Ward's Name	**Don't Know Major Vitamin content in OFSP	*Knows Major Vitamin content in OFSP
Boma	8	2
Kilakala	7	3
Kichangani	8	2
Sultani Area	6	4
Saba Saba	8	2
Mafiga	10	0
Mji Mkuu	10	0
K/Ndege	8	2
K/Maghorofani	10	0
Mazimbu	7	3
Mji Mpya	8	2
Mlimani	8	2
Total	98 (81.7%)	22 (18.3%)

**Respondents who did not know the major vitamin content in OFSP

* Respondents who knew the major vitamin content in OFSP

4.7 Sweet Potato Consumption Behavior in the Last 12 Months

The consumption information of sweet potato by the respondent in the past twelve months was also gathered. About 93.3% of respondents agreed to have consumed sweet potato in the last twelve months while 6.7% of the respondents did not consume sweet potato in the same period. Since the high percentage of the respondents agreed to have consumed sweet potatoes, then it was an indication that the study targeted the right respondents and are consistent with Harvest Plus (2012) who argued that in many regions of Sub-Saharan Africa, people traditionally eat white or yellow sweet potato. This could be an opportunity for orange sweet potato to be incorporated into their diets in order to reduce the prevalence of vitamin A deficiency significantly.

Table 7: Respondents' Sweet Potato Consumption Behavior in Last 12 months

Sweet potato consumption	Respondents (n=120)	Percentage
Yes	112	93.3
No	8	6.7
Total	120	100.0

4.8 Processed OFSP Consumption Behavior in the Last 12 Months

Table 8, indicates that 14.2% of the respondents had consumed processed OFSP products in the study area while about 85.8% of the respondents had not consumed the processed OFSP products within the same period. The implication of this result is that there were either a limited supply of processed OFSP products or a limited knowledge and awareness about the availability of processed OFSP products in the market.

Table 8: Respondents' Processed OFSP Consumption Behavior in Last 12 months

Processed OFSP consumption	Respondents (n=120)	Percentage
Yes	17	14.2
No	103	85.8
Total	120	100.0

4.9 Respondents' Awareness of Availability of Processed OFSP products

The awareness of respondents on OFSP being processed into flour, breads and biscuits were also assessed. Table 9 shows 43.3% of the respondents had already heard that OFSP is being processed into flour, breads and biscuits. However, 56.7% of the respondents said they had never heard about OFSP being processed into flour, breads and biscuits. These results imply that there is still a great room of making the promotion. Olapade and Ogunade (2014) argued that promotion leads to expanded markets and thus encourage the increased production of root crops and also the use of processed foods based on local

products to replace imported foodstuffs which will also conserve foreign exchange. Advertising or promotion is important in order to tell consumers about the availability of products or services, their benefits and why customers should make a purchase decision (CIP, 2013).

Table 9: Respondents' Awareness of Availability of Processed OFSP products

Processed OFSP products' awareness	Respondents(n=120)	Percentage
Yes	52	43.3
No	68	56.7
Total	120	100.0

4.10 Sensory Evaluation

The sensory evaluation had to be done by each respondent in order to assess the Sensory properties of the samples of the presented products. The respondents had to rate how much he/she like or dislike each sample by indicating appropriate reference coded 1 to 9 in the column against each attribute. The attributes were appearance or colour, Aroma or flavor, taste and texture for each particular product. Thus Fig.3 shows the mean results of hedonic scores on how respondents liked or disliked each attribute while Figure 4 shows the mean hedonic scores for overall acceptability of the products. The overall acceptability of the products indicated in Fig.4 further shows that there is no significant difference between the acceptability of OFSP bread (30%) and OFSP bread (20%) in the study area. However, there is a significant difference in overall acceptability between OFSP breads and OFSP flour, OFSP breads and OFSP biscuits, and between OFSP flour and OFSP biscuits at $P < 0.05$. The different letters in Fig.4, shows significant difference ($P < 0.05$).

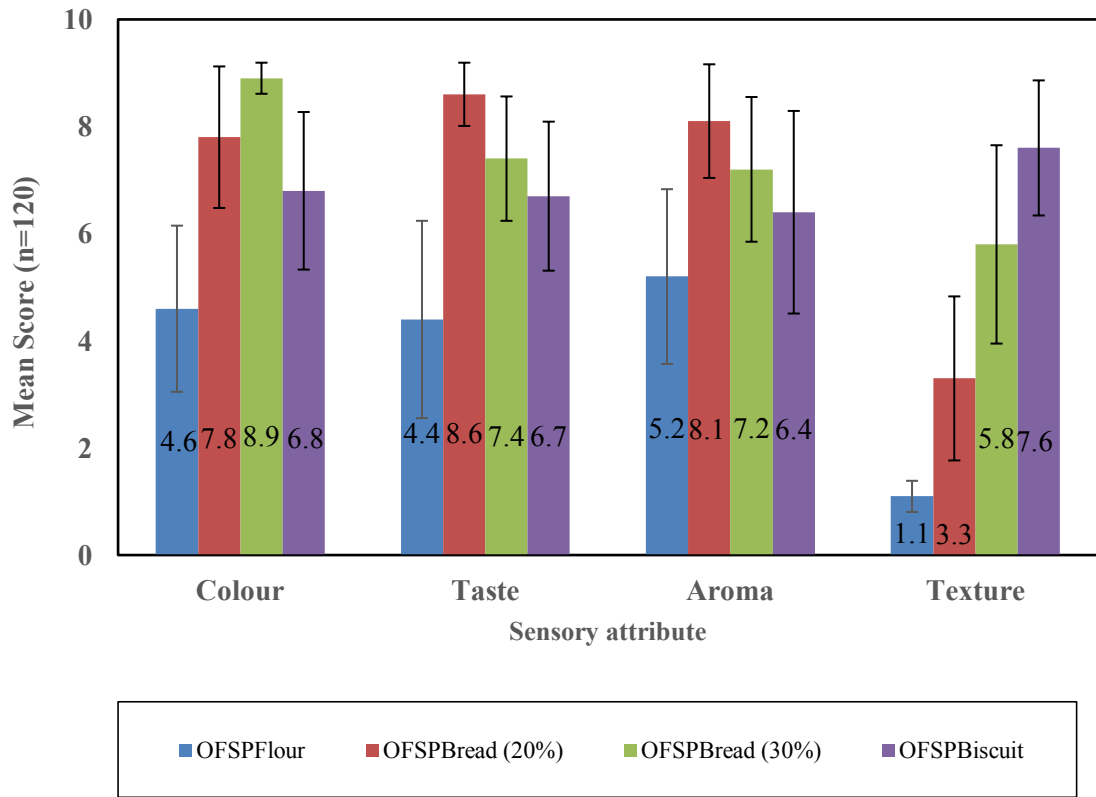


Figure 3: Sensory profile of the samples (n=120)

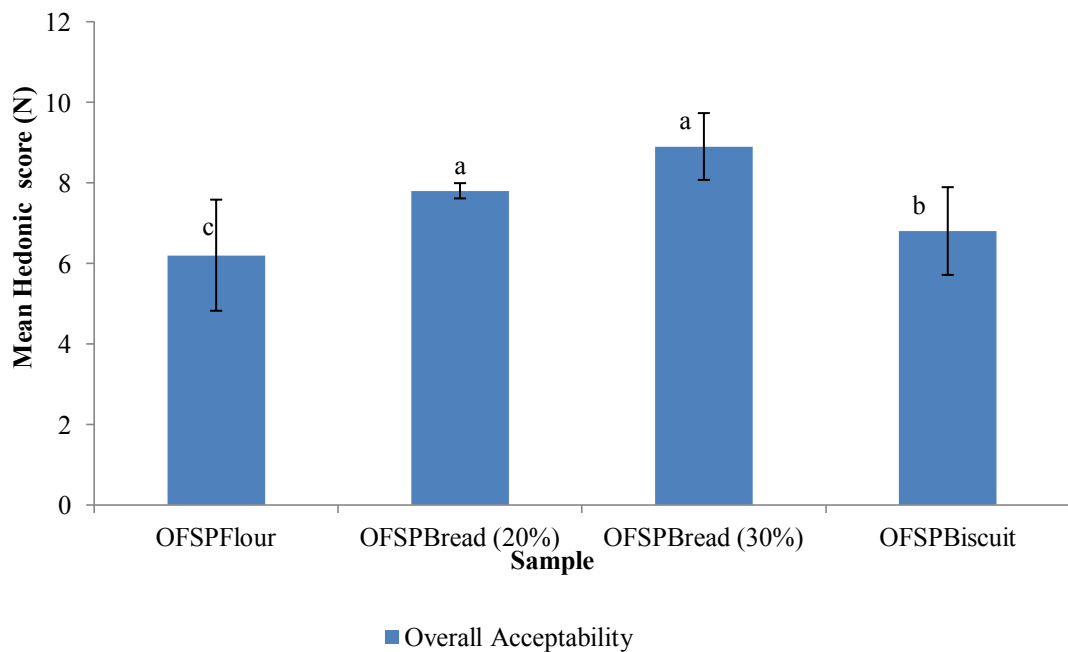


Figure 4: Mean hedonic scores showing overall acceptability by consumers (n=120).

4.10.1 Preference mapping

4.10.2 Principal Component Analysis of the descriptive sensory data

The bi-plot shown by Fig. 5 has the two first significant principal components from Principal Component Analysis (PCA) on average sensory attributes. The obtained results show that Principal Component one (PC1) and Principal Component two (PC2) are accounted for 72.4% and 25.0% of the systematic variation in the data respectively. The variation between samples along PC1 was explained by colour, taste, aroma and texture on one side while PC2 was mainly described by variation colour, taste and aroma on one side and texture on the other side. Thus Fig. 5 shows the relationship between sensory properties and acceptability (i.e. Preference mapping) of the OFSP products.

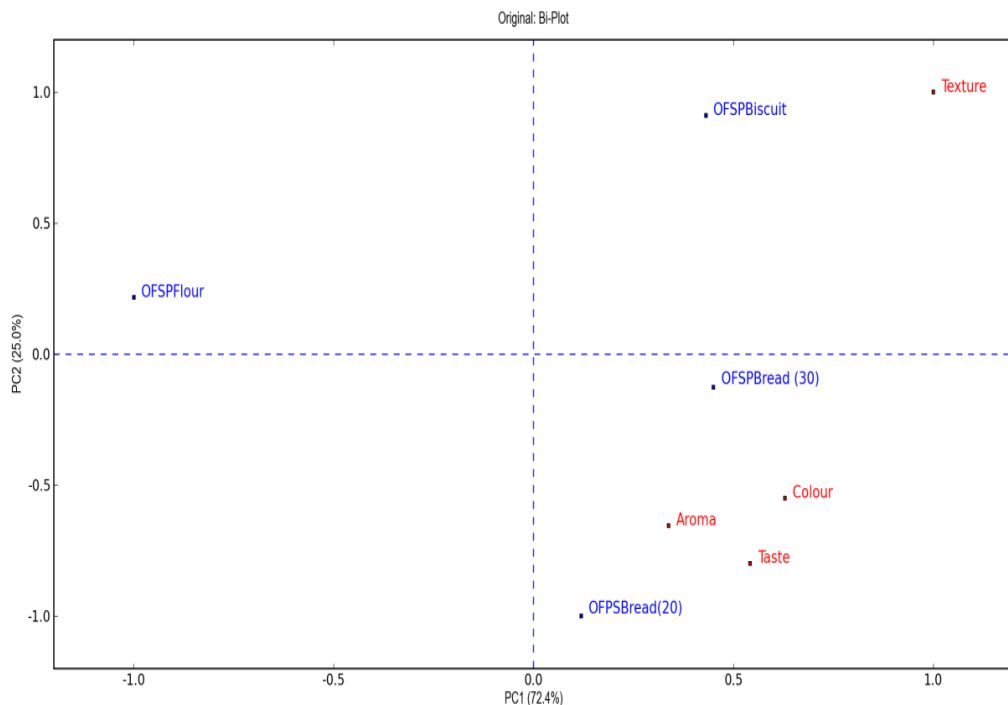


Figure 5: Bi-plot of Principal Component Analysis (PCA) showing relationship between samples and sensory attributes

4.10.3 Relationship between Descriptive Data and Hedonic Liking by Partial Least Square Regression (PLSR)

Fig.6a shows the results from a PLSR using descriptive data as X-variables and liking rated by consumers as Y-variables. The finding indicates that, most consumers fall to the right of the vertical Y-axis which means the acceptance values of these respondents go in the direction of OFSP bread (30%) and OFSP bread (20%) associated with colour, taste and aroma attributes and OFSP biscuits associated with texture attribute. Few respondents (about 13 respondents) preferred OFSP flour as indicated by the third quadrant. The first and fourth quadrants show the high preference for OFSP bread (30%) and OFSP bread (20%) samples respectively which is similar to the overall acceptability observed in hedonic results in Fig. 4.

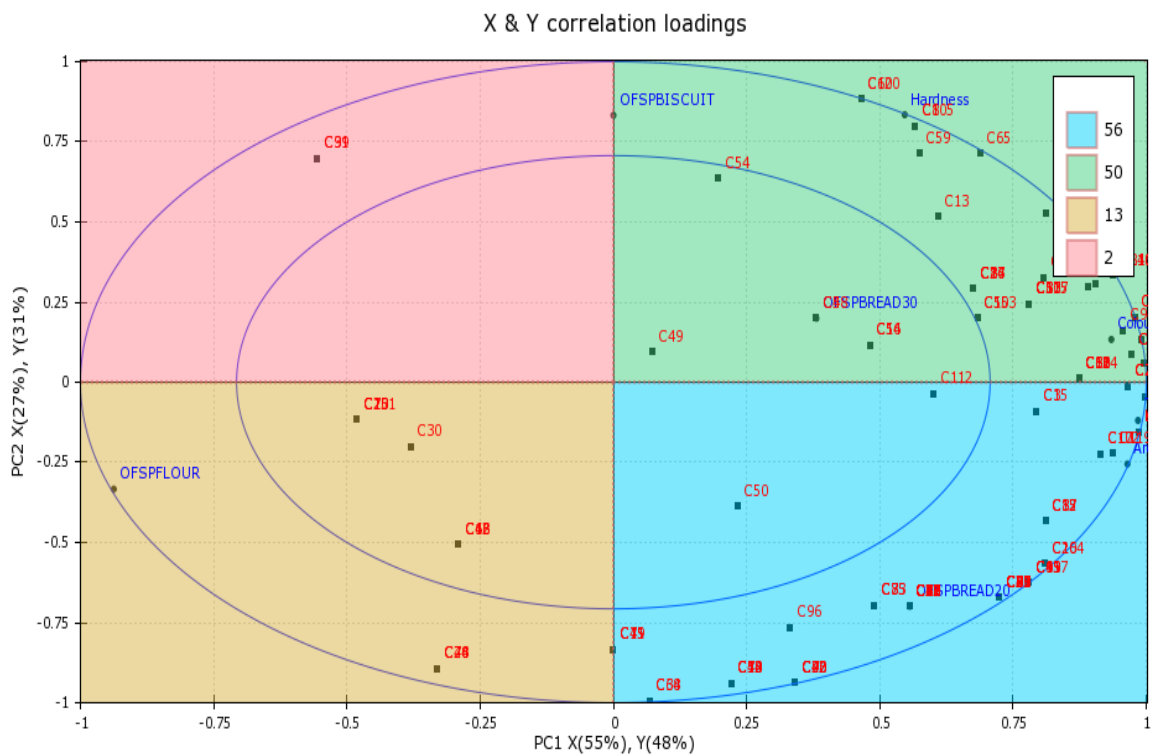


Figure 6(a): Correlation loadings from a partial least square regression of OFSP products samples with descriptive data as X variables and hedonic rating as Y variables

Thus both Fig. 6a and 6b represents the same thing, although the different becomes the colored quadrants in Figure 6a which indicates the number of respondents who preferred a particular sample product. Therefore these results imply that the liking of OFSPbread(30%) and OFSPbread(20%) by respondents was due to colour, taste and aroma while liking of OFSP biscuits was due to texture as indicated by Fig. 6b.

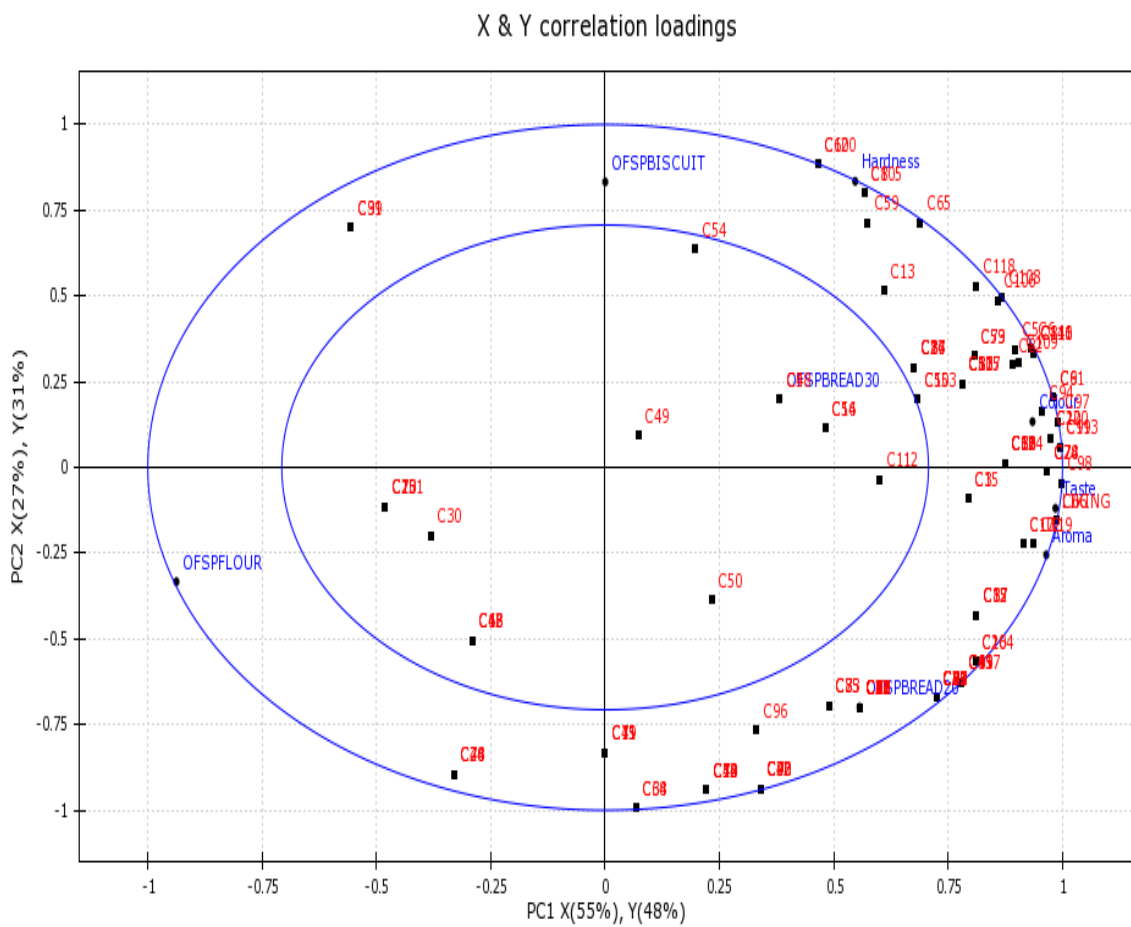


Figure 6(b): Correlation loadings from a partial least square regression of OFSP products samples with descriptive data as X variables and hedonic rating as Y variables

4.11 OFSP Products’ Brand Name

Basing on sensory evaluation made, each respondent was also required to rank the brand name in order of preference and the results were as shown in Table 10 where in the first

rank, 34.0% of the respondents preferred mostly the OFSP bread(30%) followed by OFSPbread(20%) which was preferred by 33.1% of respondents in the second rank. The 45.8% of the respondents ranked OFSPbiscuits as their third preference while 58.7% of the respondents ranked the OFSPflour as their fourth preference. These results show that the OFSPbread(30%) was preferred by the majority followed by the OFSPbread(20%) and the OFSP biscuits while the OFSP flour was the least brand name preferred by respondents in the study area. The implication of these results is that the agro processing unit engaging in those products production should put more effort in breads production as well as biscuits if the best three products are to be selected for production.

Table 10: Products' Brand Name Preference Ranking

Products' brand Name	Respondents' 1st ranking on product	Respondents' 2nd ranking on product	Respondents' 3rd ranking on product	Respondents' 4th ranking on product
OFSPflour	15.2%	9.1%	26.7%	58.7%
OFSP bread(30%)	34.0%	32.2%	14.6%	5.3%
OFSPbread(20%)	31.3%	33.1%	12.9%	6.9%
OFSPbiscuit	19.5%	25.6%	45.8%	29.1%
Total	100%	100%	100%	100%

4.12 The WTP of OFSP flour, OFSP bread and OFSP biscuits

After completing sensory evaluation, the WTP for each product was determined. Each respondent was asked his/her WTP to each product presented. The 95% of the respondents (Table 11) who were asked "could they purchase the OFSPflour if had to be made available in the market place?", answered "Yes" while 5% of respondents answered "No" on the same question. Hence these results show the majority of the respondents could buy the OFSPflour if it is made available in the market place.

The WTP for the OFSP bread (30%) showed that 99.2% of the respondents who were asked “could they purchase the OFSP breads if had to be made available in the market place?” answered “Yes” while 0.8% answered “No” on the same question. Thus, these results signify that the majority of the respondents can buy the OFSP bread (30%) if could be made available in the marketplace. Also the WTP for the OFSP bread (20%) shows that 98.3% of the respondents who were asked “could they purchase the OFSP bread (20%) if had to be made available in the marketplace?” answered “Yes” while 1.7% answered “No” on the same question. Thus, these results imply that the majority of the respondents can buy the OFSP bread (20%) if could be made available in the marketplace.

Finally 95.8% of the respondents who were asked “could they purchase the OFSP biscuits if had to be made available in the market place?” answered “Yes” while 4.2% of respondents answered “No” on the same question. Also these results show that the majority of the respondents can buy the OFSP biscuits if could be made available in the market place. Generally, these results showed the respondents’ WTP for the presented products is high and its implication is that the agro processing industry engaging in these products development should utilize that available opportunity by promoting the products, increasing production and ensure the consumers’ satisfaction.

Table 11: The WTP of OFSP flour, OFSP bread and OFSP biscuits

Product Name	Respondents’ Response	Percentage	Respondents’ Response	Percentage
OFSP flour	Yes	95.0	No	5.0
OFSP bread (30%)	Yes	99.2	No	0.8
OFSP bread (20%)	Yes	98.3	No	1.7
OFSP biscuit	Yes	95.8	No	4.2

4.13 Packaging of Processed OFSP Products

The view of the respondents on the way processed OFSP products presented to them were packaged was assessed in order to know whether there is a need for improvement. Table 12 shows that 98.3% of the respondents complied by the way the OFSP products were packaged while 1.7% of the respondents did not comply with the way the products were packaged and the reason given was that “similar products in the market place are better packaged than the way products presented to them were packaged”. Hence in general the results shows the majority of the respondents complied with the way the OFSP products presented to them had been packaged. The implication of these results is that the agro processing industry engaging in producing the three products should continue with the way those products are packaged.

Table 12: Packaging of Processed OFSP Products

Respondents' Response	Respondents(n=120)	Percentage
Yes	118	98.3
No	2	1.7
Total	120	100.0

4.13 Willingness to Pay

In this study apart of each respondent to be required to show his/her WTP for the four products under study as shown in Table 10, also each respondent was required to state exactly monetary value which could he/she be willing to pay to each product. The enumerator had to state the attached market price for each product before asking how much could be paid by the respondent. If the respondent had to pay the market price, then that market price had to be raised by 10% until No and if the respondent was not ready to pay to the market price, then that price had to be lowered by 10% until No.

The information of WTP in monetary value from each respondent and to each OFSP product presented to the respondent was collected and the binary logistic regression was used to analyze equation (1) in order to get the value of alpha (α) and rho (ρ) indicated in Table 13. However, the market price attached by Solartunda processing unit which is operating under the School of Agricultural Economics and Business Studies (SAEBS) at Sokoine University of Agriculture was TZS4000 per kg for OFSP flour, TZS1000 per one-quarter kg for OFSP breads and TZS1000 per one-tenth kg for OFSP biscuits as it was based on the production cost per unit and they were used as a reference in determining respondent's WTP in monetary value.

The author of this research bought all those products at the same mentioned price from Solartunda processing unit where the OFSP flour was purely made from OFSP and OFSP breads had two different composition: one had 20% and the other had 30% of orange fleshed sweet potato while OFSP biscuits had a composition of 30% orange fleshed sweet potato flour and 70% wheat flour each. The double-bounded contingent valuation (DBCW) was used to elicit willingness to pay and then, Mean WTP value was estimated using the relation: Mean WTP = α/ρ where α = Coefficient of intercept term and ρ = bid price was estimated and the results are as shown in Table 13.

The mean WTP in monetary value for the four products was calculated and found to be TZS4106.26 per kg, TZS1568.67 per one-quarter kg, TZS1592 per one-quarter kg and of TZS973.84 per one-tenth kg as shown in Table 12. For the OFSP flour and OFSP breads the monetary value is little bit higher than the market price while in case of OFSP biscuits the WTP in monetary value is TZS973.84 per one-tenth kg which is little bit low compared to its market price.

The implication of these results is that respondents had a positive WTP to the products and this means the products will be purchased if are to be supplied in the market. This positive WTP for the OFSP flour and OFSP breads becomes consistent with previous studies in other countries done by Baker (1999); Govindasamy and Italia(1999); Roosenetal.(1998); Loureiroet al. (2002) as cited by Cerdaet al.(2012). However, in the same Table13, mean WTP in monetary value for OFSPbiscuits was calculated and found to be TZS973.84 per one-tenth kg and since that value is less than the market price of TZS1000, then it implies that if the product is to be available on the marketplace, it will not be purchased at the price of TZS1000 instead it will be purchased at the price of TZS973.84. Therefore producer should think to reduce the production costs or any other costs such as logistics costs so that it can be sold at that price of TZS973.84 while still providing the normal profit to the producer.

Table 13: Mean WTPin Monetary Value

Parameters	OFSPflour	OFSPbread(30%)	OFSPbread(20%)	OFSPbiscuits
Alpha(α)	-266.907	-243.144	-256.312	-172.37
Rho(ρ)	0.065	0.155	0.161	0.177
MeanWTP= $\frac{\alpha}{\rho}$	4106.26*	1568.67*	1592*	973.84*

Note: *The value is in Tanzania Shillings

4.14The Main Ingredientsof Processed OFSP products

According to the Solartunda processing incubator manager, the OFSPflour was purely made from OFSP while the OFSPbreads had different composition: one had 30% of OFSP flour and the other had 20% of the OFSP flour with 70% and 80% of wheat flour respectively. Further OFSPbiscuits had a composition of 30% of OFSPflourand 70% of wheat flour. Furthermore, the4.2kg of raw form of OFSP are required to produce 1kg of

OFSP flour. However, the price of 1kg of raw OFSP is being bought at TZS350 while the transportation cost is TZS125 per 1kg of raw OFSP. Hence this shows that the price per kg of raw OFSP is TZS475. From this information, the price of 4.2kg of raw OFSP becomes TZS1995. Since 1kg of OFSP flour is being sold at TZS4000, then this indicates that it makes sense to produce OFSP flour rather than selling the raw form of OFSP.

Again, in the case of OFSP bread and OFSP biscuit, the composites are 70% wheat and either 20% or 30% of OFSP flour in bread and 30% of OFSP flour in OFSP biscuit. This means in average 0.35kg and 0.15kg of wheat and OFSP flour respectively are required to prepare 0.5kg of OFSP bread while 0.07kg of wheat and 0.03kg of OFSP flour respectively are required to prepare 0.1kg of OFSP biscuits. Hence, computations indicate that TZS299.25 and TZS187.5 are the price of raw OFSP and wheat flour respectively required to produce 0.5kg of OFSP bread. Therefore, 0.5kg of OFSP bread is valued TZS486.75 before being processed into OFSP bread.

Since the OFSP bread is being sold at TZS1000, hence it makes sense to process the OFSP into OFSP bread. In case of OFSP biscuits, 0.126kg of raw OFSP which is equivalent to the price of TZS59.85 is required to be mixed with 0.07kg of wheat amounted to TZS87.50. Then this shows that 0.1kg of OFSP biscuits before being processed could have been sold at TZS147.35. This is still showing that it makes sense to process OFSP into OFSP biscuits as the processed OFSP biscuits are sold at TZS1000 although the respondents showed the WTP in monetary value of TZS973.84. All what have been said above are summarized in Table 14.

Table 14: Computation of Processed OFSP products' ingredients

OFSP product	Raw OFSP required	Price of raw OFSP per Kg	Transport cost of Raw OFSP per Kg	Total cost needed to produce 1Kg of OFSP (B)	B +10% of B	Market price of OFSP flour
Flour	4.2Kg(1470)*	TZS350	TZS125	TZS1995	TZS2194.5	TZS4000
OFSP product	Raw OFSP in Kg required	OFSP flour in Kg	Wheat flour In Kg	OFSP flour In Kg	OFSP bread In Kg	OFSP biscuit In Kg
Bread	0.855(299.25)*	0.15	0.35(187.5)*	None	0.5(486.75)*	None
Biscuits	0.126(59.85)*	0.03	0.07(87.5)*	None	None	0.1(147.35)*

Note: * The values in blackest are in Tanzania Shillings (TZS) and indicate the monetary value for the value in Kg written before the blackest

4.15 Factors Influencing WTP for OFSP Products

Since there was no significant difference in overall acceptability between OFSP bread (30%) and OFSP bread (20%) as shown in Fig. 4, then the factors assumed to influence OFSP products were analyzed to only three products namely OFSP flour, OFSP bread (30%) and OFSP biscuits. Factors assumed to be influencing the WTP for the selected processed OFSP products include price, age of the respondent, sex of respondent, household size, education level of the respondent, income of the respondent, marital status of the respondent, color of the product, flavor of the product, taste of the product, knowledge on nutrition possessed by the product and packaging of the product. However, the variables such as color, flavor and taste were dropped during analysis because there were no other similar products which were tested with the same attributes when the survey was conducted.

4.15.1 Factors Influencing WTP for OFSP Flour

Table 15a; indicate the logistic regression analysis results for OFSP flour. The bid/price, household size, education level, income, nutrients knowledge and packaging are the factors

which were found to significantly influence consumer WTP for OFSP flour in the study area ($P < 0.05$). However, bid/price was found to influence consumer's WTP negatively and it was consistent with the study by Adepoju and Oyewole (2013); Anyam *et al.* (2013), which imply that as the price of OFSP flour increases less is likely to be purchased. The same study by Adepoju and Oyewole (2013) indicated significance of education level of household head, income level of household head, nutrients knowledge and packaging of the product to influence households' WTP which is also consistently with this study. The age of the respondent was not significantly influencing consumer WTP for OFSP flour which is consistent with the study by Emunuet *et al.* (2012) and marital status were not significantly influencing consumer WTP for OFSP flour. The general implication on OFSP flour might be a good product if targeted to smaller households with relatively more income as the price increments seem to affect WTP.

Table 15(a): Logistics Regression Analysis Results for OFSP flour (n=120)

	Independent Variables	B	S.E.	Wald	Sig.
Step 1 ^a	Price1	.5060	.319	24.21	.029**
	Ageresp	-.004	.012	.181	.670
	Sexresp	.942	.534	31.62	.037
	Hholdsiz	-.913	.513	4.325	.012**
	Edlevresp	.837	.478	23.36	.010**
	Incopermoth	1.824	.314	37.32	.000**
	Martstaresp	.18	.703	.166	.123
	Vitamknowl	.450	.164	27.50	.031**
	Packaging	.980	.718	7.361	.009**
	Constant	-2.593	638.357	.100	.997

Note: ** 5% significance

4.15.2 Factors Influencing WTP for OFSP Bread (30%)

Table 15b; indicate the logistic regression analysis results for OFSP bread (30%). The bid/price, household size, education level, income level, nutrients knowledge and

packaging of the products are significant factors influencing consumer WTP for OFSP products. In this study, only the age of the respondents, sex of respondents and marital status were not significant in influencing consumer WTP for OFSP breads (30%). These results imply that increase in price and household size have negative impact on the consumer WTP for the OFSP bread (30%) while other factors like education, raise of income, possessed knowledge on the nutrients of the product as well as the good packaging are motivating consumers to purchase the products. However age, sex and marital status from the results imply that the OFSP breads will be purchased regardless of consumer age, sex and marital status.

Table 15(b): Logistics Regression Analysis Results for OFSP bread(30%) (n=120)

	Independent Variables	B	S.E.	Wald	Sig.
Step 1 ^a	Price2	.660	3.11	2.351	.011**
	Ageresp	.113	.408	.118	.701
	Sexresp	.006	.037	.229	.823
	Hholdsiz	-.814	.382	41.34	.031**
	Edlevresp	.432	.128	3.411	.004**
	Incopermoth	.864	.438	5.741	.037**
	Martstaresp	.003	.016	.191	.310
	Vitamknowl	.916	1.497	3.121	.002**
	Packaging	.768	.33	8.339	.016**
	Constant	-1.747	367.974	.000	.996

Note: ** 5% significance

4.15.3 Factors Influencing WTP for OFSP Biscuits

Table 15b; indicate the logistic regression analysis results for OFSP biscuits. The bid/price, age of respondents, education level, income level, nutrients knowledge and packaging are factors that influence significantly consumers' WTP in the study area. Although the income level is significant still its coefficient is negative as shown in

Table 15c. Since the coefficient for income variable was expected to be positive and because the coefficient is negative, then its implication is that as the consumers' income rises less of OFSP biscuits will be purchased. This compliments the consumer theory for inferior good. The description of consumer theory on inferior good is that as the income level rises; less of the inferior good is purchased. But the same theory describes that as the income level rises; more good is purchased if that good is a normal good.

Thus apart from the concern noted on the survey from respondents about the small amount the OFSP biscuits' samples compared to other substitute packed biscuits available in the market, the negative coefficient could imply that OFSP biscuit is inferior to the consumer. Other factors such as sex of respondents, household size and marital status of the respondents were insignificant in influencing consumers' WTP for the OFSP biscuits. The implication of these results to the processor or factory is to increase a little bit quantity of the OFSP biscuits or low a price of the OFSP biscuits so that value of money is experienced by the consumer when purchasing the product.

The processor should also improve and maintain the packaging of the OFSP biscuits as it will motivate more consumption and the potential consumers to be targeted by the processor should be the educated ones. If the OFSP biscuits are the inferior good, the productions should be targeted to low income earners while the amount of OFSP biscuits should be increased to satisfy consumer's needs if the OFSP biscuits is a normal good. The factors found to influence the consumers' WTP for the OFSP products are consisted with the study done by Agyekum *et al.* (2014) on WTP for Faecal Compost by Farmers in Southern Ghana whose results showed that price, packaging as well as farmer's socio-demographic characteristics, such as monthly household income, household size and age also significantly influenced farmers' willingness to pay.

Table 15(c): Logistics Regression Analysis Results for OFSP biscuits (n=120)

Independent Variables		S.E.	Wald	Sig.	
Step 1 ^a	Price3	.770	.261	5.101	.0111**
	Ageresp	.981	.492	2.871	.0310**
	Sexresp	.041	.109	.2130	.7341
	Hholdsiz	-.009	.013	.193	.6110
	Edlevresp	.735	.171	33.80	.0170**
	Incopermoth	-.58	.271	21.31	.0010**
	Martstaresp	.408	.127	.212	.1440
	Vitamknowl	1.973	.1240	3.304	.0230**
	Packaging	.654	.360	41.12	.0159**
	Constant	-1.712	334.569	.000	.996

Note: ** 5% significance

4.16 General respondents' comments on OFSP products

After the sensory evaluation had been finished, each respondent interviewed was asked to give his/her general comment to each product evaluated and the following were the comments given:

4.17.1 OFSP flour

- The manufactured and expired date should be indicated on the package of the OFSP flour
- The OFSP flour should be promoted because many people are not aware its availability
- It should also be largely produced and distributed in the available outlets
- It is a good idea to have sweet potato flour which can be used to prepare porridge, buns, *chichili* and chapattis.

4.17.2 OFSP breads

- The manufactured and expired date should be indicated on the package of the OFSP breads
- Promotion of the OFSP breads should be done significantly because many people are not aware its availability
- The OFSP breads should be largely produced and distributed in the available outlets
- The OFSP breads are of good quality, sweet, soft and can be consumed without blue band

4.17.3 OFSP biscuits

- The promotion of the OFSP biscuits should be done because many people are not aware of its availability
- The OFSP biscuits should largely be produced and distributed in the available outlets
- The OFSP biscuits are very sweet and of quality. However, its size should be increased a bit so that the value of money is experienced by the consumer.

CHAPTER FIVE

5.0 CONCLUSIONS AND RECOMMENDATIONS

5.1 Conclusions

The main objective of this study was to assess the consumer acceptability and WTP for selected processed OFSP products in Morogoro Municipality. In achieving this objective the following specific objectives were undertaken; to rate the selected processed OFSP products' attributes considered important for consumer acceptability; to estimate the value consumers are willing to pay for selected processed OFSP products in the study area and to determine factors influencing WTP for selected processed OFSP products. The major findings from the study were as follows.

The OFSP bread (30%) and OFSP bread (20%) were accepted in association with colour, taste and aroma attributes while acceptance of OFSP biscuits was associated with texture attribute. The majority of the respondents (over 80%) were found to be unaware of the major vitamin content in the OFSP. In other words over 80% of the respondents do not know the advantage of consuming OFSP to their health. Orange fleshed sweet potato is one of a few new crops, which is an excellent source of energy and important nutritive substances that can contribute to improve the nutrient status of communities (Laurie and Heerden, 2012). The orange fleshed sweet potato is being promoted in the developing world as a source of pro-vitamin A towards alleviating vitamin A deficiency (Ibid). Now in conclusion, the consumers' acceptability of the OFSP products stated above and unawareness of significant Vitamin available in OFSP products imply that there is an opportunity to be utilized by the processors in the study area and at the same time OFSP stakeholders should increase their efforts in dissemination of the information on the potential consumption of OFSP products to the consumers' health.

Another major finding was the mean willingness to pay stated by the respondents to each of the presented product. In this case, TZS4106.26 per kg for OFSP flour was its mean WTP stated by respondents compared to its market price of TZS4000. Also TZS1568.67 and TZS1592 per one-quarter kg was the mean WTP for OFSP bread (30%) and OFSP bread (20%) respectively compared to market price of TZS1000 attached to each. Furthermore, the mean WTP was TZS973.84 per one-tenth kg for OFSP biscuits compared to its market price of TZS1000. The three products whose mean WTP exceeds their market price imply an availability of opportunity to be utilized by processors. However, the product with less mean WTP compared to its market price as indicated above means the respondents are willing to pay for the product but at low price than the actual price. Thus in conclusion the processor has to utilize the available opportunity by continuing producing the processed OFSP products as they are going to be purchased and keeping in mind that one of the products will be purchased at low price. If at that low price stated the processor will still get the normal profit, that product should also be continued in its production but if no normal profit accruing, then its production should stop.

The final major finding of this study is that bid/price, education level, income, nutrients and packaging were factors which found to influence consumers' WTP for OFSP products at $P < 0.05$ level of significance. In addition, consumers' WTP for OFSP flour and OFSP bread were significantly influenced by household size at $P < 0.05$ while age was found to influence WTP for OFSP biscuits at $P < 0.05$ level of significance. Moreover, sex was found to influence WTP for OFSP flour at the same level of significance. This findings concludes that when the producer develops the processed OFSP products should consider all these factors because without considering them as the ones influences the consumers' willingness to pay, when the products reaches the markets will not be purchased and that will affect negatively the performance of the industry.

5.2 Recommendations

Based on the conclusions and observation done at the study area, the following recommendations are suggested:

- i. Deliberate decision should be taken by the government to advertise and promote the importance of consuming the OFSP products in the study area. This effort will in one way or another increase the OFSP products demand and hence reliable market for smallholder farmers who are engaging in OFSP production as well as the agro-processors engaging in value addition of orange fleshed sweet potato such as Solartuda agro-processing plant.
- ii. The agro-processing plant such as Solartuda which is engaging in value addition of the orange fleshed sweet potato products should promote and advertise the availability of the OFSPflour and OFSPbreads in the market. These efforts will increase consumer demand which in turn will increase its market share as well as its revenue. However the size of the OFSPbiscuits should be increased as it was suggested by most of the respondents in the study area so as for them to be willing to pay for the product. Otherwise the price of OFSPbiscuits should be reduced so that value of money is the same with the utility delivered by the product.
- iii. Since the OFSP products' attributes considered important for consumer acceptability were colour, aroma, taste and texture; then care should be taken when developing those products so that all these attributes are maintained. During the survey it was observed that most of the respondents prefer to consume the value added products made from their locality. However consumers do consume the added value products from other countries because are the most products available in the market place.

- iv. Since the mean WTP for both OFSPflour and OFSPbreads were greater than the market price; meaning the majority of the respondents were willing to pay these products, then Solartuda agro-processing unit should largely produce and distribute those products in the study area. Furthermore, that large production which must be associated with distribution of the products should go hand in hand with the promotion of the products to increase the consumer demand and awareness for the availability of the products in the market place. For the OFSPbiscuits whose mean WTP was less than the market price, two decision options should be done: one to increase the size of the OFSPbiscuits or to reduce the price of OFSPbiscuit. However, for any decision option to be taken, profit per unit has to be experienced.
- v. The little knowledge about the major Vitamin available in OFSP imply that more efforts have to be done by stakeholders in providing education on the potential role of OFSP and effect of Vitamin A deficiency. HarvestPlus (2012) asserted that a marketing campaign should be built around an "orange brand" to raise awareness of the role OFSP can play in reducing vitamin A deficiency.

5.3 Further Area of Research

This study was carried out in Morogoro Municipality. There is a need to carry out similar study in different agro-ecological zone as per sweet potato production is concerned in order to determine the other consumers' willingness to pay so that when the OFSPs' stakeholders put more efforts on adoption of orange fleshed sweet potato with significant β -Carotene content in it which is the pro-vitamin A, the willingness to pay for processed OFSP products should be clearly estimated and known as the more agricultural produces will be processed as we move from low to medium industrialized country.

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APPENDICES

Appendix 1: Variables hypothesized to affect the WTP in the study area

Variable	Description of variable	Expected sign
Bid/price	Price of the OFSP as increases	–
Age	Age in years of the consumer as increases	+/-
Gender	Sex of the respondent	+/-
Household size	Number of people as increases in the household	–
Education level	Level of education of consumer as increases	+
Income level	Income level of consumer as increases	+
Marital status	For the married person	+
Nutrients	Major vitamin content in OFSP product	+
Packaging	Packaging of OFSP product	+/-

Appendix 2: Consumer survey questionnaire

CONSUMER SURVEY QUESTIONNAIRE

Enumerator's Name.....Date (DD/MM/YY).....Ward
Name.....

NB: Screening questions:

- Do you have the behavior of purchasing packed flours from supermarkets or any other outlets for your family consumption? 1.Yes 2.No
- Do you have the behavior of purchasing packed breads from supermarkets or any other outlets for your family consumption? 1.Yes 2.No
- Do you have the behavior of purchasing packed biscuits from supermarkets or any other outlets for your family consumption? 1.Yes 2.No

If YES to all three questions above, introduce the purpose of the research and start collecting information from a respondent who is ready to get involved in this study.

Introduction

I would like to ask you to spend no more than **sixty minutes** in this study. This survey is about a study of consumer acceptability and WTP for selected processed OFSP products (i.e 795= OFSP flour, 814=OFSP bread(30%), 843=OFSP bread(20%) and 625=OFSP biscuits).

There are four parts in this questionnaire: Part I, Part II, Part III and Part IV

1.0 PART I: Household characteristics

1.1 Sex of respondent 1.Male 2.Female

1.2Age of the respondent.....years **1.3** Education level of respondent

Informal education 2. Prima education

Secondary education i) level ii) A-level 4.Higher education 5.Other

(Specify).....

- 1.4 Marital status 1. Married 2. Single 3. Divorced 4. Separated 5. Widowed
 5. Other (Specify).....

1.5 Household size (Number of people)

1.6 Number of children in household with 5 years or below.....

2.0 OCCUPATION AND INCOME

2.1 What is your **major** occupation? Government employed 2. Private sector employed 3. Self employment

2.2 What is the range of income received per month from your occupation?

- (a) <100 000 Tsh (b) 100 000 – 199 999 Tsh. (c) 200,000 – 399 999 Tsh
 (d) 400 000 – 1000000 Tsh (e) >1000 000 Tsh

3.0 PART II: Sweet potato purchasing and consumption behavior

3.1 Can you mention two types of sweet potato cultivated or consumed in Tanzania?

a)..... b)

3.2 Have you eaten sweet potatoes for the past 12 months? 1. Yes (If Yes, continue with 3.3)

2. No (If No, continue with 3.4)

3.3 List the form of sweet potato eaten within the past 12 months and their frequency

Variety and Form of sweet potato	Frequency/month
<input type="checkbox"/> 1. Unprocessed WFSP	
<input type="checkbox"/> 2. Unprocessed OFSP	
<input type="checkbox"/> 3. Processed OFSP	<input type="checkbox"/> 1. Flour
	<input type="checkbox"/> 2. Bread
	<input type="checkbox"/> 3. Biscuit
Other (Specify)	

3.4 If No sweet potato was eaten in 3.2 above, why?

.....

3.5 If sweet potato in 3.2 was eaten, where do you normally eat Home vender
 3. Resta ant 4. Other (specify).....

3.6 In which form do you usually buy sweet potato? 1. Unprocessed WFSP
 2. Unprocessed OFSP 3. Processed OFSP 4. Other
 (Specify).....

3.7 Are you aware with the nutrients/vitamin available in WFSP products? 1. Yes
 2. No

3.7 Are you aware with the nutrients/vitamin available in OFSP products? 1. Yes
 2. No

3.8 What is the significant or major Vitamin available in OFSP product (i) A (ii) Q (
 iii) D (iv) Don't know

4.0 Awareness of processed OFSP products

4.1 Have you ever heard about processed OFSP products (i.e. 795= OFSP flour,
 814=OFSP bread(30%), 843=OFSP bread(20%) and 625=OFSP biscuits) 1. Yes (If Yes,
 continue with 4.2 and 4.3) 2. No (If No, continue with **5.0**)

4.2 Where did you hear them?

1. Home 2. Local Market 3. Supermarket 4. Friend place 5. Food
 exhibition Other (Specify).....

4.3 Have you ever bought processed OFSP products? 1. Yes 2. No

4.4 If Yes in 4.3 why did you buy processed OFSP products and not unprocessed one?

1. Safe (not poisonous) 2. Very convenient in use 3. Not very expensive

4. Available 5. Other (specify).....

4.5 If No in 4.3 why?

1. Not safe (Chemicals and poisonous) 2. Very expensive 3. Not available 4. Not available if available 5. Other (Specify).....

5.0 PART III: Sensory Evaluation Form for selected processed OFSP

Time.....

Please look and taste each of the (3) coded samples from left to right. Indicate how much you like or dislike each sample by indicate your appropriate reference (1-9) in the column against each attribute.

9 – Like extremely: 8 – Like very much: 7- Like moderately: 6- Like : 5- Neither like nor dislike: 4- Dislike: 3- Dislike moderately: 2- Dislike very much: 1- Dislike extremely

Attributes	Sample 795	Sample 814	Sample 843	Sample 625
Appearance/ colour				
Taste				
Aroma/flavor				
Consistence/texture				
General acceptability				

Overall acceptability: 9. Completely acceptable, 8. Moderately acceptable, 7. Acceptable, 6. Neither acceptable nor unacceptable, 5. Moderately unacceptable, 4. Completely unacceptable

Comments on:

Sample 795.....

Sample 814.....

Sample 843.....

Sample 625.....

5.3 Basing on sensory evaluation made, show the brand name in order of your preference

Brand Name	Ranking
OFSP flour	
OFSP bread(30%)	
OFSP bread(20%)	
OFSP biscuit	

5.4 Basing on your assessment on the attributes above, if the products are available in the market would you be willing to pay or purchase for

(a) OFSP flour 1. Yes 2. No (b) OFSP bread(30%) 1. 2.

(c) OFSP bread (20%) Yes No (d) OFSP biscuit Yes No

6.0 PART IV: Questions on willingness to pay

I am about to ask you if you would purchase a selected processed OFSP product at a certain price. However usually the amount of money people SAY they are willing to pay is sometimes higher than the amount they would ACTUALLY pay for the product in market place. For this reason, as you read the following question, please imagine that you would ACTUALLY have to pay the amount keeping in mind what you normally pay for **foodstuff** for you and your family.

- By considering carefully the following options, suppose these were the **only options** available in the market place, which one would, you choose? 795= OFSP flour, 814=OFSP bread(30%), 843=OFSP bread(20%), and 625= OFSP biscuits

6.1 Would you pay 4000 TZS for a package of 1000 grams of OFSP flour at the purchasing store as seen in the samples?

If YES: Would you pay 4200TZS? (If YES, rise price by interval of 200TZS until NO)

If NO: Would you pay 3800TZS? (If NO, lower price by interval of 200TZS until YES)

6.2 Would you pay 1000TZS for a package of 750grams of OFSP bread(30%) at the purchasing store as seen in the sample?

If YES: Would you pay 1050TZS? (If YES, rise price by interval of 50TZS until NO)

If NO: Would you pay 950TZS? (If NO, lower price by interval of 50TZS until YES)

6.3 Would you pay 1000TZS for a package of 750grams of OFSP bread(20%) at the purchasing store as seen in the sample?

If YES: Would you pay 1050TZS? (If YES, rise price by interval of 50TZS until NO)

If NO: Would you pay 950TZS? (If NO, lower price by interval of 50TZS until YES)

6.4 Would you pay 1000TZS for a package of 100grams of OFSP biscuits at the purchasing store as seen in the sample?

If YES: Would you pay 1050TZS? (If YES, rise price by interval of 50TZS until NO)

If NO: Would you pay 950TZS? (If NO, lower price by interval of 50TZS until YES)

6.5 Do you prefer the packaging of the presented product 1. Yes No If No why.....

7.0 WTP follow-up questions

Reasons for willingness to pay

7.1 Possible reasons for willingness to pay for OFSP flour

.....

7.2 Possible reasons for willingness to pay for OFSP bread(30%)

.....

7.3 Possible reasons for willingness to pay for OFSP bread(20%)

.....

7.4 Possible reasons for willingness to pay for OFSP biscuit

.....

Reasons for unwillingness to pay

7.4 Possible reasons for unwillingness to pay for OFSP flour

.....

7.5 Possible reasons for unwillingness to pay for OFSP bread(30%)

.....

7.6 Possible reasons for unwillingness to pay for OFSP bread(20%)

.....

7.7 Possible reasons for unwillingness to pay for OFSP biscuit

.....

THANK YOU FOR YOUR COOPERATION