HOUSEHOLD CONSUMPTION OF ORANGE - FLESHED SWEET POTATO AND ITS ASSOCIATED FACTORS IN CHIPATA DISTRICT, EASTERN PROVINCE, ZAMBIA.

PATRICIA SAKALA

Student no: 3207135.

A mini-thesis submitted in partial fulfilment of the requirements for the Master of Science Degree in Nutrition Management.
Faculty of Community and Health Science,
University of the Western Cape,

Supervisor: Prof. M. Faber

Co-Supervisor: Dr. E Kunneke

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ABSTRACT

Orange-fleshed sweet potato consumption promotion is one of the key nutrition sensitive interventions implementedto address high vitamin A deficiency among the rural population of Zambia since 2011. However, to date no study has been completed regarding household consumption of orange-fleshed sweet potato and factors related to their consumption. The study detailed here therefore sought to establish the consumption of orange-fleshed sweet potato, and to identify factors associated with its household consumption in the *Integrating Orange Project* areas in Chipata district of Zambia.

The study randomly sampled 295 households, and collected information on the household characteristics, production, procurement, consumption and knowledge on orange-fleshed sweet potato. Cross tabulation chi square and one-way analysis of variance were used to identify associated consumption factors.

The study found that 86.8% of the households ate orange-fleshed sweet potato; 49.5% ate it 1 to 3 days per week and 30.2% ate it at least 4 or more days per week, and only 13.2% did not consume orange-fleshed sweet potato at all. A relationship was found between having children younger than u-ETTc[(A5(ra)(nd)] TJETB[(a)4(n

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it, compared to only 27.0% of households who ate orange-fleshed sweet potato more than 4 days per week among those that bought it.

The respondent's knowledge of the health benefits of orange-fleshed sweet potato was found to have a relationship with its consumption in the household ($P < 0.001$). Only 7.8% of the households where respondents knew the benefits of orange-fleshed sweet potato (n=215) never ate orange-fleshed potato, compared to 50.0% of households where the respondents did not know any benefit (n=80). In contrast, 33.5% of the households where the respondents knew the health benefits ate orange-fleshed sweet potato at least 4 days a week compared to only 7.9% of households where the respondents did not know any benefit.

Overall, the study showed that most households consumed orange-fleshed sweet potato. The highconsumption might be due to seasonality, as the study was done during the harvesting season of orange-fleshed sweet potato. Also, prodcution of orange-fleshed sweet potato was promoted in the study area through the *Integrating Orange Project*. These results therefore suggest that projects seeking to promote consumption of orange-fleshed sweet potato as an intervention for vitamin A deficiency control should promote production of orange-fleshed sweet potato and sensitization of communities on the health benefits of orange-fleshed sweet potato consumption.

Keywords

Orange-fleshed sweet potato; Consumption; Vitamin A deficiency; Orange-fleshed sweet potatoe knowledge; Sweet potato preferences; Production; Procurement; Cooking methods; Purchase .

DECLARATION

I declare that the mini-thesis is my own original effort and that it has never been submitted somewhere else for any purposes. Ideas from other publications have been cited and acknowledged.

Signature _____ Date _____

Patricia Sakala.

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ABBREVIATIONS

ANOVA	Analysis of variance
CSO	Central Statistics Office
CDC	Centre for Disease Control
CIP	International Potato Centre
HBM	Health Belief Model
LIMA	Land size of 50 x 50 meters.
NFNC	National Food and Nutrition Commission
NNSS	National Nutrition Surveillance System
OFSP	Orange-fleshed Sweet Potato
PCA	Principle Component Analysis
SPSS	Statistical Package for Social Science
USAID	United States Aid
VAD	Vitamin A Deficiency
VAS	Vitamin A Supplementation
WFP	World Food Program
WHO	World Health Organization

CHAPTER 1. INTRODUCTION

1. INTRODUCTION

The World Health Organization reports that Vitamin A deficiency (VAD) affects 190 million pre-school aged children and 19 million pregnant women in Africa and South-East Asia (WHO, 2009). The deficiency varies from one region to another, with the highest rate of occurrence being in the tropical regions where poverty and infections are dominant (CSDH, 2008). Zambia is one of the tropical African countries that experiences high vitamin A deficiency among children and women (NFNC, 2008). One of the interventions currently under implementation for vitamin A control is the promotion of orange-fleshed sweet potato (OFSP) in rural farming communities. The literature reviewed below has proved that OFSP impacts positively on VAD control. However, this effect cannot be attained if there is no evidence that OFSP is consumed. Therefore, understanding the consumption of OFSP and factors that promote its consumption in the household are key in adopting OFSP as aVAD control intervention.

This study is focussed on assessing the consumption of OFSP and factors associated with its consumption in households in Chipata district, Eastern province of Zambia. The paper is structured into 5 chapters. The first and current chapter provide the background information on overview of the vitamin A deficiency problem, vitamin A deficiency control interventions and the context in which the study was undertaken. The second chapter provides a review of the existing literature on the study topic. The third chapter provides the methods used in undertaking this study. The results of the study are provided in the fourth chapter and the discussion of the results in light of the existing literature is provided in the fifth chapter where the study is also concluded.

1.1.Overview of vitamin A deficiency problem

Zambia is one of the sub-Saharan African countries with a high prevalence of VAD among children and women. A vitamin A impact study done in Zambia reported that about 53% of children 6 to 59 months old, and 14% of women of childbearing age are vitamin A deficient (NFNC, 2003). In addition, a baseline study for *The orange maize project* in Eastern Province in Nyimba district in

Zambia further confirmed that 54% of children between 24-59 months were vitamin A deficient (Hotz, Palaniappan, Chileshe, Kafwembe, & Siamusantu, 2011).

Vitamin A deficiency results from a low intake of preformed retinol and pro-vitamin A carotenoids (Hellen Keller International (HKI), 2004; Haskell, 2012). The deficiency status is aggravated by the presence of infections such as malaria and measles among others, which compromises the absorption of vitamin A in the body (WHO, 2011). As depicted in the vitamin A conceptual framework (Appendix 1), socio-economic and cultural factors, as well as access to vitamin A rich foods, contribute significantly to the deficiency situation (Jonsson, 1997; van Het Hof, West, Weststrate, & Hautvast, 2000).

Vitamin A is a micronutrient which plays an important role in eye function, cellular growth and development, maintenance of epithelial cellular integrity, immune function, and reproduction (Aguayo & Baker, 2005; WHO, 2009). The lack of vitamin A may result in xerophthalmia (the dryness of the conjunctiva of the eye), an increased risk of irreversible blindness, increased morbidity and mortality, poor reproductive health, an increased risk of anemia, as well as slow growth and development in children (WHO, 2011). All age groups are at risk, although children younger than six years of age,pregnant and lactating women are more vulnerable. Children have an increased risk of developing VAD due to their high vitamin A requirements to support rapid growth. In poor communities, the situation among children is worsened by the poor quality of weaning foods fed to them, which provides very little vitamin A coupled with increased episodes of childhood diseases. Pregnant and lactating women are at risk due to their high vitamin A requirments to support fetal growth and breast milk production(UNICEF, 1998). Therefore, strategies have been put in place to control VAD among these most vulnerable populations as discussed below.

1.2. Vitamin A deficiency control interventions

The control of vitamin A deficiency in Southern Africa is centered on three

strategies, which include high-doses vitamin A supplementation (VAS) for children 6-59 months old, food fortification, and dietary modification strategies (Low, Kapinga, Cole, Loechl, Lynam, & Andrade., 2009; Tanumihardjo & Furr, 2013).

1.2.1. Vitamin A supplementation

Vitamin A supplementation is a key strategy that has been implemented in many developing countries including Zambia, Zimbabwe and Malawi (HarvestPlus, 2012). These and many other countries have endorsed the program because evidence has shown that consistent coverage of over 80% of vitamin A supplementation among children 6-59 months contributes to a 25% reduction in all causes of mortality among this age group (Imdad, Yakoob, Sudfeld, Haider, Black, & Bhutta, 2011). Zambia has implemented VAS as a control measure since 1999 through bi-annual child health week campaigns. Much success has been recorded, with a national coverage of above 80% in some years. However, hard to reach areas still report coverage below 80% due to geographical and logistical challenges (NFNC, 2008). Vitamin A supplementation coverage has been affected by the high costs associated with the bi-annual campaigns. For instance, a study done in Zambia showed that the country spends about US$11.4 million per year to implement the two campaigns (Fiedler, Mubanga, Siamusantu, Musonda, Kabwe, & Zulu, 2012).).

1.2.1. Food fortification

Vitamin A fortification of sugar is another control strategy which has been implemented in Zambia since 2004. It involves adding vitamin A to sugar at the factory processing level (NFNC, 2003). However, access to fortified sugar in rural areas has been a challenge. A surveillance report in Zambia showed that only 57% of households in rural areas have access to fortified sugar with the right amounts of the fortificant as per Zambian legislation (NFNC, 2009).

1.2.3. Dietary modification strategies

Dietary modification strategies focus on improving the quality of family diets by promoting the consumption of vitamin A-rich foods such as dark, leafy greens (e.g. sweet potato leaves, cassava leaves, spinach, pumpkin leaves), orange-fleshed fruits (e.g. pawpaw and mangos), and orange-fleshed vegetables (e.g. carrot and OFSP (Haskell et al. 2004). Included in this strategy is the promotion of biofortified foods such as orange maize and OFSP, which contain high concentrations of β-carotene, a precursor of vitamin A, which is converted to vitamin A in the body. This intervention is especially suitable for rural communities which have limited access to animal sources of foods rich in vitamin A (Burri, 2011; USAID, 2012). This study focusses on OFSP promotion as one of the food-based strategy to address VAD.

Promotion of OFSP in Zambia is a relatively new intervention, and thus its production is currently very low. At the national level, only 19% of farmers cultivate OFSP of which 9.8% of theseare in the Eastern province (CSO, 2011). The *Integrating Orange Project* baseline survey done in Chipata showed that only 0.2% of households cultivated OFSP in the district, with the total contribution of 3.67 hectares (Lubinda, 2010). In addition, the National Nutritional Surveillance System (NNSS) completed during the harvest season in Zambia showed that only about 11% of the households had consumed OFSP 24 hours prior to the survey, and 86.1% of the households had not consumed OFSP in the seven days preceding the survey (NFNC, 2008). As a result, the country is promoting OFSP and orange maize production as food-based strategies to address VAD in the rural areas.

The promotion of OFSP in the Eastern and Central Province of Zambia is being spearheaded by the International Potato Center (CIP) under a USAID project called the*Integrating Orange Project*. The project was initiated in 2011, and since then a number of interventions have been implemented. These include the provision of high-quality OFSP vines to the farmers, the training of communities on good agronomic practices, the multiplication and conservation of vines,the promotion of recipes through community cooking demonstrations and the

conducting of OFSP preference tastes in the target areas. The preference tastes done in all communities have shown that more than 80% of the community members like the OFSP products and are willing to consume them in their homes (Mueller, 2012; HarvestPlus, 2012).

These interventions have been reported to increase the adoption of OFSP production and consumption at the household level.

1.3. Problem statement

Production and consumption of OFSP have been promoted inChipata district since the inception of the *Integrating Orange Project* in 2011. Several activities, including preference tastes on OFSP dishes have shown that residents of the communities like the taste of both the leaves and the root prepared in various ways (Mueller, 2012). However, the consumption of OFSP at the household level and the factors associated with its consumption are unknown. Therefore, this study was commissioned to establish the consumption of OFSP andidentify factors associated with its consumption in the household diets in rural households of Chipata district. The results of this study provides guidance on the factors that needs to be enhanced to promote consumption of OFSP as a food-based strategy.

1.4. Context

Chipata district is a provincial centre of the Eastern Province in Zambia with a population of 436,894 people, of which 223,021 are females and 213,873 are males.Chipata is predominantly rural, with 324,509 people living in the rural areas (CSO, 2011). The district covers a land area of about 6,692 km^2 and is approximately 600 km from Lusaka, the capital city of Zambia, although it is only 110 km from Lilongwe, the capital city of Malawi. The district enjoys strong trade and cultural ties with Malawi (Kasali, 2007).

The district experiences a warmtropical savannah type of climate with an annual mean temperature range from 14.7°C to 26.0°C. It receives an average rainfall of

up to 1 000 mm which peaks during the rain season between December and March. As such, farming is the main economic activity for the majority of the district's population. The district is suitable for growing rain-fed crops such as maize, sweet potato, groundnuts, cowpeas and indigenous vegetables (Kasali, 2007).

The food consumption pattern in the district is not very different from the typical Zambian family diet of three meals per day. A baseline study for the promotion of high-iron beans in Chipata showed that 94.3% of households consumed three meals per day. The meals consisted mostly of cereals, nshima (a thick pulp made from cereal flour), legumes, and vegetables (NFNC, 2009). Family meals in Zambia are predominantly vegetarian and inadequate in vitamin A, the B vitamins, and iron (Halimatou, Kohler, Taren, Mofu, & Chileshe, 2014). Consumption of roots and tubers in the country is very low, and are mainly eaten as breakfast foods or snacks (Lubinda, 2010). This makes Zambia different from countries such as Mozambique, Kenya, and Uganda, where sweet potato are consumed as a main or secondary dietary staple (HarvestPlus, 2012). Therefore, large scale adoption of OFSP requires a more comprehensive promotional approach in Zambia compared to other African countries.

Given the potential that Eastern province has of growing rain-fed crops such as sweet potato, OFSP has been promoted as an intervention to control vitamin A deficiency. The intervention is based on well documented evidence on the impact of OFSP on vitamin A control and other factors in the literature. The following chapter provides a review of existing literature on theimpact of OFSP consumption on VAD control and the factors associated with its consumption.

CHAPTER 2. LITERATURE REVIEW

2. LITERATURE REVIEW

Vitamin A deficiency (VAD) is public health challenge that affects 190 million pre-school aged children and 19 million pregnant women in World Health Organization (WHO) regions in Africa and South-East Asia (WHO, 2009). Higher prevelances have been recorded in the tropical regions where poverty and infections are widespread (CSDH, 2008). OFSP is one of the dietary modification strategies adopted by countries with a high burden of VAD including Zambia. This chapter provide's a review of existing literatureonthe impact of OFSP on VAD control, and factors associated with the consumption of OFSP. The chapter is divided into two main sections; the first section reviews the evidence on the impact of OFSP on vitamin A status and the second section provides information on the factors associated with consumption of OFSP.

2.1. Impact of consumption of orange-fleshed sweet potato on vitamin A status

The promotion of OFSP production and consumption has become one of the new initiatives for vitamin A deficiency control adopted in many African countries. This is based on evidence that OFPS are not only easy to cultivate, but also provide an adequate amount of vitamin A to promote health among the general population (Gilligan, 2012;HarvestPlus, 2012). Evidence has shown that the consumption of OFSP can make a significant contribution towards the improvement of vitamin A status among vulnerable groups (HarvestPlus, 2012; Chipungu et al. 2010; Hotz et al. 2012). For instance, OFSP promotional programmes in bothUganda and Mozambique resulted in increased consumption of OFSP which accounted for 78% of the vitamin A intake among women and children (HarvestPlus, 2012; Hotz et al. 2012). Additionally, Low, Arimond, Osman, Cunguara, Zano, & Tschirley, 2007) claimed that feeding between 100-125g of OFSP to children younger than five years old supplied their recommended daily allowance for vitamin A. Similarly, Van Jaarsveld, Faber, Tanumihardjo, Nestel, Lombard, & Benadé, 2005) in their randomized controlled trial of OFSP efficacy among children five to ten years old in South Africa

claimed that feeding children on 125g of OFSP at least five days per week improves liver vitamin A stores and contributes significantly to the reduction of vitamin A deficiency. Further, a recent systematic review by Jenkins, Shanks & Houghtaling (2015) in the *Towards Sustainable Nutrition Improvement in Zambézia Province* project in Mozambique established a 50% reduction of VAD in children younger than five years old who consistently consumed OFSP.

In addition, literature has also shown that OFSP can have other health benefits to the target population. A controlled trial which assessed theinclusion of OFSP in children's diets in Mozambique showed that OFSP not only improved vitamin A status among children, but also improved the variety of their diets (Low et al, 2007). Similarly, another study that assessed the health benefits of OFSP among children younger than fiveyears old in 36 villages in Northern Mozambique indicated that OFSP adoption in the diets of the children reduced diarrheal episodes in these children (Jones &de Brauw, 2015).

Thus, the literature suggests that regular consumption of OFSP can significantly contribute to the reduction of VAD and improve the general health status in children younger than five years old. However, a number of factors affect the consumption of OFSP. The following section provides a review of factors that affect the consumption of OFSP.

2.2. Factors associated with consumption of orange-fleshed sweet potato

This section discusses literature on the factors associated with consumption of OFSP. The literature is discussed in two parts. In the first part, the general overview of the factors that affect food consumption based on the food systems model are discussed; these are later put into perspective of the consumption of OFSP using the existing literature in the second part of the section.

Overview of factors that affect food consumption.

Food consumption is a complex concept that is affected by a number of factors. The food systems model (Appendix 2) shows that production, distribution,

consumption, preferences, and knowledge on the value of the food among members of thehousehold are major factors that affect consumption. Food production involves the cultivation of a crop by the household which can be either for consumption or for commercial purposes. This is the major way of obtaining food for consumption in most rural communities (FAO, 2011; NFNC, 2009; Low Arimond, Osman, Cunguara, Zano, & Tschirley, 2007b).

Distribution involves ways in which households that do not cultivate or may have limited yields, manage to access foods. Procurement is one of the main distribution strategies in food access which involves selling, buying or the receiving of food as a gift by the household. Purchasing is affected by a number of factors, such as the household‘s purchasing power, the availability of products on the market, and preference for specific products. Consumption of food is also generally affected by the preparation and cooking methods used in preparing the food, the appearance of the food,and cultural acceptability of the foods.

Knowledge of the nutritional value of the food is also an important factor that influences people‘s and households‘ choices (FAO, 2011). As demonstrated in the health belief model (Appendix 3), people are more likely to adopt an intervention if they understand the health implications of non-compliance. The model shows that people with knowledge on the health outcomes of the existing situation analyses the perceived seriousness of the problem, their susceptibility to the problem at hand, and the benefits they hope to attain when they adhere to the interventions (Rimer & Glanz, 2005). Literature has shown that knowledge has an influence in people‘s choice of OFSP. A study by Okello, Shikuku, Sindi & Low (2015) showed that products such as chips, fritters, cakes and porridge made from OFSP are usually preferred by both children and adults than those products made from other tubers and cereals during the preference test events.

The next sections discuss the existing literature on the aforementioned factors in the context of OFSP.

2.2.1. Household demographic factors

Literature shows that demographic characteristics, such as place of residence, gender, having a child less than five years of age, and age of the head of household, are associated with household adoption of OFSP cultivation. In their Kenyan report, Kaguongo, Ortmann, Wale, Darroch, & Low, (2012) showed that older household heads were less likely to adopt OFSP than younger household heads because the potato variety was new and they had little knowledge about it. In addition, a study by Behrman (2011) which assessed the potential role of gender in decision making within households, on OFSP production and consumption, both in Uganda and Mozambique, demonstrated the effect of demographic factors on OFSP promotion. This study found that men and women considered different factors when making OFSP production decisions; men were found to likely make decisions associated with monetary gains, while women's decisions were more focused on household consumption. The same study established that having children younger than five years old encouraged households to consume OFSP. These results assert that gender and household composition are important factors in the consumption of OFSP.

2.2.2. Factors associated with production of orange-fleshed sweet potato

Production of OFSP is affected by a number of factors which includes, the size of land allocated to OFSP production, labor availability, the availability of quality vines, market access, and decision making. For example, a study which examined the association between household production and consumption of OFSP in rural Mozambique indicated that households with bigger farm plots of between 33 to 359m^2 of OFSP consumed more OFSP than those with smaller plots. Therefore, the study concluded that the size of land dedicated to the production of OFSP was an important factor in the adoption of OFSP in the household diets (Low et al. 2009).

A study by Kaguongo et al. 2012) whichassessed factors influencing adoption and intensity of OFSP production and consumption in Kenya showed that a lack of quality OFSP vines reduced the cultivation of the sweet potato among farmers, which thus contributed to lower levels of consumption of OFSP in the households.

Further, a systematic review on OFSP use in Mozambique showed that despite the project successes in nutrition and production of OFSP in different areas across the country, challenges such as the availability of planting vines, accessibility to the variety, storage and marketing of OFSP were still common among farmers (Jenkins et al. 2015). These factors limited the farmer's OFSP production in the project areas. For instance, a baseline study for the *Integrating Orange Project* in Zambia showed that 66.5% of farmers in Eastern province of Zambia failed to cultivate OFSP due to some of the challenges mentioned above (CSO, 2011; Lubinda, 2010). Similarly, production of OFSP in countries where it is widely grown is also negatively affected by a number of factors.For example, though OFSP is widely grown and accepted in Mozambique, farmers fail to increase their production due to poor soil fertility, poor yields, and sweet potato weevil attacks. (Jenkins et al. 2015).

Further, the influence of decision making on the production of OFSP was established in a study which examined the role of gender in the adoption and diffusion of OFSP in Uganda. The study showed that households where women decided what to cultivate were more likely to cultivate OFSP than households where men made the decision (Gilligan, Kumar, McNiven, Meenakshi, & Quisumbing, 2014).

Additionally, Low et al. (2007b) found that the variety of sweet potato that farmers adopted affected their production of OFSP. In their study, they found that more than 90% of farmers who adopted OFSP varieties in the Mozambique nutrition project increased their OFSP farm plot size to more than ten times when compared with the size at baseline. This increase in the production of OFSP resulted in increased household consumption of OFSP.

The literature generally shows that access to resources affects production of OFSP in the householdwhich impacts on its consumption in the households.

2.2.3. Factors associated with procurement of orange-fleshed sweet potato

Procurement of OFSP has been found to be infleunced by a number of factors. Behrman (2011) found that the market potential of the crop influences its production by the household. In their qualitative study, they found that farmers were willing to cultivate crops that were on demand and would generate income from them. For instance, people travelling to Eastern province know the study areas as a place were OFSP are produced and sold. The *Integrating Orange Project* baseline survey reported that 36% of farmers sold OFSP on the road side to small scale traders who took them to provincial centers for sale and only 0.3% of farmers sold their sweet potato within the communities (Lubinda, 2010). This means that selling to small scale traders would limit the availability of OFSP for purchase locally in the community as majority of the farmers would prefer to sell them for cash. Evidence has shown that commercialization of the crop among small scale farmers has the potential to limited production of the crop (Kuhlgatz &Mofya-Mukuka, 2015).

Furthermore, a study in Uganda and Mozambique showed that access to OFSP in communities was limited by the size of land under cultivation. Farmers who grew OFSP were not willing to sell their produce because they produced very little, and appreciated the nutritional and health benefits of the crop (Behrman, 2011). Therefore, limited production of OFSP affected the availability of OFSP for the community to purchase for consumption, indicating the production levels has an effect on the purchasing of OFSP for consumption.

Similarly, another study in Uganda which assessed whether consumers were willing to pay for OFSP reported that consumers were not willing to pay more for OFSP products than other varieties of sweet potato (Chowdhury, Meenakshi, Tomlins, & Owori, 2009). In addition, Campilan, Attaluri Mallubhotla & Surya (2009) also found that households were not willing to pay for OFSP if it became expensive. This is understandable since OFSP was a new crop, and thus many people may not be willing to eat it when they lack understanding of its benefits. This illustrates why sensitization is key in this instance.

The review highlighted the interaction effect of production outputs, and access to OFSP for consumption in the household. It demonstrates that low production can limit the availability of OFSP and reduce the consumption of hosueholds that cannot manage to produce their own.

2.2.4. Factors associated with Knowledge on orange-fleshed sweet potato

Knowldege on OFSP has been found to have an effect on the consumption of OFSP. This is because it makes one aware of the good attributes of the crop which influences the choice of OFSP in the diets.

Familiarity of the crop to farmers has also been documented to influence adoption of OFSP. An evaluation study of OFSP promotion projects in Mozambique and Uganda showed that farmers‘ familiarity with the crop increased their adoption of OFSP in the diets by 3% in Mozambique and 7% in Uganda. The same study indicated that having received training, on the nutritional and health benefits of OFSP and knowledge on child nutrition, was associated with an increase in farmers‘ adoption of the crop (Berhman, 2011). Similarly, another study on factors influencing adoption and intensity of adoption of OFSP in Kenya showed that farmers who had knowledge of the benefits of OFSP were more likely to adopt OFSP production than those who did not (Kaguongo et al. 2012). Further, an experimental study done in Uganda among women showed that knowledge on the benefits of OFSP increased their willingness to pay for OFSP by 40% from the baseline findings (Chowdhury et al. 2009).

In conclusion, the literature reviewed above has demonstrated that OFSP consumption is currently promoted in countries as a food-based strategy to control vitamin A deficiency. It showed that production factors are important in the availability and subsequent consumption of OFSP in the households. It also showed that factors such as procurement also depended on production for the household to access OFSP for consumption. The household composition was also found to play an important role in the consumption of OFSP in the household.

The review also found that almost all the studies were done in East African countries where OFSP production and consumption are generally higher than in Zambia, implying that factors that might affect the consumption may differ. In addition, none of the reviewed studies provided representative and strong findings on the consumption of OFSP. Almost all the studies focussed on OFSP production, while consumption was considered as a minor outcome of the study. Therefore, there is limited knowledge on the consumption of OFSP and its associated factors. In addition, despite promoting production and consumption of OFSP for 6 years in Zambia in Eastern province, no study has been done to assess the consumption and factors that need to be enhanced to promote high consumption. Therefore, this study seeks to assess the consumption patterns of OFSP and factors associated with it's consumption in the household diet in the International Potato Centre (CIP) operational areas in Chipata district of Zambia. The evidence generated through this study will be key in guiding sensitive nutrition OFSP promotional programs that will contribute to the reduction of VAD among the vulnerable population. The following chapter provides details on the methods used to undertake this study.

CHAPTER 3. METHODOLOGY

3. METHODS

This chapter provides a detailed account of the methods used in this study to investigate the objectives outlined below. The aim of this study was to assess household consumption of OFSP and its associated factors among the target rural communities of the *Integrating Orange Project* in Chipata district, Zambia. Specifically, it focussed on the following objectives:

1. To determine the consumption of OFSP among households in the *Integrating Orange Project* areas.
2. To assess demographic factors of the households and their relationship with consumption of OFSP.
3. To assess OFSP production and procurement factors at the household level and their association with consumption of OFSP.
4. To assess OFSP preference and knowledge factors and their relationship with consumption of OFSP.

This chapter presents information in seven sections which covers the study design, population and sampling, the data collection process, the data analysis, validity and reliability, generalizability and will conclude with the ethical considerations of the study.

3.1. Study design

The study used a cross sectional design and collected primary data from the households in the study areas. This design was preferred because it was appropriate in answering the research topic and was more affordable, as data was only collected at one point in time (Katzenellenbogen, Joubert, & Karim, 1997).

3.2. Population and sampling

The study was conducted among the rural populations of Chipata district in the *Integrating Orange Project* communities located in Chipangali, Chipata Central, Kasenengwa and Luangeni agricultural camps. People residing outside these areas were not included in the study. In addition, households that did not consent to

take part in the study were excluded from the study.

A study sample size was calculated using the (Centre for Disease Control & Prevention (CDC), & World Food Programme (WFP) (2005) equation shown below:

$$n = t^2 \mathrm{x} \frac{p \,\mathrm{x}(1-p)}{d^2}$$

Where:

n = required sample size

t= Confidence level at 95% (standard value of 1.96)

p = Estimated prevalence of consumption of (11%) (NFNC, 2009).

d = Precision of ±3.5 (standard value of 0.035)

Calculations using the above equation provided a total of 307 households to be included in the study. The sample calculation used a precision of 3.5% because of the smaller prevalence of consumption of OFSP, which was 11% (NFNC, 2009). A 5% non-response rate was added because some households were anticipated to be busy with other farming activities. Therefore, the inclusion of the non-response rate brought the final sample calculation to 353 households. The inclusion of the non-response rate provided a guarantee of the desired precision of the sample even when some households did not participate. Therefore, enumerators were requested to call at least three timesonhouseholds that were not available. However, the enumerators were not allowed to replace sampled households that could not be reached after the third non-response visit, because this was expected to be compensated by the non-response added to the sample.

A systematic random sampling approach was used to select the households to reduce selection bias, as it provided equal opportunities for all households to take part in the study (Bonita, Beaglehole, & Kjellström, 2006). Participating households were selected from the primary sampling frame which had a list of all the households in the project area. The sampling frame had a total of 2790 households, these were numbered from the first to the last in all target areas. A selection interval was then calculated by dividing the required sample of 353

households into the total number of households on the main list to find the interval. Therefore, every eighth household was selected to make up the required sample size for the households. The starting point for the selection was randomly identified between 1 and 8 using a simple random sampling method. Subsequent households were selected by adding the sampling interval to the number of the selected household. The process was repeated until the required sample size was attained.

3.3. Data collection

A structured household questionnaire (Appendix4) was designed to collect quantitative data on household demographics, production of OFSP, procurement of OFSP, consumption of OFSP, social issues and knowledge on the nutritional benefits of OFSP.

Prior to data collection, social mobilization meetings were held in the selected areas to inform the community about the study. The Chewa translated information sheet (Appendix 5) for the study was used to explain the purpose of the study to the community during the meetings.

Data for the study was collected by agricultural officers in the sampled agricultural camp. The officers received five days orientation in data collection techniques. The training included role plays on the administration of the questionnaires, and use of the local language in administering the questionnaires to increase data validity and to ensure that questions were asked in a proper manner(De Vaus, 2014). The household heads or spouses were the main respondents of the questionnaire.

Data collection was done for a period of 10 days in all the targeted communities and a total of 105 villages across 15 agricultural camps under the *Integrating Orange Project* target communities were included in the study. Prior to the administration of the questionnaire, the enumerators explained the purpose of the study and the ethical considerations which governed the study using the Chewa

translated information sheet (Appendix5). The enumerators reminded the respondents that their participation was voluntary and that they could withdraw from participation at any time if they felt uncomfortable. Thereafter, the enumerators enquired if the respondents were willing to take part in the study before administering the questionnaire. Those who consented were asked to sign the consent form (Appendix 6) before the interview commenced.

Data was collected from a total of 295 households; with 184 (62.4%) of the respondents being males, and 111 (37.6%) females. The target sample size could not be reached because the data collection period coincided with the agricultural community shows in the areas in which farmers were participating. In addition, the shows were scheduled over a period of one month across the villages, which made it difficult to find respondents in their homes. Furthermore, farmers were required to camp for some days at the central place in the provincial centre where the agricultural show was taking place. This made it very difficult to find the respondents, even after three days of callbacks. Further follow-ups could not be made due to resource constraints.

Close supervision was provided by the researcher during the data collection process to address all technical problems in the field. The researcher often sat in with the enumerators to listen to the interviews and to provide guidance and technical support during the exercise. Data completeness was checked on a daily basis on all the questionnaires that were submitted by the enumerators, and field errors were corrected while in the field.

3.4. Data analysis

3.4.1. Data Entry and Cleaning

A data entry screen was designed using EPI data program (Lauritse & Bruus, 2003-2005) which was used to enter data. Data was exported to version 20 for cleaning and analysis (IBM SPSS Statistics, 2011). An exploratory data analysis was performed to understand the data, and to identify errors or strange values which were verified from the source questionnaires. The stem and leaf plot

graphical display were used to explore numerical variables while bar graphs and frequencies were used for categorical or nominal variables.

3.4.2. Data Analysis

Categorical variables were summarized as frequencies and percentages and are presented in tables. An exploratory analysis was performed to summarize numerical data which are presented as means with standard deviations or as a median with the interquartile range depending on data normality.

The associations between the dependent variable (consumption of OFSP) and the independent variables involved running two tests. A one-way analysis of variance (ANOVA) was used to test for the association between a dependent (categorical) variable and the continuous independent variables. Levene‘s test for homogeneity of variance significance determined whether to use the ANOVA test or the Welch‘s test for the association. The one-way ANOVA significance was used when Levene's test was not significant, and the Welch‘s test was used when Levene's was significant. Significant findings from both tests were verified by the Tukey post hoc analysis..

Secondly, a cross tabulation chi-square test was used to examine the association between nominal dependent and independent variables. The validity of the chi-square test was observed in ensuring that all the assumptions of the chi-square were met. These included: ensuring that all observations were independent; no cells with expected count of less than 1; not more than 20% of the cells had expected frequency less than 5 (Field, 2013). Variables with a smaller cell count were recoded to make the test valid. A P-value of ≤ 0.05 was considered statistically significant for all the tests performed in the study. Unstandardized residuals were used to detect the differences within the different categories (Field, 2013).

3.4.3. Alterations during analysis

During analysis, some variables were grouped to increase the sample size and make the analysis valid. A new variable for the frequency of food consumption was created from the combination of three variables, which were consumption of OFSP within 24 hours; consumption of OFSP within the last 7 days; and consumption of OFSP when available. Further, this variable was collapsed into three categories when looking at the association with variables that considered households that ate OFSP. Additionally, categories for the variable which collected data on preferred colour of sweet potato were collapsed into two from the original four categories.

Variables collected which measured the same conceptswere subjected to Principle Component Analysis (PCA) for data reduction and identification of factors present. PCA was considered suitable for analysing questions that measured the same concepts because it changes related variables into a small number of uncorrelated variables by minimising the loss of information (Field, 2013).

Prior to the analysis, data assessment for PCA, suitability test was done using Kaiser-Meyer-Olkin (KMO) and Barlett‘s test of sphericity. The analysis was done if the KMO was above 0.5 and the Sphericity test was significant ($P < 0.05$) and all correlations between variables using the Anti-image test were above 0.5. The PCA was used for extraction using a limit of eigenvalues greater than 1, and varimax rotation was used for ease of interpretation of results. The scree plot was also commanded to confirm the number of factors extracted. Thereafter, the resulting rotated factors were named based on the loading on the factor (Field, 2013). The extracted factors were saved as variables that were used for analysis of the associations. These variables were z-score based variables with the mean of zero, the standard deviation of one and variance of one.

PCA was used on the following variables:

(i) Preference of varieties for cultivation

The four question items asked on variety preference were subjected to PCA for data reduction. The initial data screening showed that the items were suitable for PCA (KMO = 0.5; Bartlett's test P = 0.007). In the second part of the test, two factors were extracted and confirmed by the scree test. The extracted factor explained the total variance of 31.4% and 28.0%, respectively. The variables were then named according to the concepts as presented in the varimax rotated matrix. The first component was named –orange-fleshed varieties‖ because it extracted all the orange varieties and the second was named –common varieties‖ because the factor contained varieties that have been known to be indigenous non orange sweet potato. These two factors were saved as continuous variables that were used in the analysis of its relationship with OFSP consumption.

(ii) Forms of preparing OFSP for consumption

The nine question items on OFSP preparation methods were initially analysed for suitability of PCA, and the items were found to be suitable (KMO = 0.823, Bartlett's test P < 0.001). The analysis extracted two factors which explained 45.2% and 18.1% variance respectively. These components were named –value addition cooking methods‖(preparation methods which involved mixing OFSP with other foods or processing the OFSP root in another way other than eating it as a root) and –common methods of preparing OFSP‖ (using common methods that did not involve any further processing of the OFSP other than merely washing the roots, eating it raw, or boiling it).

(iii) Actions to control VAD

The seven question items on the respondent's proposed actions to control VAD were also found to be suitable for PCA analysis (KMO = 0.579; Bartlett's test of sphericity P < 0.001). However, three variables had factor loadings below 0.5 and when one variable was removed, the loadings for the other variables went above 0.5 and the KMO increased to 0.7 with a significant Bartlett's test (P < 0.001), showing that data was suitable for PCA. Finally, one factor was extracted that

explained 55.2% variance and was thus named –eating different foodsll. The component was saved as a variable that was used to run the one-way ANOVA test for its relationship with consumption of OFSP.

3.5. Validity and Reliability

The study validity refers to the degree the study measures what it is intended to measure. Reliability refers to the repeatability of the findings (Bonita et al. 2006). Prior to orientation, the questionnaire was pre-tested in a community with similar characteristics as the study population to ensure that the study participants had a similar understanding of the questions and that the questions were relevant and appropriate. A total of 20 questionnaires were administered to 20 households to ensure that the questions were collecting the desired information. Feedback from these interviews assisted in finalizing the questionnaire and adjusting some questions that were not clear (DeVaus, 2014). Furthermore, the study questionnaireswere administered by enumerators who spoke _Chewa', the local language fluently.

3.6. Generalizability

The results of the study are applicable to the rural communities in Eastern province where the intervention took place, but the lessons learned could be more broadlyused in rural areas with a similar setting as the study area. In addition, the results could provide a guide to designing similar interventions for other areas in Zambia with similar characteristics.

3.7. Ethical considerations

Participation in this study was voluntary among all selected households. The enumerators explained the aim, objectives, purpose, benefits, and risks of the study using a Chewa translated information sheet which was also provided to the household (Appendix 5). Once verbal consent was sought, participants were asked to sign a consent form (Appendix 6). Given the nature of the study, it took up about 30 minutes of the respondents' time. However participants were assured that appropriate referrals to the social welfare department were arranged, and that

they were free to terminate or refuse to answer questions if they felt uncomfortable. They were also informed that the signed consent forms and non-anonymized data would be securely kept in the researcher‘s cabinet and that information collected would purely be usedfor academic purposes.

The study was approved by the University of Western Cape Biomedical Research Ethics committee.

CHAPTER 4. RESULTS

4. RESULTS

This chapter presents the results of the study. The results are presented in two main sections. The first section provides the description of the various factors assessed in the study and the second section presents the results of the assessment of the relationships between the factors and consumption of OFSP.

4.1. Description of factors

4.1.1. Household demographic factors

Household characteristics of the study population are presented in Table 4.1.1. The Table shows that of the 295 households, 210 (71.2 %) were male headed and 85 (28.8%) were female headed. The overall mean age of the household heads was 44.7 years (SD 12.9), with the youngest being 20 years and the oldest 85 years old. Male household heads had an average age of 43.7 years (SD 12.2) and female household heads had an average of 47.3 years (SD 14.1). The overall mean household size was 6.6 (SD 3.0) with the smallest household typically having one member and the largest having 18 members. Male headed households had a mean of 7.4 members (SD 3.0) compared to female headed households which had 6.9 members (SD 2.3). Of the 295 households, 183 (62.0%) had children less than 5 years old with a median of 2 children (IQR 1). Male headed households had a median of 2 children (IQR 5) while female headed households had a median of 1 (IQR 4) child less than 5 years old. Further, the Table shows that farming was the modal livelihood means of survival reported by 251 (85.1%) households.

Table 4.1.1: Household demographic characteristics (N=295).

	n	%
Sex of the household head		
Male	210	71.2
Female	85	28.8
Presence of children younger than 5 years old		
Households with children younger than 5 years	183	62.0
Households without children younger than 5 years old	112	38.0
Main methods of survival		
Farming	251	85.1
Business	25	8.5
Gifts from friends and relatives	9	3.0
Formal employment	3	1.0
Other	7	2.4

4.1.2.

Table 4.1.2.2: Reasons why some households do not grow orange-fleshed sweet potato.

	n	%
Reasons for not growing OFSP (n=104)[1]		
Do not like it	1	1.0
Do not know the value	7	6.7
The crop is not marketable	5	4.8
Do not know how to cook it	1	1.0
Do not have money to buy planting materials	13	12.5
Do not have land	5	4.8
Do not have planting materials	26	25.0
No reason	57	54.8
Reasons why others in the community don't grow OFSP, as perceived by households growing OFSP (n=178)[1]		
Do not like it	9	5.1
Do not know the value	91	51.1
The crop is not marketable	44	24.7
Do not know how to cook it	21	11.8
Do not have money to buy planting materials	67	37.6
Other	17	9.6

OFSP = orange-fleshed sweet potato

[1] More than one answer could be provided

(ii). The size of land cultivated for all crops and OFSP.

The size of land cultivated for all crops and OFSP in the 2014/15 farming season was assessed. Results in Table 4.1.2.3 indicate that of the 282 households that cultivated different types of crops, 161 (57.1%) cultivated more than 1 hectare of land and 43 (15.2%) cultivated between 1 to 3 limas of land (Land unit that equals 0.25/hectare). Of the 167 households that cultivated OFSP in the 2014/15 farming season, only 4 (2.4%) cultivated more than 1 hectare and 67 (40.1%) cultivated between 1 to 3 limas of land for OFSP.

Table 4.1.2.3: Size of land cultivated for all crops and OFSP in the 2014/15 farming season.

	All crops (n=282)		*OFSP (n=167)*	
	N	%	N	%
Less than 1 lima	37	13.1	82	49.1
1-3 lima	43	15.2	67	40.1
1 hectare	39	13.8	13	7.8
More than 1 hectare	161	57.1	4	2.4
Don't know	2	0.7	1	0.6

OFSP = orange-fleshed sweet potato

Lima = Land unit that equals 0.25 / heactre(ha)

1 hectare = 10 000 meter squared,(100mx100m)

Households were asked whether they had changed the size of land cultivated for OFSP during the 2014/15 season in comparison to the 2013/14 farming season. The results in Table 4.1.2.4 show that of the 167 households which planted OFSP during the 2014/15 season, 63 (37.7%) had increased the size of land, and 86 (51.5%) had maintained or reduced the size of land compared to the 2013/14 season. For the 63 households which increased the size of land, the main reason for doing so was the availability of inputs (n=23; 36.5%). For the 86 households who reduced or maintained the size of land, the main reasons for doing so were a lack of planting materials (n=28; 32.6%), and lack of land (n=22; 25.6%).

Table 4.1.2.4: Changes in size of land used for cultivation of OFSP between 2013/14 and 2014/15 season and reasons for the change.

	n	%
Change in the size of land cultivated for households who planted OFSP in the 2014/15 season (n=167)		
Increased	63	37.7
Reduced/remained the same	86	51.5
Was the first time to plant OFSP	18	10.8
Reasons for increasing the size of land cultivated (n=63)		
Inputs were available	23	36.5
Found good market for the crop	19	30.2
Consider OFSP nutritious	17	27
Had improved farming methods	2	3.2
Other	2	3.2
Reasons for reducing or maintaining the size of land cultivated (n=86)		
Lack of planting materials	28	32.6
Lack of land	22	25.6
Lack of labour	10	11.6
Lack of rains	9	10.5
Lack of market	6	7.0
Other	6	7.0
Planted for home consumption only	5	5.8

OFSP = Orange-fleshed sweet potato

(iii) Sweet potato variety preference for cultivation and support towards production.

For households which cultivated OFSP (n=178), the preferred sweet potato varieties for cultivation were assessed, and households were requested to name all sources of their planting materials for OFSP production. The results in Table 4.1.2.5 indicate that 144 (80.9%) households preferred the Olympia, 64 (36.0%) preferred the Chingovwa, and 73 (41.0 %) preferred the Zambezi variety. The main reasons for preference were that they considered the varieties to be nutritious (n=117; 65.7%) and healthy (n=117; 65.7%). The planting materials for the preferred varieties were mainly sourced from the CIP project (n=89; 50.0 %) and own stock from previous seasons (n=71; 39.9%).

Table 4.1.2.5: For households growing OFSP (n=178), the preferred varieties, reasons for preference and sources of planting material.

	n	%
Preferred varieties for planting[1]		
Zambezi	73	41.0
Chingovwa	64	36.0
Olympia	144	80.9
Unknown	6	3.4
Reasons for preferring the different varieties[1]		
We like it	75	42.1
It's nutritious	117	65.7
It's a healthy food	117	65.7
Has good texture	38	21.3
Its available	43	24.2
It's easy to cultivate and manage in the fields	47	26.4
It's disease free	21	11.8
Sources of the preferred varieties[1]		
Own stock from previous season	71	39.9
Vines within community	30	16.9
Gifts	45	25.3
Purchase within the village	31	17.4
CIP project	89	50.0
Other	15	8.4

OFSP = Orange-fleshed sweet potato

CIP = International Potato Centre

[1] More than one answer could be given

(iv) Support for OFSP production

The results of the sources of support households received towards production of OFSP are presented in Table 4.1.2.6. The Table shows that of the 167 households which cultivated OFSP during the 2014/15 season, 63 (37.7%) received support, of which 45 (71.4%) received support from the CIP project and 47 (74.6%) from the Ministry of Agriculture. The type of support received was mainly in the form of planting materials (n=57; 90.5%) and skills (n=39; 61.9%). Several households received support from more than one source.

Table 4.1.2.6: Support received towards the production of OFSP for households who planted OFSP during the 2014/2015 season.

	n	%
Household support for those who cultivated OFSP duirng the season (n=167)		
Household received support during the last season	63	37.7
Source of assistance for those who received assistance (n=63)[1]		
Ministry of Agriculture	47	74.6
Ministry of Community development	20	31.7
CIP	45	71.4
Other	16	25.4
Type of assistance for those who received assistance (n=63)[1]		
Vines for planting OFSP	57	90.5
Financial	2	3.2
Skills training	39	61.9
Other	1	1.6

OFSP = Orange-fleshed sweet potato

CIP = International Potato Centre

[1] More than one answer could be given

(ii) OFSP production challenges during 2014/15 season

Households which grew OFSP in the 2014/15 season were asked if they faced any challenges in the production of OFSP during the season and the results are presented in Table 4.1.2.7. For the 167 households which cultivated OFSP during the season, the main problems encountered were a lack of market (n=34; 20.4 %), and diseases and pest attacks (n=20; 12.0%). Specific problems reported regarding diseases and pests were maggot attacks and rotting of the tubers in the field and during storage. However, 77 (46.1%) households of the 167 which cultivated OFSP during the season did not experience any problems with the cultivation of OFSP during the 2014/15 season.

Table 4.1.2.7: Production challenges faced by households that grew OFSP during the 2014/15 season (n=167).

	n	%
Lack of market	34	20.4
Diseases and pests	20	12.0
Lack of vines	18	10.8
Lack of manpower	11	6.6
Land problems	3	1.8
Other	4	2.4
None	77	46.1

4.1.3. Procurement of orange-fleshed sweet potato.

(i) Selling of OFSP

The results of the household sales of OFSP are presented in Table 4.1.3.1. The Table indicates that 124 (69.7 %) of the 178 households that usually grew OFSP sold some of their OFSP, and of these, 97 (78.2%) sold them within their communities. Some households sold OFSP from more than one places.

Table 4.1.3.1: Selling of OFSP and places sold from.

	n	%
Selling of OFSP for those who usually cultivated OFSP (n=178)	124	69.7
Locations for selling OFSP for those who sold OFSP (n=124)[1]		
Within the community	97	78.2
Along the roadside	47	37.9
Take them to the city	31	25.0

OFSP = Orange-fleshed sweet potato

[1] *More than one answer could be given*

(ii) Purchasing of OFSP

Purchasing of OFSP for consumption was assessed in the 295 households, and the results in Table 4.1.3.2 shows that 118 (40.0%) households usually bought OFSP for consumption and 57 (19.3%) bought OFSP within the previous 24 hours. In addition, 101(85.4%) households of the 118 households bought OFSP within their communities and 36 (30.5%) bought OFSP from farms in another community. Further, the study also showed that 46.1% of households faced challenges in procuring OFSP. For those that bought OFSP, the median number of days that

households bought OFSP for consumption in a week and a month were 3 days (IQR 1) and 9 days (IQR 7) respectively.

Table 4.1.3.2: Procurement of OFSP (N=295).

	n	*%*
Households buys OFSP for consumption		

households, children less than five years were fed OFSP; 71 (38.8%) of households fed children OFSP every day when available.

(iii) Methods of preparing OFSP for consumption

Households that ate OFSP (n=256) were asked to mention preferred methods of preparing OFSP for consumption in the households; 45.2% preferred value addition methods, and 16.3% preferred traditional methods of preparing OFSP.

Table 4.1.4.1: Household consumption of OFSP (N=295) and feeding children on OFSP.

	n	%
Frequency of household consumption of OFSP (N=295)		
Ate 4 or more days in past week (at least 4 days/week)	89	30.2
Ate 1-3 days in past week (1 – 3 days/week)	146	49.5
Eats, but not in past 7 days	21	7.1
Never eats OFSP	39	

(n=42; 20.3%). Children were identified by 172 (83.1%) respondents as the main group at risk of developing the aforementioned problems. On the other hand, 11 (3.7%) of the 295 respondents said that eating OFSP caused yellow fever.

Table 4.1.4.2: Problems thought to develop as a result of not eating OFSP and groups at risk, for those respondents who said that not eating OFSP may cause problems (n=207).

	n	%
Problems thought to develop when OFSP are not consumed.		
Poor eyesight	150	72.5
Low immunity and poor general health	42	20.3
Other	15	7.2
Group thought to be at risk of developing some health problems if not eating OFSP		
Children	172	83.1
Adults	32	15.5
Others	3	1.4

4.1.5. Knowledge of orange-fleshed sweet potato.

(i) Knowledge of VAD, prevention of VAD and benefits of OFSP.

The knowledge on VAD and the benefits of OFSP were assessed, and the results are presented in Table 4.1.5.1. Of the 295 respondents, 230 (78.0%) said they knew something about VAD, and 227 (98.7%) of those that knew something about VAD said that something could be done to prevent it. Respondents who had thought VAD could be controlled were asked to name all actions they thought could control it; 211 (93.0%) said eating vegetables; 202 (88.0.%) mentioned eating OFSP, and 199 (86.5%) suggested eating vitamin A rich foods.

Further, respondents were asked if they knew the benefits of OFSP. The results in Table 4.1.5.1 show that 87.1% of the 295 respondents knew the benefits of OFSP. Among those that knew the OFSP benefits (n=257), 215 (83.6%) said it controlled VAD, and 131 (51.0%) said it made the body healthy. Some respondents indicated more than one benefit of OFSP.

(ii) Presence of a member trained in OFSP value addition methods

Respondents were asked if they had any household members who were trained in value addition skills for preparation of OFSP. The results in Table 4.1.5.1 further shows that of the 295 households, 91 (30.8%) had at least one member trained in value addition preparation of OFSP, of which 81 (89.0%) of them said that the trained members used these skills to prepare OFSP for consumption in their households.

Table 4.1.5.1: Knowledge on vitamin A deficiency, preventive actions and benefits of OFSP.

	n	%
Respondents knew something on vitamin A deficiency (n=295)	230	78.0
Respondents think something can be done to control VAD (n=230)	227	98.7
Suggested actions to control vitamin A deficiency (n=227)[1]		
Eating vitamin A rich foods	199	87.7
Vitamin A supplementation	90	39.6
Eating a variety of foods	108	47.6
Eating vegetables	211	93.0
Eating fruits	116	51.1
Eating OFSP	202	88.9
Eat orange maize	25	11.0
Respondents knew that OFSP had health benefits (n=295)	257	87.1
Perceived benefits of eating OFSP (n=257) [1]		
Control vitamin A deficiency	215	72.9
Provides the required nutrients	108	42.0
Makes the body healthy	131	51.0
It gives energy	126	49.0
Don‘t know	1	0.4
Others	4	1.6
Training in value addition of OFSP		
Households with members trained (n=295)	91	30.9
Households where trained members prepare OFSP using value addition methods (n=91)	81	89.0

OFSP = Orange-fleshed sweet potato

VAD = Vitamin A deficiency

[1] More than one answer could be given

(iii) Sources of information on VAD and OFSP

The respondents were asked to mention the sources of information they had on VAD, prevention of VAD and OFSP benefits. Results presented in Table 4.1.5.2show that 102 (34.6%) households obtained the information from the health staff, 98 (33.6%) from the agricultural officers, and 25 (8.5%) from CIP project staff.

Table 4. 1.5.2: Source of information on vitamin A deficiency (N=295).

	n	%
Health workers	102	34.6
Agricultural workers	98	33.6
CIP project staff	25	8.5
Community members	3	1.0
Others	2	0.7
Respondent did not know anything on VAD	65	22.0

CIP = International Potato Centre

VAD = Vitamin A deficiency

4.2. Factors associated with consumption of orange-fleshed sweet potato.

4.2.1. Socioeconomic factors.

(i) Gender of the household head and household livelihood means.

Sex of the household head and household livelihood means were not associated with consumption of OFSP ($P > 0.05$). The results showed that 49.5% of male-headed households and 49.4% of female-headed households ate OFSP 1 to 3 days per week. In addition, 51.0 % of farming households and 40.9% of non-farming households ate OFSP 1 to 3 days per week.

(ii) The presence of children younger than five years old in the household.

Consumption of OFSP differed among the households with children and those without children [χ^2 (3) = 10.110, P = 0.018]. The residue analysis showed statistically significant differences between households with and without children for those that never ate OFSP and those that ate OFSP 1 to 3 days during the previous week. As illustrated in Figure 4.2.1, only 8.7 % of household with children younger than five years old never ate OFSP, compared to 20.5% of

households without children. However, 54.6% of households with children younger than five years old ate OFSP 1 to 3 days per week compared to 41.1% of households without children.

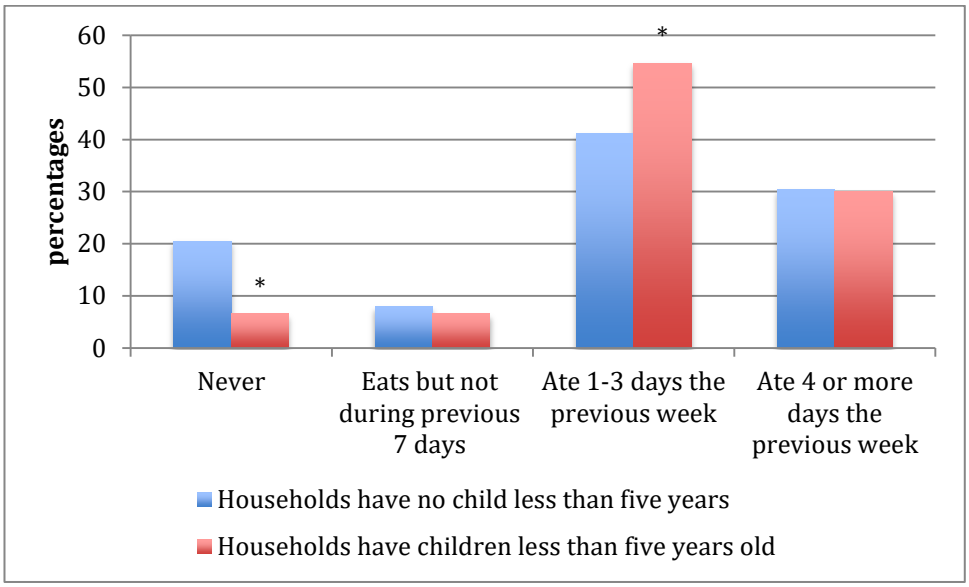

Figure 4.2.1: Presence of children younger than 5 years in the household and consumption of OFSP

Chi square test: P = 0.018

** Statistical significant differences between households with children and those without children younger than 5 years old*

Households with children younger than 5 years: n=183

Households with no children younger than 5 years: n=112

(iii) Age of household head and household size.

The age of the household heads and the size of households were not related to consumption of OFSP (P > 0.05). As shown in Table 4.2.1.1, the average age of household heads for households that ate OFSP 1 to 3 days the previous week was 44.6 ± 11.9 years compared to 43.8 ± 12.3 years for those that ate OFSP at least 4 days during the previous week. In addition, the average number of people in households that ate OFSP 1 to 3 days the preious week was 6.7 ± 3.0 compared to 6.5 ±3.0 members in households that ate OFSP at least 4 days per week.

Table 4.2.1.1: Household size, age of the household head and consumption of OFSP

	Household size	**Age of household head**
OFSP consumption:	Mean ±SD	Mean ±SD
Never	6.9±3.6	46.3±15.7
Eats, but not during previous 7 days	6.5±3.2	47.2±26.3
1-3 days the previous week	6.7±3.0	44.6±11.9
4 or more days the previous week	6.5±3.0	43.8±12.3

One way ANOVA: P = 0.92 (household size); P = 0.72 (age of household head)

Age of the household head: n=285

SD = Standard deviation

4.2.2. Orange-fleshed sweet potato production factors.

Production of OFSP was associated with consumption of OFSP [χ^2 (3) = 69.444, P < 0.001]. The residue analysis showed that there were statistically significant differences between households that produced OFSP and those that did not among households that never ate OFSP and those that ate OFSP at least 4 days during the previous week. Figure 4.2.2 shows that only 1.1% of households that produced OFSP compared to 31.6% of those that never produced it, never ate OFSP. However, 40.4% of households that produced OFSP compared to 14.5% that never produced OFSP ate OFSP at least 4 days during the previous week.

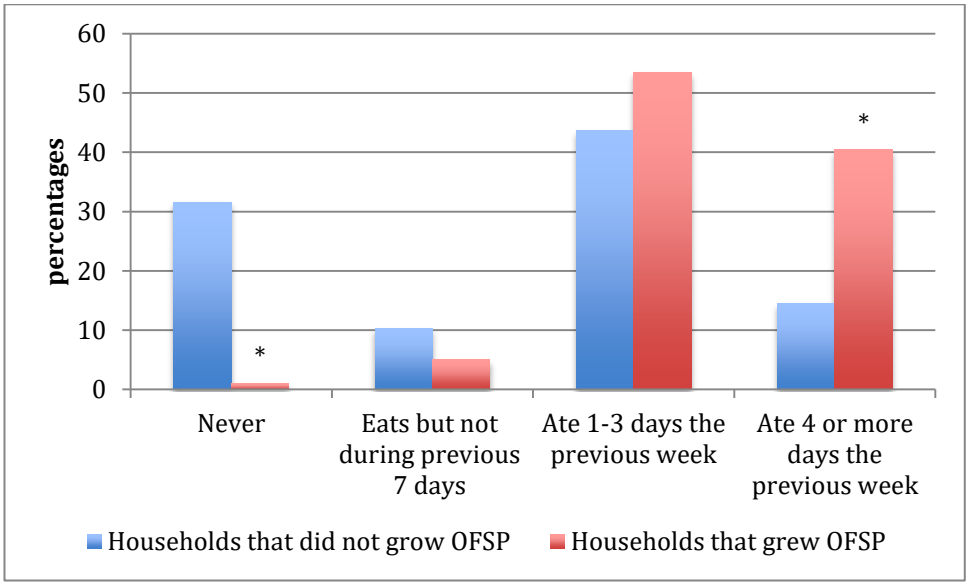

Figure 4.2.2: Production and consumption of orange-fleshed sweet potato

Chi square: P < 0.001

** Statistically significant differences between households that grow and those that do not grow OFSP*

Households that grow OFSP: n=178

Households that do not grow OFSP: n=117.

(i) Sweet potato variety preference for cultivation.

For those households that produced OFSP (n=178), preference of orange-fleshed varieties for production was found to be associated with consumption of OFSP [F (3) = 4.312, P = 0.006]. The post-hoc assessment revealed that households that ate OFSP, but did not eat it in a 7 day period (mean score -1.1±1.0) had a statistically significantly lower score of preference for orange-fleshed sweet potato varieties than households that ate OFSP 1 to 3 days duing the previous week (mean score = 0.0±1.0), and those that ate OFSP at least 4 days during the previous week (mean score = 0.2±1.0). The results suggest that those who eat OFSP, but did not eat itfor 7 days, were less likely to prefer orange-fleshed varieties than those that ate it 1 to 3 days or at least 4 days during the previous week.

Preference of common varieties (non-orange) for production was associated with consumption of OFSP [F (3) = 6.518, P < 0.001]. Households that ate OFSP, but did not eat it during the previous 7 days (mean score =1.3±2.0) had a statistically significant higher score of preferring common varieties than households that ate OFSP 1 to 3 days during the previous week (mean = -0.2±1.0), and those that ate OFSP at least 4 days the previous week (mean = 0.0±1.0).

4.2.3. Orange-fleshed sweet potato procurement factors.

Purchasing of OFSP was associated with the consumption of OFSP [χ^2 (3) = 19.072, P < 0.001] with statistically significant differences shown between households that purchased and those that did not purchase among those that ate OFSP 1 to 3 days during the previous week and at least 4 days during the previous week. Based on the households that ate OFSP (n=256), Table 4.2.3.1 shows that 56.2% of the households that ate OFSP 1 to 3 days during the previous week bought OFSP, compared to only 27.0 % of those that ate OFSP at least 4 days during the previous week.

Table 4.2.3.1: .Purchasing and consumption of orange-fleshed sweet potato

	Household bought OFSP		**Household did not buy OFSP**	
	n	**%**	**n**	**%**
Eats but not in 7 days (n=21)	10	47.6%	11	52.4%
Eats 1-3 days per week* (n=146)	82	56.2%	64	43.8%
Eats at least 4 days per week* (n=89)	24	27.0%	65	73.0%

Chi square: P < 0.001

** Statistically significant difference between households that bought and those that did not buy OFSP*

Households that bought OFSP: n=118

Households that did not buy OFSP: n=177

(i) Availability of orange-fleshed sweet potato for purchase.

For those households that bought OFSP for consumption (n=118), the mean number of days they bought OFSP within 30 day period was associated with the consumption of OFSP [F (3, 113) = 4.336, P = 0.015)]. The post-hoc analysis showed that households that ate OFSP 1 to 3 days per week bought OFSP for statistically significantly fewer days within a 30 day period than those that ate OFSP at least 4 days per week. Table 4.2.3.2 shows that households that ate OFSP for 1to 3 days per week bought OFSP for 8 days (IQR=29) within 30 day period compared to those that ate OFSP least 4 days per week, who bought OFSP for 11 days (IQR=28). Purchase of OFSP in within the past 7 days was not associated with consumption of OFSP (P > 0.05).

Table 4.2.3.2: Number of days of purchasing OFSP and consumption of OFSP for those that purchased OFSP

Frequency of consumption of OFSP		**Number of days household buys OFSP in 7 days**	**Number of days households buy OFSP in 30 days**
Eats but not in past 7 days (n=7)	Median	3.5	12.5
	Range	5	29
1-3 days/week* (n=82)	Median	2.0	8.0
	Range	7	29
4 or more days/week* (n=24)	Median	4.0	11.0
	Range	6	28

One way ANOVA; P = 0.018 for days when households bought OFSP in 7 days

P < 0.001 for days households bought OFSP within 30 day period

**.... Statistical significant differences between households that ate OFSP 1 to 3 days in the previous week and those that ate OFSP 4 or more days during the previous week*

Households that bought OFSP n=118.

(ii) Facing challenges in procuring orange-fleshed sweet potato.

Facing challenges in procuring OFSP for consumption was associated with the consumption of OFSP [χ^2 (3) = 35.237, P < 0.001]. The residue analysis showed statistically significant differences between households that faced challenges in

procuring OFSP and those that did not among those that never ate OFSP and those that ate OFSP least 4 days within the previous week. Figure 4.2.3 shows that 19.9% of households that faced challenges in procuring OFSP never ate OFSP, compared to 7.5% that did not face any challenges in procuring it. On the other hand, 42.1% of households that never faced procurement challenges ate OFSP at least 4 days within the previous week as opposed to 16.2% that faced procurement challenges.

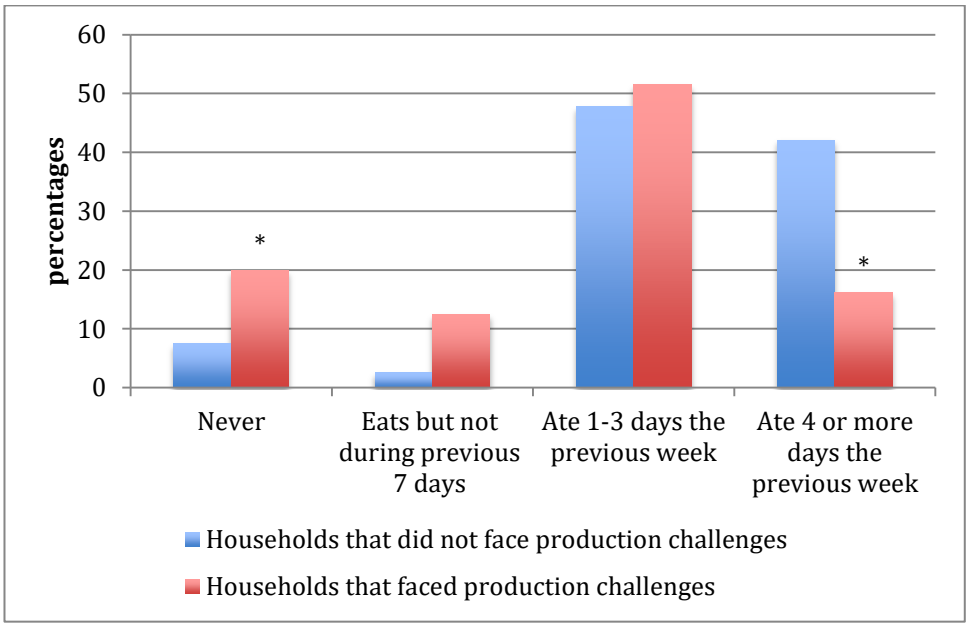

Figure4.2.3: Challenges faced in procuring orange-fleshed sweet potato and consumption of orange-fleshed sweet potato

Chi square: P < 0.001;

**.....Statistical significant differences between households that faced challenges during the production of OFSP and those that did not face any challenges*

Households that faced procurement challenges.... n=136

Households that did not face procurement challenges.... n=159.

4.2.4. Orange-fleshed sweet potato consumption preferences.

(i) Feeding of children younger than five years old.

A relationship was found between feeding children younger than five years old on OFSP, and households' consumption of OFSP [$\chi^2(3) = 55.601$, $P < 0.001$]. The results indicate that households that fed the children on OFSP and those that did not were different among those that ate OFSP 1 to 3 days per week and those that

ate OFSP at least 4 days per week. For instance, 58.4% of households that fed children OFSP compared to 38.4% of those that did not feed them OFSP 1 to 3 days during the previous week. Similarly, 33.6% of households that fed children ate OFSP it at least 4 days during the week compared to 14.5% that did not feed the children OFSP.

(ii) Colour of sweet potato consumed

The preferred colour of sweet potato for consumption among households that ate OFSP (n=256) was associated with consumption of OFSP [χ^2 (2) = 6.394, P = 0.041]. Statistically significant differences were found between households that preferred orange coloured sweet potato and those that preferred non-orange coloured sweet potato for those that ate OFSP 1 to 3 days per week and at least 4 days in the previous week. The results in Figure 4.2.4 show that 63.0% of households that ate OFSP 1 to 3 days during the previous week prefered orange coloured sweet potato compared to 37.0% of households that prefered none orange sweet potato. In addition, 78.7% of the households that ate OFSP at least 4 days in the previous week prefered orange coloured sweet potato compared to 21.3% of those that ate none white potatoes within 4 days during the previous week.

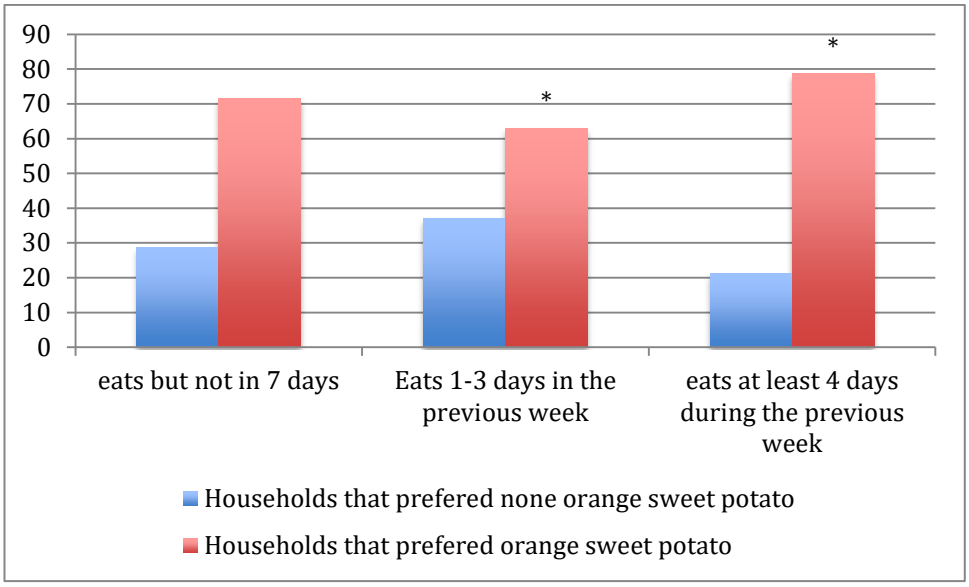

Figure 4.2.4: Colour preference of sweet potato and consumption of orange-fleshed sweet potato, for those that ate OFSP

Chi square: P = 0.041

**.... Statistical significant differences between households that prefered none orange sweet potato and those that prefered orange-sweet potato*

Households that preferred non-orange-fleshed sweet potato.... n= 79 Households that preferred orange-fleshed potato.... n= 177

Consumption variable was recorded to include only three groups that ate OFSP.

(iii) Methods of preparing OFSP for consumption

For households that ate OFSP (n=256), the use of value addition methods (alternative methods of processing in a different way than the usual boiling, or eating it raw) of OFSP preparation was associated with consumption of OFSP [F (2, 253) = 6.157, P = 0.002]. The post-hoc test showed that households that ate OFSP, but did not eat it within 7 days had a statistically significantly lower mean score (0.5±0.4) of preferring value addition methods of preparing OFSP for consumption than those that ate OFSP 1 to 3 days per week (-0.2±1.1). The use of common methods (methods that involve further processing of the root) of preparing OFSP was not associated with consumption of OFSP (P > 0.05).

4.2.5. Orange-fleshed sweet potato knowledge factors.

(i) Having a household member trained in value addition methods of preparing OFSP.

Having at least one household member trained in value addition methods of preparing OFSP was found to be associated with consumption of OFSP [χ^2 (3) = 10.416, P = 0.027]. Statistically significant differences were found between households that had a trained member and those that did not have a trained member among households that never ate OFSP and those that ate OFSP 1 to 3 days per week. As can be seen from Figure 4.2.5.1, only 4.4% of households with a member trained in cooking OFSP never ate OFSP compared to 17.2% of households that did not have a trained member. On the other hand, 58.2% of households with a trained member ate OFSP 1 to 3 days during the previous week compared to 45.6% that did not have a trained member. However, the use of the value addition methods in preparing the foods in the household was not related to consumption of OFSP (P > 0.05).

Figure 4.2.5.1: Presence of a household member in the preparation of OFSP and consumption of orange-fleshed sweet potato.

Chi square: P = 0.027

**.... Statistical significant differences between households that had a member trainned in preparation of OFSP and those that did not hav any any member trained*

Households that had a trained member.... n=91

Households that did not have a trained member.... n=196

Households unsure of a trainned member ....n=8

(ii) Respondents' awareness of benefits of OFSP

Respondents' awareness of the benefits of OFSP were found to be associated with the consumption of OFSP [χ^2 (3) = 55.345, P < 0.001]. Statistically significant differences were observed between households where respondents said they knew the benefits of OFSP, and those in which they did not, among households that never ate OFSP, and those that ate it at least 4 days during the previous week.Figure 4.2.5.2 shows that 7.8% of households where the respondents knew the benefits of OFSP never ate OFSP compared to 50.0% where the respondents were ignorant of the benefits. On the other hand, 33.5% of households where respondents claimed that they knew the benefits of OFSP ate OFSP at least days during the previous week compared to 7.9% households where respondents did not know the benefits.

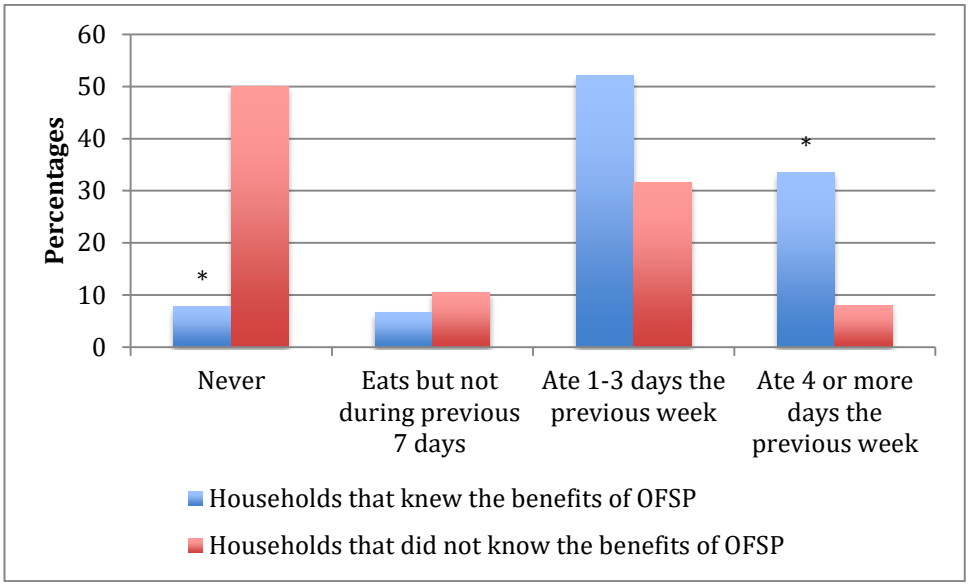

Figure 4.2.5.2: Respondents' knowledge on benefits of OFSP and consumption of orange-fleshed sweet potato.

Chi square: P = 0.014

** ....Statistically significant differences between households whose respondents knew the benefits of OFSP and those whose respondents did not know the benefits of OFSP*

Households where respondents knew the benefits of OFSP.... n=215

Households where respondents did not know the benefits of OFSP.... n=80.

(iii) Respondents' knowledge of vitamin A deficiency.

The respondents' claim of knowledge of VAD was found to have an association with their consumption of OFSP [χ^2 (3) = 26.384, P < 0.001]. Statistically significant differences were observed between households where respondents claimed to have knowledge of VAD and those that did not make such claims, among those that never ate OFSP and those that ate OFSP at least 4 days per week. Figure 4.2.5.3 shows that 8.3% of households where respondents said they knew something about VAD (n=230) never ate OFSP compared to 30.8% of households where they never made such a claim (n=65). However, 34.3% of households where respondents claimed to know something about VAD ate OFSP

at least 4 days per week compared to 15.4% of households where respondents did not know the benefits of OFSP.

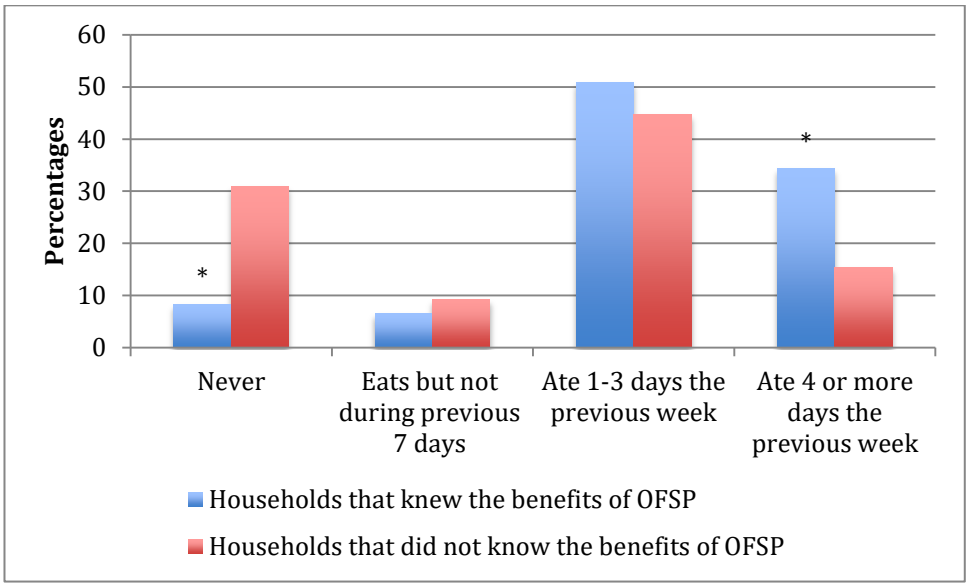

Figure 4.2.5.3: Respondents' awareness of vitamin A deficiency and consumption of orange-fleshed sweet potato.

Chi square: P =0.014

**.... Statistical significant differences between households where respondents knew something about VAD and those whose respondents did not know any information on VAD*

Respondents knew something about VAD.... n=230

Respondents did not know anything about VAD.... n=65

VAD....vitamin A deficiency.

(iv) Proposed measures of vitamin A deficiency control

One-way ANOVA was used to establish a relationship between eating a variety of foods as a proposed measure to control VAD and consumption of OFSP (n=256). The analysis revealed statistically significant differences among households where respondents proposed actions to control VAD and households where respondents did not propose any [F (2, 253) = 8.465, P < 0.001]. The post-hoc test showed that respondents in households that never ate OFSP had a statistically significantly higher mean score of suggesting eating a variety of foods to control VAD (1.0±0.7) than those from households that ate OFSP, but not in the last 7 days (-

0.4±1.0), those that ate OFSP 1 to 3 days per week (0.07±1.0) and those that ate it at least 4 days per week (-0.2±1.0).

In summary, this study has identifed that having children in the household, household production of OFSP, purchase of OFSP, facing challenges in procurement of OFSP, variety preference for production of OFSP, preference of cooking methods of OFSP, having trainned members in value additionin the household and respondents‘ knowledge on VAD and OFSP were important factors in the household consumption of OFSP. The following chapter will discuss these results in light of the existing literature on the association between OFSP and consumption of OFSP.

CHAPTER 5: DISCUSSION

5. DISCUSSION

The purpose of this study was to determine the consumption of orange-fleshed sweet potato, and to identify factors associated with its consumption in household diets among the target rural communities of the *Integrating Orange Project* in Chipata district of Zambia. In order to achieve the objectives of the study assessed social demographic; production, procurement; OFSP consumption, and knowledge factors of the households. These factors were then analysed in relation to consumption of OFSP. This chapter provides a discussion of the findings of the study presented in the previous chapter in the context of the existing literature.

5.1. Consumption of orange-fleshed sweet potato

Overall, the study established that consumption of OFSP was higher (86.8%) than the estimates of NFNC (2008) which reported 11% consumption of OFSP in Zambia. This result was expected given the fact that the study was conducted in the areas where OFSP was under promotion at the time of data collection. The results could be indicative of the effect of the OFSP consumption promotional programmes conducted by stakeholders in the areas, since OFSP consumption was very low before the initiation of the promotion programme (Lubinda, 2010). However, this higher proportion could also be reflective of the higher sweet potato consumption experienced during the harvest period since the study was conducted during the sweet potato harvest time when most communities usually have a surplus of sweet potato (Hidetoshi, Yudai, Ueru, & Chieko, 2013). Therefore, consumption in other seasons is expected to vary from the current findings.Fluctuation of food availability has been reported to be a major contributor to micronutrient deficiencies such as VAD among the vulnerablepopulation (FAO, 2011). Nevertheless, these results provide much hope in terms of the promotion of OFSP consumption among the vulnerable communities as a vitamin A deficiency control. Consumption of OFSP is currently promoted as the most sustainable strategy to address vitamin A deficiency among the vulnerable rural communities (Low et al. 2007).

5.2. Socio-demographic factors

The study found that the average age of study participants was 44.7 years (SD 12.9) and was similar to the national estimates reported by the CSO (2011) in Zambia. This indicates that most heads of households were in the more economically productive age groups which areable to participate in economic activities such as the production of OFSP. This finding has important implications for the farming activities of OFSP because OFSP is a labour intensive crop that requires the efforts of energetic, young people (Kapinga, Ewell, Jeremiah& Kileo, 1995). Age of the household heads was however not related to the consumption of OFSP in the study population.

The study revealed that 71.2% of the household heads were males versus 28.8% who were females (Table 4.1.1), indicating that male heads were over-represented in the study. This finding was similar to the CSO, MoH & ICF international (2014) averages that estimated male-headed households at 73% and female-headed households at 27% in Zambia. The gender of the household head has implications onOFSP production because the household head influence household food consumption (Mmasa & Mlambiti, 2012). Literature shows that women are major producers of sweet potato in general, as they use it as a main household food security crop and yet they face a number of challenges which limit their food production potential (Behram, 2011; FAO, 2010; Sraboni, Malapit, Quisumbing, Ahmed, 2014).

However, the study found that gender of the household heads did not have any relation with consumption of OFSP ($P > 0.05$), meaning that the consumption of OFSP between male and female-headed households was similar. This finding was expected, because male-headed households do not usually eat food differently from female-headed households since they usually have female spouses who are responsible for household food consumption. In Zambia, more than half of the male household heads (56%) are married and live with their spouses (CSO et al. 2014). Additionally, cultural and social norms consider food preparation activities as the main chore of women and wives in particular (Smith & Haddad,

2015). Furthermore, food consumption patterns in most rural Zambian families do not vary with gender of the household head as studies have reported similar sources of foods in such regions (Halimatou et al. 2014).

Households in the study population had an average of 6.6 (SD=3.0) typical members. This finding ishigher than the CSO et al. (2014) report which found household size of 5.4 members in rural areas. This could be attributed to the smaller sample size used in this study, which was specific to the area, compared to CSO et al. (2014) which had a nationally representative sample. This study found that household size was not related to consumption of OFSP ($P > 0.05$) meaning that the consumption of OFSP did not differ due to the number of people in the household. This is in line with findings by Mmasa& Mlambiti, (2012) which established no association between household size and the consumption of OFSP. This can be explained by the fact that others have found that the overall household size has little or no effect on the variety of foods consumed in the household (Aemro, Mesele, Birhanu, & Atenafu, 2013).

In this study, 62.0% of the households had children younger than five years old, a finding which is higher than reported by CSO et al. (2014) which showed that every two households in Zambia have a child younger than five years. This means that more households had children younger than five years in the present study. This finding has implicationsfor the consumption of OFSP because children younger than five are considered to be a group vulnerable to most health problems. WHO recommends that children of this age are fed on a variety of nutrient dense foods to prevent nutritional deficiencies such as VAD (WHO, 2010). Therefore, programmes are designed to sensitize women during children's clinics to provide their children with a varied diet (NFNC, 2010).

Having children younger than five years old in the households was found to be related to consumption of OFSP ($P < 0.05$). More households without children younger than five (20.5%) never ate OFSP compared to those that had children younger than five (8.7%) (Figure 4.2.1). This result demonstrates that having

children younger than five years old in the household increased the chances of eating OFSP in the household. This study conformsto other studies which have shown that households with children younger than five years consume OFSP more than those without (Kaguongo et al. 2012). Therefore, these results could also be a reflection of the effect of sensitizations of mothers during the ‗under-five clinics' as a collaborative effort between the Ministry of Health and CIP (Mueller, 2013) present in the study area. This study also found that the majority of the household respondents indicated that OFSP was a nutritious and healthy food (Table 4.1.2.5). This conforms to Sindi, Kiria, Low, Sopo & Abidin,'s study (2013) which found that mothers who were sensitized on the health benefits of OFSP considered it to be good for babies, and were willing to feed it to their children. Evidence shows that people with knowledge of the benefits of the interventionare likely to adopt the practices that are promoted to prevent known consequences of not doing so (Rimer and Glanz, 2005).

5.3. Household production factors of orange-fleshed sweet potato.

The study found that 60.3% of households usually produced OFSP, a finding which was similar to Yanggen& Nagujja'sstudy (2006) which found that 64% of the households cultivated OFSP during thepromotional period in their study. This means that the OFSP sensitization currently being undertaken in the areas has improved OFSP production by the household. The current production of OFSP provides much anticipation of higher consumption due to promotional programmes currently active in the area. Increased production of food is linked to better household food security and income for the households, as the farmers are able to sell the surplus and make a profit (Kuhlgatz & Mofya- Mukuka, 2015).

Household production of OFSP was found to have a relation with consumption of OFSP ($P < 0.001$) (Figure 4.2.2). A higher proportion of households that produced OFSP (40.4%) ate it compared to those that did not produce it (14.5%). This result means that housheold production of OFSP is an important factor in the consumption of OFSP within households. This finding is, in line with the observations of Okello et al. (2015) who indicated higher consumption of OFSP

among households that cultivated than those that did not in areas where it was being promoted. Households that produce OFSP are expected to have a higher consumption frequency because they do not purchase OFSP for consumption as they eat from their produce. Own household production of food is the main source of food consumed in rural households as more than 80% of the household eats food they produce themselves (FAO, 2011).

Preference of OFSP varieties for production was explained by a variance of 31.4% versus 28.0% for the non-orange varieties, suggesting a high preference of OFSP varieties among farming households. This result is in line with the study of Kaguongo et al. (2012) which found that more households adopted the cultivation of OFSP varieties after the promotional programmes in those areas. High production of the OFSP varieties has been linked to increased consumption and household‘s income as theproduction of OFSP has been found to be related to OFSP value addition at thehousehold level (Sindi et al. 2013).

There was a significant relationship between households‘ preference of sweet potato varieties for cultivation and consumption of OFSP ($P < 0.001$). Households that ate OFSP less frequently had a statistically significantly lower mean score of preference for orange varieties for cultivation (-1.1±1.0) than those that ate them more frequently (0.2±1.0). This means that preference for OFSP for cultivation was an important factor increasing the probability of the household eating OFSP. This could possibly be due to the fact that household‘s own cultivation of food is the main source of food (NFNC, 2008) which also imply that most of the households that ate OFSP are those that cultivated it. This finding is in line with the study of Okello et al. (2015) which found that knowledge on OFSP qualities such as dry matter content, its nutritionalvalue, and the high yield increased farmers preference for OFSP varieties for production and consumption. The preference for the orange-fleshed variety in the present study could have been due to the fact that the CIP is currently implementing OFSP with superior agronomic traits which appeal to farmers in the area (Mueller, 2013). In addition, Mazuze (2004) observed a high preference of OFSP where promotional

programmes included information on nutritional benefits of OFSP to children younger than five years old. Promotion of a nutrient-dense crop has been recommended as one way of improving the quality of households' diets and to increase vitamin A intake among the vulnerable population (FAO, 2011).

5.4. Household procurement factors

The study found that 40% of the households bought OFSP for consumption (Table 4.1.3.2). This result could not be compared with any study because literature search did not find any study that investigated this association. This result means that purchasing of OFSP was an important method of acquiring OFSP for consumption at household level. Purchasing of food in rural areas is the second main method of accessing foods that are not produced by the households (NFNC, 2008). A number of factors such as purchasing power, availability of the product, and proximity to the marketplace influences the consumption of food purchasing ability of the household (FAO, 2011). Purchase of OFSP was statistically significantly related to consumption of OFSP among the households that bought OFSP and those that did not buy OFSP ($P < 0.001$) (Table 4.2.3.1). Households that bought OFSP for consumption ate them less frequently in a week than those that did not buy OFSP. These findings suggest that most households that bought OFSP could not sustain the consumption for along period of time. This finding is in line with the study of Chowdhury et al. (2009) which established that consumers were not willing to pay for the orange-fleshed sweet potato for an extended time where sensitization was lacking. In addition, other studies have found that more than 40% of households may not be willing to eat OFSP if they became expensive (Campilanet al. 2009). The reduced frequency of consumption among those that bought OFSP could possibly mean that households might have been willing to buy OFSP at the time of the study since the study was done during the harvest time when the supply was higher and the prices were lower. Consequently, and the consumption could have reduced when the supply sarted to reduce.

Prioritisation of the food to purchase for household consumption depends on the importance they accord to the food which they are made aware of during sensitization programmes (Mueller, 2013). Therefore, it is also possible to assume that households in the study areas may not yet understand the value of OFSP. Further, it could also mean that the OFSP may not have been available for alonger period in the area.

The present study also found that 46.1% of households faced procurement challenges (Table 4.1.3.2). This finding implies that facing challenges limited the frequency of consuming OFSP in the households. FAO (2011) claims that challenges such as availability of the crop and lack of income may limit the consumption of any crop, including OFSP, for longer periods. OFSP accessibility challenges may also limit consumption of OFSP (Okello et al. 2015).

Facing procurement challenges in accessing OFSP for consumption was found to have a relationshipwith consumption of OFSP ($P < 0.001$). Households that faced procurement challenges either never ate OFSP or ate it less frequently than those that did not face challenges ($P < 0.001$) (Figure 4.2.3). This implies that households that faced procurement challenges had limited consumption of OFSP. Jenkins et al. (2015) claimed that factors that affect production may limit the availability of OFSP in the community thereby affecting the consumption. The lack of purchasing power may be a possible challenge that households may have faced, taking into consideration the high poverty levels in the rural areas of Zambia (CSO et al. 2014). In addition, this study also highlighted that OFSP were only available for purchase for a median of 8 days (IQR = 29) per month (Table 4.2.3.2). This means that the supply of OFSP was limited at the local market for the households to purchase it more frequently for consumption. It is important to realize that although 56.6% of the households cultivated OFSP during the 2014/15 season, the areas under cultivation were very small, as 49.1% of the households cultivated less than three Lima (1 lima = 50x50 meters)size of land for OFSP (Table 4.1.2.3), a finding that was also observed bySindi et al (2013).Evidently, peasant farmers would always havesell off the surplus from

their produce (FAO, 2011), which imply that very little would be made available for purchase if the production is low. This was also observed in the current study as 78.2% of the households which produced OFSP sold them in the study areas. Further, as observed by Kaguongo et al. (2012) lower consumption of OFSP is evident where small pieces of land are cultivated with OFSP.

5.5. Consumption preference factors.

Preference of orange coloured sweet potato for consumption in the study areas was found to be higher (69.1%) than none orange coloured sweet potato (30.9%) among households that consumed sweet potato (Table 4.1.4.1). This finding is in line with the findings of Okello et al. (2015) which found that consumers tend to prefer orange coloured sweet potato over white sweet potato (Okello et al. 2015). The higher preference of orange sweet potatos in this study could also be attributed to the sensitization campaigns that were conducted by the *intergrating orange project* in the area. In addition, the vitamin A supplementation campaigns doen by the health services also provide messages on consumption of orange foods for the provision of vitamin A to the community in the areas.

Colour preference of sweet potato for consumption was found related to the consumption of OFSP ($P < 0.05$) (Figure 4.2.4). More households that ate OFSP (78.7%) preferred orange sweet potato than households that preferred none orange coloured sweet potato (21.3.%). This finding is in line with the study of Jenkins et al. 2015 who found that consumption preferences was associated with variety preferences and knowledge on the crops being promoted. In addition, Okello et al. (2015) claimed that farmers were more likely to prefer the varieties of sweet potato they were more familiar with than the new varieties. Therefore, this finding was expected because communities are familiar with the orange variety of sweet potato since it was under promotion in the area.

Additionally, Kaguongo et al. (2012) found that farmers adopt new interventions differently; some are late adopters, while others are early adopters. The result could be a reflection of the early adopters trying out the new variety. However,

Kaguongo, 2012 found that households that had knowledge of the nutritional attributes of OFSP preferred the orange coloured sweet potato than those that did not have and indicated that households in the urban areas had a higher acceptance of orange coloured sweet potato than those in rural areas. Therefore, the low preference of orange coloured sweet potato in this study could possibly be due the fact that 67% of the households that produced OFSP sold them along the roadside (Table 4.9) to the people travelling to the city for income, and then they might have consumed non-orange varieties since they are less marketable. Therefore, there is a higher chance that OFSP could mainly be produced for sale than consumption in the area, A factor which is important to address if the OFSP promotion could contribute to VAD control among the rural population.

The colour of sweet potato has been found to be the most important visible attribute that motivates people's consumption of sweet potato in urban areas because they are more knowledgeable of the health attributes of the crop (Nalley, Hudson & Parkhurst, 2006). The present study found that 69.7% of the households that cultivated OFSP sold them implying that very little remained for consumption taking into consideration the small sizes of land cultivated in the study area. Kuhlgatz & Mofya-Mukuka (2015) found that commercialization of OFSP crops paired with low production of the crops negatively affect the consumption of OFSP in households.

Preference of value addition methods for preparing OFSP for consumption was found to be higher (45.2%) than the use of traditional methods of preparing OFSP for consumption (16.3%) suggesting that most households preferred value addition methods of preparing OFSP for consumption. However, this finding was much higher than what Mmasa& Mlambiti (2012), and Fetuga, et al. (2013), which indicated that only 34%and 27% of households respectively preferred value addition methods of processing OFSP in their studies. Wheatly & Leochl (2008) found that consumers generally accept OFSP products such as snacks made from OFSP. Therefore, this finding demonstrates much improvement considering that OFSP were recently introduced in the study. The findings in the current study

could also be a reflection of the excitement that people may have for the alternative to the common OFSP preparation methods (Hidetoshi et al. 2013). As alluded to earlier, OFSP is still a new crop under promotion in the area, and farmers are still in the adoption phase.

Further, a statistically significant higher score of preference of value addition methods of preparing OFSP for consumption was observed among household that ate OFSP more frequently compared to those that ate it less frequently ($P < 0.05$). This finding implies that value addition methods of preparing OFSP for consumption encourage households to eat OFSP for longer periods. This finding is in line with that of Orinda (2013) findings showed that value addition encouraged households to eat more OFSP, and also generated income from sweet potato products. These results could possibly be explained by the fact that OFSP promotion programmes in the area conduct value addition training sessions in communities such as hold field days, local agricultural shows, and farmer fields schools to promote the crop (Mueller, 2012). Additionally, the current study found that 30.8% of households had members trained in value addition methods and 89% of those households with trainned members claimed that they used the skills in preparing OFSP in the households. Farmer participation in value additiontraining held within the community has been found to be positively correlated with the practice of value addition at the household level (Orinda, 2013). Evidence shows that the value addition to sweet potato preparations not only increases the palatability of the food, but also contributes to access of nutrients after consumption thereby improving the vitamin A status of the household member (van Jaarsveld et al. 2005).

5.6. Knowledge factors

The study found that 87.1% of respondent‘s said they had knowledge of the health benefits of OFSP (n=215), a finding which s higher than the 38.2% that was found by Kaguongo et al. (2012). This finding mean that most household heads or spouces were sensitized on the nutritional benefits of OFSP since respondents comprised of household heads or their spouses, and were expected to make well-

informed decisions on the consumption of OFSP. Knowledge of the nutritional value of food has been associated with better dietary choices (Spronk, Kullen, Burdon & O'Connor, 2014).

Respondents' claims of knowledge of the benefits of OFSP were related to the consumption of OFSP ($P < 0.001$) (Figure 4.2.5.2). Half of the households where respondents said they did not know the benefits of OFSP never ate OFSP, compared to only 8.3% where respondents who said they had knowledge of OFSP. This finding implies that the respondents knowledge on the benefits of OFSP increased the probability of the household consume OFSP. This result concurs with the study of Rimer & Glanz (2005) which found that knowledge on health benefits of any food is an important motivational factor to dietary choices individuals make. These findings are in line with other studies that have found high adoptionof OFSP in the diets of households with knowledge of the benefit of OFSP (Okello et al. 2015). The results of the current study could be attributed to extensive OFSP promotion that was active in the area (Mueller, 2012). Consumer knowledge of the healthy attributes of food increases their choice of the food in their diets (Nalley et al. 2006).

The results of the present study reveal an interesting situation, where there is a tremendous increase in the consumption and production of OFSP among the households compared to previous years, and that households prefer OFSP varieties for consumption, and yet more than half of those that eat sweet potato prefer the non-orange coloured varieties. In addition, the respondents claim to have knowledge of the benefits of OFSP which should enable them to prioritiseconsumption of OF SP. Research will be required to assess the quality of knowledge that households have and to understand the attitudes and practices of households on OFSP.

5.7. Study limitations

The study could not assess the kind of knowledge the respondents had on OFSP and how it could have affected their decision on OFSP preferences within the

household. In addition, this study did not assess the quantities of OFSP consumed by the households.

The study focused on a small area where the *Integrating Orange Project* was promoting OFSP consumption. This increased the proportion of households consuming OFSP, thereby limiting the assessment of the associations. Therefore, the findings may not be reflective of the OFSP consumption within the districts but will be applicable in areas where OFSP are being promoted with a similar setting. However, the results presented here provide useful information on the consumption of OFSP which has been lacking, and which will be useful in designing nutritional interventions to increase and maintain the high consumption of OFSP.

CHAPTER 6: RECOMMENDATIONS AND CONCLUSION

6.1. Conclusions

In principle, the study achieved its aim of profiling the consumption of orange-fleshed sweet potato, and identifying factors associated with the consumption or adoption of OFSP in the family diets. Household characteristics such as demographic, OFSP production, procurement and knowledge were assessed to identify the factors associated with household consumption of OFSP.

Consumption of orange-fleshed sweet potato was quite high in the area, probably due to the fact that the assessment was done during the harvest period, when sweet potato were generally available for consumption and also the promotion of OFSP in the areas at the time of the study. Knowledge on benefits of OFSP focussed on health benefits to children younger than five years old. Household engagement in the production of OFSP and procurement of OFSP were main factors related to the observed consumption of OFSP.

However, in order for high consumption of OFSP to be maintained and to contribute to VAD control, promotional strategies such as the production of OFSP, marketing of OFSP, and value addition techniques should be promoted. Projects should use sensitization on the nutritional benefits of OFSP as an entry point for other OFSP promotional programs. The OFSP programme sensitizations should target households with children less than five years old to be effective.

6.1. Recommendations

The government should develop a comprehensive communication strategy to disseminate key messages on the nutritional benefits of eating OFSP which should be shared with institutions promoting production and consumption of OFSP as an intervention for vitamin A deficiency control.

Collaboration among stakeholders dealing with food-based interventions and child health promotional programmes should be strengthened in order to intensify consumption of OFSP at the household level.

Further research is recommended to assess the quantities consumed, knowledge on OFSP attitudes, and perceptions of people on OFSP.

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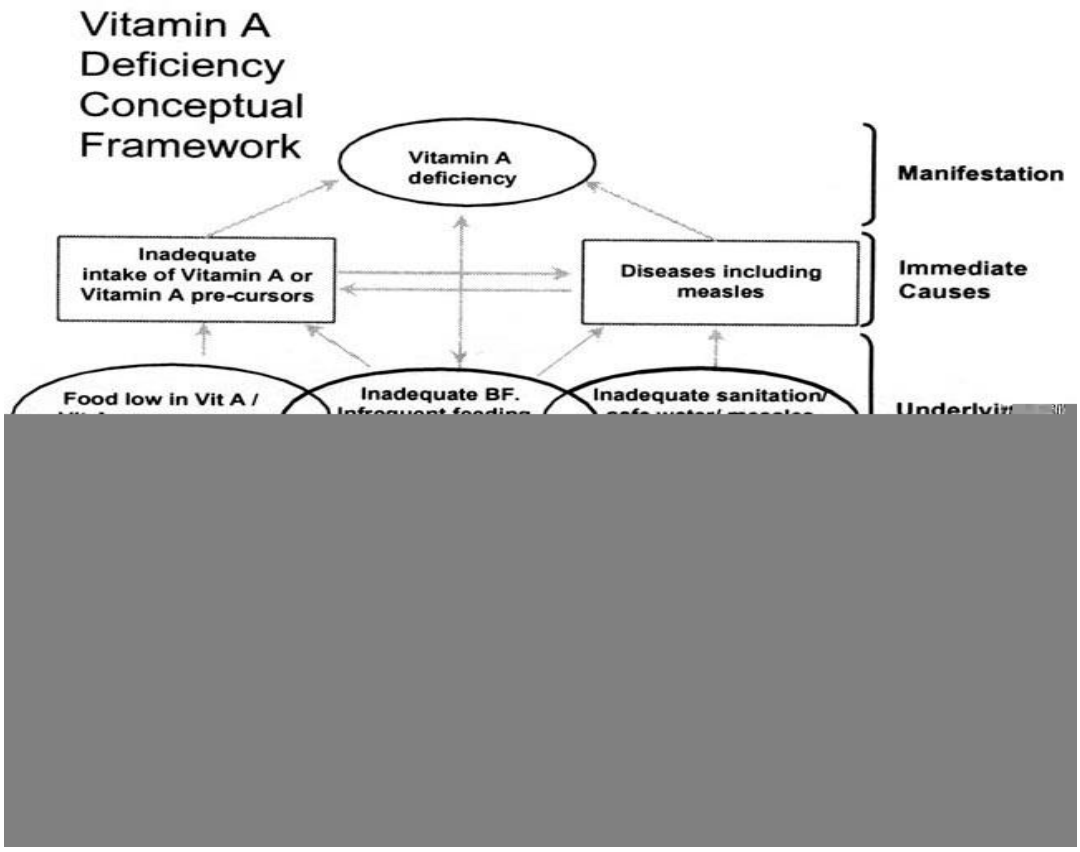
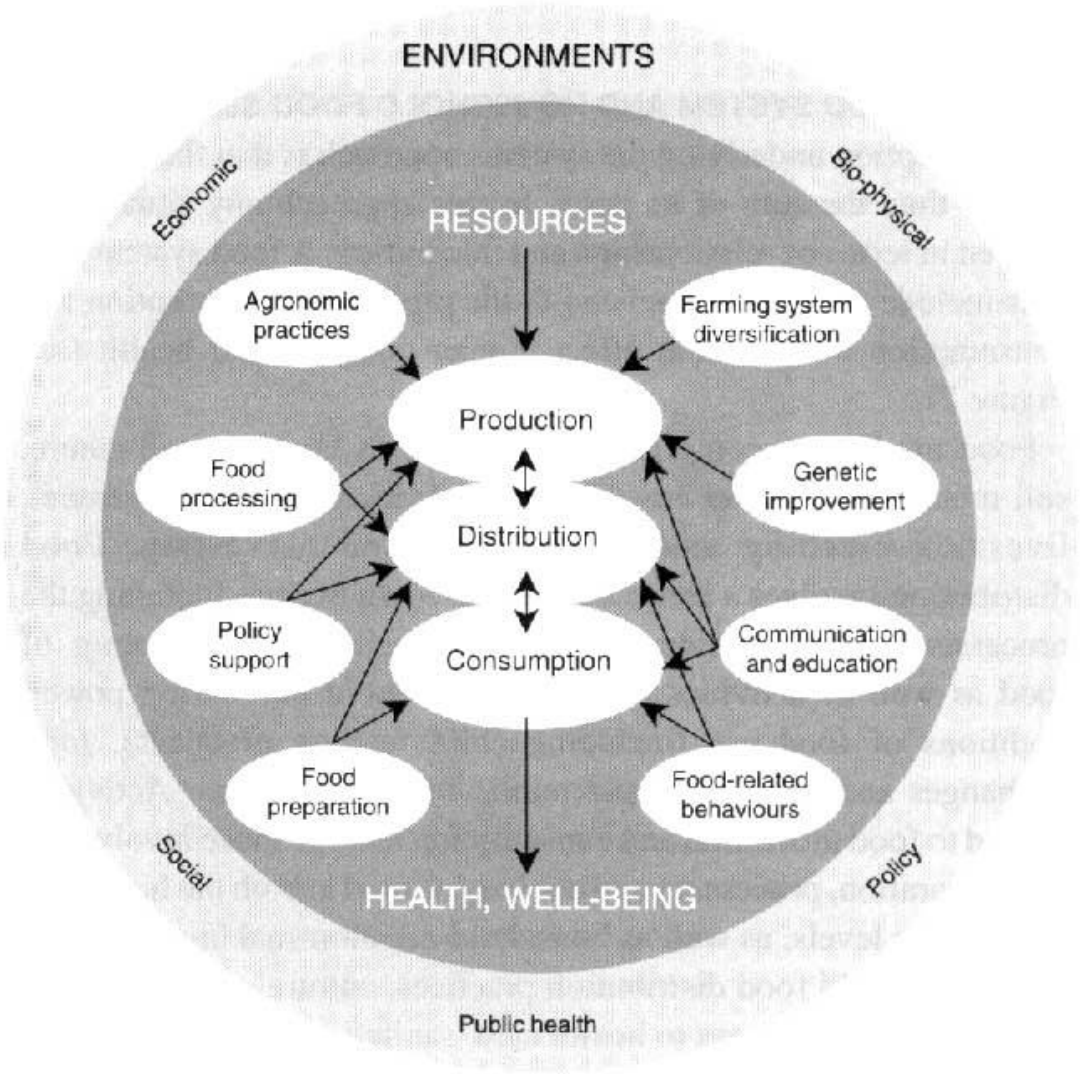
APPENDICES

Appendix 1: Conceptual framework of vitamin a deficiency



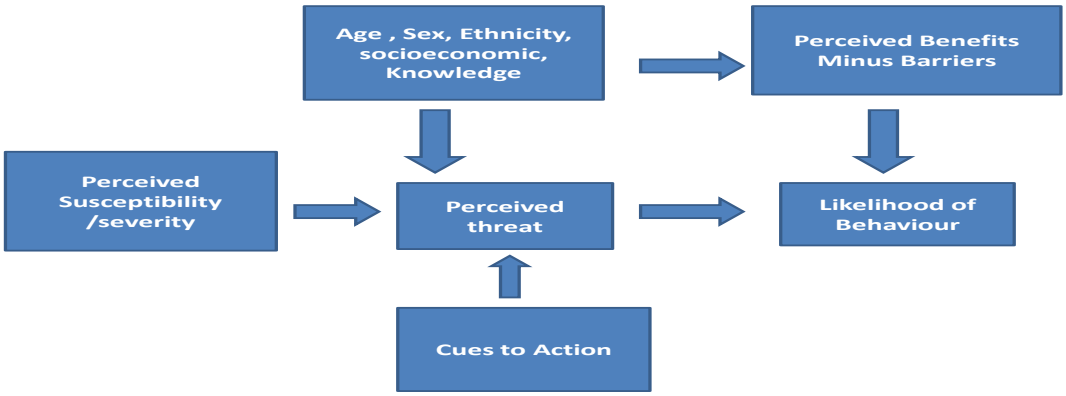
Source: Jonsson 1997, 112 p

Appendix 2: The food systems model



Source; FAO, 2011.

Appendix 3: Health belief model



Source Rosenstock, Strecher & Becker, 1994.

Appendix 4: Household questionnaire

HOUSEHOLD QUESTIONNAIRE

CONSUMPTION OF OFSP IN CHIPATA DISTRICT

SECTION A: IDENTIFICATION PARTICULARS				
Province Name: Eastern Province				
District Name: Chipata				
Household Serial Number (Please Zero fill for numbers less than 100)				
Name of the Household head				
Sex of the household head (1. Male 2. Female)				
Age of the household head				
Sex of the Respondent.				
Indicate a 1 if the respondent is male and 2 if the respondent is female in the box provided	1	Male		
	2	Female		
Date of interview **(DD/MM/YY)**			**0 6 / 2 0 1 5**	
Village Name				
Camp Names				

SECTION B: DEMOGRAPHIC CHARACTERISTICS

*1.*How many people have been living and eating together in this household for the past 6 months		
(Write the total number of people in the box provided		

2. Are there children below the 59 months of age in this households			
(Indicate the number of the corresponding response in the box provided	1	Yes	
	2	No ***Skip to Q4***	

3. How many children below 59 months have been living in this household for the past 6 months?			
(Indicate the number of children in the boxes provided)			
4. What is the main method of survival for this household? *Please indicate the number of the corresponding responses in the boxes provided against each of them*	1	Farming	
	2	Formal employment	
	3	Business	
	4	Gifts from friends and relatives	
	5	Other specify	
5. Does the household grow any crops? *Please indicate the number of the corresponding responses in the boxes provided against each of them*	1	Yes	
	2 No skip to Q27		

SECTION C: PRODUCTION OF ORANGE FLESHED SWEET POTATOES

7. Does this household grow orange fleshed sweet potatoes?			
(Indicate the number of the corresponding response in the box provided	1	yes	
	2	No ***Skip to Q 27***	

8. Did the household grow orange-fleshed sweet potatoes in the 2014/2015 farming season?			
(Indicate the number of the corresponding response in the box provided	1	yes	
	2	No ***Skip to*** 12	

9. How much land did you cultivate for Orange fleshed sweet potatoes in the last farming season? *Please indicate the number of the corresponding responses in the boxes provided against each of them*	1	less than 1 lima	
	2	1-3 limas	
	3	1 hectare	
	4	more than 1 hectare	
	5	don‘t know	

10. Has the land cultivated for Orange fleshed sweet potatoes increased or reduced, remained the same from 2013/2014 last farming season? ***(Please indicate the number of the corresponding responses in the boxes provided against each of them)***	1	increased	
	2	Reduced	
	3	Remains the same	

11 .Why has the area under cultivation increased, reduced or remained the same? ***(Explain)***

12. Who makes the decision to plant / grow orange-fleshed sweet potato in this household? *indicate the corresponding response in the box provided*	1	male head of household	
	2	Female head of household	
	3	Children and Dependants in the households	
	4	other Specify	

13. What variety of sweet potatoes did the household grow in the last farming season

This is a multiple response question. Please indicate the number of the corresponding

16. Where do you get the planting materials for Orange Fleshed Sweet potatoes from? ***(This is a multiple response questions, indicate the number of the corresponding responses in the box provided against each response***	1	own stock from previous season	
	2	vine in the community	
	3	given by friends and relatives	
	4	from integrating orange project	
	5	purchase within the village	
	6	Others specify	

17. Did this household receive any assistance with planting materials and skills on sweet potatoes production in the last farming season from any organization?			
(Please indicate the number of the corresponding responses in the boxes provided against each of them	1	Yes	
	2	No ***Skip to Q21***	

18. What assistance did the household receive? *This is a multiple response question. Please indicate the number of the corresponding responses in the boxes provided against each of them*	1	Planting Vines	
	2	Financial	
	3	Skills /training	
	4	others Specify	

19. Which organization provided the assistance? *This is a multiple response question. Please indicate the number of the corresponding responses in the boxes provided against each of them*	1	Ministry of Agriculture	
	2	Ministry of Community Development	
	3	Integrating orange project	
	4	others Specify	

20. For how many farming seasons has this household received this support from this organization? ***(write the number of farming season)***		

21. Do you experience any plant diseases with the orange fleshed sweet potatoes variety you are currently planting?			
(Indicate 1in the box provided if yes and 2 if no	1	Yes	
	2	No ***skip to Q23***	

22. If yes, what diseases affect the orange fleshed sweet potatoes? ***Explain***

23. Do you sell some of your orange fleshed sweet potatoes after harvest? ***(Indicate 1 in the box provided if yes and 2 if no***	1	yes all of them	
	2	Yes some of them	
	3	No ***Skip to Q25***	

24. Where do you sell your harvested orange fleshed sweet potatoes? ***(This a multiple response question, please indicate the number of the corresponding response in the box provided***	1	Within the community	
	2	Along the road side	
	3	take them to the city	

25. Why do you think some households in this community do not grow orange fleshed sweet potatoes? ***(This is a multiple response questions, please indicate the number of the corresponding response in the box provided***	1	Do not like it	
	2	Do not know the value	
	3	The crop is not marketable	
	4	Do not know how to cook it	
	5	Do not have money to buy planting materials	
	6	others specify	
26. What challenges did you face in cultivating OFSP in the last farming season			
(Mention and Skip to question 28)			

27. Why does your household not grow orange fleshed sweet potatoes?	1	Do not like it	
	2	Do not know the value	

(This is a multiple response question. Please indicate the number of the corresponding response in the box provided	3	The crop is not marketable	
	4	Do not know how to cook it	
	5	Do not have money to buy planting materials	
	6 7 8	Do not have land for OFSP Do not have Planting materials Others specify _____	

SECTION D: PROCUREMENT OF ORANGE FLESHED SWEET POTATOE

28. Does the household buy orange fleshed sweet potatoes for consumption?			
(Indicate 1 in the box provided if yes and 2 if no	1	Yes	
	2	No ***Skip to Q35***	

29. Did your household buy orange fleshed sweet potatoes for consumption for consumption yesterday?		
(Indicate 1 , if yes and 2 if NO		

30. How many days in the past one week (7 days) did your household buy orange fleshed sweet potato for consumption in your household when they are in season?		
(Indicate the number of days		

31. How many days in one month (30 days) does your household buy orange fleshed sweet potatoes for consumption in your householdwhen in the season?		
(Indicate the number of days)		

32. Where do you buy orange fleshed sweet potatoes roots for consumption in this community when in the season? ***(this is a multiple responses, Please indicate the number of the corresponding response in the box provided***	1	Within the farms in the community	
	2	from farms in another community	
	3	Given by friend and relatives	
	4	Others Specify _____	

33. Does your market for orange fleshed sweet potatoes run out of sweet potatoes when they are in season?		
(Indicate 1 , if yes and 2 if NO		

34. How many months in a year are orange fleshed sweet potatoes available for buying at your market source?		
(Indicate the number of months		

35. Does the household face any challenges in procuring sweet potatoes. If so (***Mentions them)***

SECTION E: CONSUMPTION OF ORANGE FLESHED SWEET POTATO

36. Do household members eat orange fleshed sweet potatoes when they are available?			
(Indicate 1 in the box provided if yes and 2 if no	1	Yes all of them	
	2	No ***Skip to Q45***	
	3	Yes Some	

37. What colour of sweet potato does your household prefer for consumption? ***(Indicate the number of the corresponding response in the box provided***	1	White fleshed	
	2	Yellow fleshed	
	3	Orange fleshed	
	4	Other Specify _____	

38. Did your household members eat orange fleshed sweet potatoes in the last 24 hours			
(Indicate 1 in the box provided if yes and 2 if no	1	Yes ***skip to Q42***	
	2	No	

39. Why did your household not eat orange fleshed sweet potatoes in the past 24 hours? (***Explain)***

40. Did your household eat orange fleshed sweet potatoes in the past 7 days? ***(Indicate 1 in the box provided if yes and 2 if no***	1	Yes ***skip to Q42***	
	2	No	

41. Why did the household not consume orange fleshed sweet potatoes in the past 7 days? ***(Explain and skip to Q43)***

42. How many days in the last 7 days did your household consume orange fleshed sweet potatoes?		
(Indicate the number of the corresponding response in the box provided		

43. How many days in a week does your household consume orange fleshed sweet potatoes when they are in season?		
(Indicate the number of days		

44. How do you usually prepare orange fleshed sweet potatoes for consumption in your household?	1	Raw	
	2		

(This is a multiple response question, Please indicate the corresponding answer in the answer box

(do not read out the options

SKIP TO Q 46

51. Are there some traditional beliefs or norms that do not allow women and children to eat orange fleshed sweet potatoes? ***(Indicate 1 in the box provided if yes and 2 if no***	1	Yes	
	2	No ***Skip to Q53***	
	3	Don't Know, ***Skip to Q53***	

52. What belief or norms are linked to eating of orange fleshed sweet potatoes in this community? ***List and explain***

53. Has any household member received cooking lessons in the preparation of orange fleshed sweet potatoes? ***(Indicate 1 in the box provided if yes and 2 if no***	1	yes	
	2	No ***Skip to Q58***	
	3	Don't Know , ***Skip to Q58***	

54. When was this member taught? ***(Indicate the corresponding answer in the box provided below)***	1	Last month	
	2	2 months ago	
	3	6 month ago	
	4	last year	
	5	Can't remember	

55. Has the taught household member tried to prepare some of the products that he/she learnt during the training in the household?			
(Indicate 1 in the box provided if yes and 2 if no	1	Yes	
	2	No , ***Skip to Q58***	
	3	Don't Know ***Skip to Q 58***	

56. How many times per week does the taught member prepare recipes they leant for family diet when they are in season? ***(Indicate the corresponding answer in the box provided below)***	1	Once	
	2	Twice	
	3	Three times	
	4	More than three times.	

57. Why has this trained member not been able to prepare some of the recipes for household consumption? (***Explain).***

58. When you have children below five years, do you feed them on orange fleshed sweet potatoes?			
(Indicate 1 in the box provided if yes and 2 if no	1	yes	
	2	No, ***Skip to Q60***	

59. When in the season how often do children below five years eat the orange fleshed sweet potatoes dishes? ***(Indicate the corresponding answer in the box provided below)***	1	every day	
	2	Once per day	
	3	Twice per week	
	4	Once per month	

SECTION (F) KNOWLEDGE ABOUT VITAMIN A

60. Can a person develop any health problems if they do not eat orange fleshed foods ***(Indicate 1 in the box provided if yes and 2 if no***	1 2	Yes No	
61 What problems can a person develop ***(mention)***			

62. Which group of people do you think are most vulnerable to these problems? ***Indicate the corresponding answer in the box provided)***	1	Children	
	2	Adults (male and female)	
	3	Women of childbearing age only	
	4	Male adults only	
	5	Others specify	

63. Do you know anything about Vitamin A deficiency?			
(Indicate 1 in the box provided if yes and 2 if no	1	Yes	
	2	No S***kip to Q 67***	

64. What was the source of the information you received on Vitamin A deficiency? ***(Indicate the corresponding answer in the box provided)***	1	Health worker	
	2	Agriculture officers	
	3	orange fleshed sweet potatoes project staff	
	4	Community members (friends and relatives)	
	5	Others specify,_____	

65. Do you think you can do anything to protect your family from suffering from vitamin A deficiency?			
(Indicate 1 in the box provided if yes and 2 if no	1	Yes	
	2	No , ***Skip to Q67***	

66. What can you do? ***(This is a multiple response, please indicate the corresponding answer in the box provided)***	1	Eating Vitamin A rich foods	
	2	Vitamin A supplementation	
	3	Eating a variety of foods	
	4	Eating specific foods (specify)	
	5 6	Don't Know Others Specify……	

67. Do you know any food a person can eat to control or protect himself/ herself from Vitamin A deficiency? ***Indicate the corresponding answer in the box provided)***	1	Yes	
	2	No **END the interview**	
	3	Don't Know **END the interview**	

68. What foods can be eaten to control of preventing Vitamin A deficiency? ***This is a multiple response question, please indicate the number of the corresponding responses in the boxes provided against each of them)***	1	Dark green Vegetables	
	2	Fruits	
	3	Orange fleshed fruits	
	4	Orange fleshed sweet potatoes	
	5	Yellow vegetables	
	6	other specify_____	

Name of the enumerator ……

THE END THANK

Appendix 5: Chewa translated information sheet

CHIPEPA CHA ZIKOMO

KUTU WANGANI LOFUFUZA:

Mphunzilo lofufuza pa Madiedwe ambatatisi zo fila mkati ndi zomwe zimathandiza kuti anthu mumakomo assankhe kuzidya mumizhi imene nchito ya *Integrating Orange project* ikusebenza mu mzinda la Chipata in ziko la Zambia

Chimene phunzilo lo fufuza likulankula

Ukukufufula kulu chitika ndiophunzila ochudwa Patricia Sakala (mwana wamaphunzilo) pa sukulu lalikulu la Western Cape. Tikuitanani utengamo mbali mukufufuza kumeneku ndaba ndimwe amonzi amene muonelamo bwino munchito ya *intergrating orange* munzinda wa Chipata.Ukuufufza kufuna udziba madiedwe za mbatatisi zo fila mkati ndi chimene chilengetsa kuti bantu ba zidya zimnene izi mbatatisi mkakomo yao mumalo ya chita ya intergrating orange mumzinda wa Chipata.

Kodi Adzanifunsangi ndikavomela kutengamo mbali?

Adzakunfunsani mafunso yomwe yasankhidwa ya pa madiedwe, malimidwe, ya mbatatisi zo fila mkati, makhalidwe ya pa khomo pani ndiponso ndimiambo yomwe ili mumalo mwanu pa madiedwe ya mbatatisi zo. Kufufuza kumemeku kuluchitika mumidzi ili mumzinda wa Chipata in dziko la Zambia ndianthu opkunzitsiwa bwino nako pa makomo yanu. Mafunso ameneba adztenga nthawi itali monga 30 minutes ya nthawi yanu.

Kodi kutengamo mbalikwanga mu fufuza uku kudzakha kwachinsinsi?

Tizayesela kususnga chinsinsi chonse chimene muzatiuksa ndaba maynkho yanu yonse siyaza khala ndichizdiwitso chilichonse chanu ndiponso simudzalemebtsa amina yanu poyankha. Pokambitsilana sitidhaloledza munthu alionse utengamo mbali mumafunso ndiponso zones zomwe tikalemba tizaziika muchibokosi no vipeleka kuofufuza wathu. Kenaka mayankho advalobetsedwa mu computer yomwe kube munthu alionse angastekule koma ofufuza wathu chabe.
Ngati talemba malipoti paliukukufufuza sitidzaikapo azdibitso kalikonse kainu kuti timuchingilileni inu.

Ndimavuto bwanji omwe ndingapezekemo potengamo mbali?

Ufufza uku kuzamutengelani nthawi yanu pafupifupi ndi 30 minutes poyankha mafunso. Koma ngati kudzakhalako vuto linalache potengamo mbali tizaesa umuthanzizani ulandila thandizo kapena mumudzi olo kwina kwache

Ndidzaonelamo Chiyani mkufufuza kumeneku?

Ukuufufuza sikuna pangidwe umupatsani choonelamo inu pamwekha yayi koma zotulukamo zingathandize uphunzila pa madiedwe ambatatisi zofila mkati ndiponso zingathandiza nchito ya chitutukuko yo lima ndikudya mabtatisi mumalo anu pamene ikali usebenzedwa. Ndiponso kutsogolo anthu adzatengako maphunzilo apambatatisi zo pamakomo Ndiponso zotulukamo zidda thandida upeza ngila zina zo thandiza anthu kudya mbatatisi zo fila mkati.

Kodi ningakhalilile mu kufufuza kumeneku olo ningaleke nthawi iliyonse?

Utengamo mbali mukufufuza uku nichosankha chanu mungakane olo mungatengeko mbali ndi kulekela pangila nthawili onse. Mwachistanzo, munga leke uyanga mafunso ngati kwabwela munhtu amufunani mwamsanga olo kuti munavomela poyamba. Izizingachitike mkati mwamafunso. Mukhale omasuka undi uza ngati mufuna kuleka nthawi iliyonse. Kuleka utengamo mbali sikuzalenga kuti imwe mukhale mumavuto alionse yayi. Koma utengamo mbali

kudzathandiza udziba zambili pa mbatatisi zo fila mkati mmudzi mwanu ndiponso uganizila ngila yotandizilamo anthu mmalo mwanu.

Kodi Kudzakhalako thandizo iliyonse nikapezeka ndivuto ndaba yotengamo mbali mufufuza kuemeneku?

Mwatsokalangi nagti mwapezeka ndivuto ndaba yo tengamo mbali tizaesesta upeza thandizo lomwe lingafunike mmudzi olo kwinakwache.

Ngangati nilinamafunso?

Ufufuza uku kuluchitika ndi mai Patricia Sakala mwana wa sukula wapa University ku Western Cape. Ngati mungakhale ndifunso lilonse osawayawaya ukambanaye pa imelo ili patricia.sakala3@gmail.com olo pafoni yake yanambala la +260 977818330/96818330.

Ngati mungakhale ndimafunso apofufuza ndiponso ngati munthu omwe akutengamo mbali mungafunenso ku uza

Akulu a Mbali la:
Zamaphunzilo la za mumidzi ndi za umoyo pa Sukulu la:
University of the Western Cape
Private Bag X17
Bellville 7535
Ukuufufuza kwazomeledwa ndikambungwe kamaona pamaphunzilo yo fufuza kuja ku University la Western Cape. Mdziko la South Africa.

Appendix 6: Consent Form

Title of Research Project:

Consumption of Orange-fleshed sweet potatoes and exploration of factors associated with its adoption in the household diet among the target rural communities of the *Integrating Orange project* in Chipata district, Zambia.

The study has been described to me in language that I understand and I freely and voluntarily agree to participate. My questions about the study have been answered. I understand that my identity will not be disclosed and that I may withdraw from the study without giving a reason at any time and this will not negatively affect me in any way.

Participant's name……..

Participant's signature…….

Witness…….

Date…….

Should you have any questions regarding this study or wish to report any problems you have experienced related to the study, please contact the study coordinator:

Study Coordinator's Name:

University of the Western Cape

Private Bag X17, Belville 7535

Telephone: (021)959-

Cell:

Fax: (021)959-

Email: