An Investigation of the Drivers of Sustainable Market Development for High-Nutrient Staple Crops – the Case of Vitamin A-Rich Sweet Potato in Zambézia, Mozambique

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DECLARATION

I certify that this work has not been accepted in substance for any degree, and is not currently submitted for any degree other than that of Doctor of Philosophy (PhD) being studied at the University of Greenwich. I also declare that this work is the result of my own investigations except where otherwise identified by references and that I have not plagiarized the work of others.

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ABSTRACT

Vitamin A deficiency (VAD) is a serious issue for 70 percent of Mozambique's children aged between six months and five years, particularly those living in rural areas although those in low-income urban households are also at risk. Lack of access to vitamin A-rich foods contributes to the 35 percent child-mortality rate. Numerous efforts have been made to overcome this through vaccination and food fortification but these often do not reach enough children from rural households and are not cost-effective. A previous pilot project in 2002 in Zambézia province showed that introducing biofortified orange-fleshed sweet potato (OFSP) into the farming system and diet could alleviate VAD. It concluded that the incorporation of a marketing component in a similar intervention could spread the benefits of OFSP to a wider consumer segment and provide a greater incentive for farmers to include it in their cropping system if there was a market for it. This study attempts to understand the effectiveness of various marketing pathways to sustainably introduce OFSP varieties into communities with inadequate vitamin A intake. Little research has been undertaken on the marketing of sweet potato in Mozambique and no research had been carried out on how a vitamin-rich variety could sustainably be introduced to informal marketing chains, to facilitate long-term demand. The purpose of this research is to gain an in-depth understanding of the drivers of sweet potato marketing and to analyse the effectiveness of the OFSP marketing strategy adopted by the HarvestPlus Reaching End Users Project (2006-2010) in facilitating market development.

The conceptual framework draws on transaction cost theory as well as the importance of consumer sovereignty in deciding which products are demanded. A key factor in developing market linkages is addressing the ways that traders use to overcome the significant constraints associated with the trading of bulky, perishable produce while responding to short season market demands and supply sources. Key findings indicate that farmers' ability to gain from participation in OFSP marketing increased according to their links with existing active sweet potato marketing chains, distance to markets and consumer awareness of the produce's advantages. Traders accepted the new crop if they understood that the product was demanded by consumers aware of its nutritional and health

advantages. A price premium for OFSP evolved, reflecting its superior nutrient qualities and scarce supply. This did not deter consumers and their demand for the produce if they were aware of the health benefits for themselves and their children from consuming it.

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ACRONYMS

CIP	International Potato Centre
DNDR	Direcção Nacional de Desenvolvimento Rural
GB	Golden Bread
FAO	Food and Agriculture Organization
FRELIMO	*Frente de Libertação de Moçambique*
HKI	Hellen Keller International
INE	National Institute for Statistics
INIA	National Agronomic Research Institute of Mozambique
Mt	Mozambican Meticais (currency)
MAE	Ministry of State Administration
MAEFP	*Ministério de Administração Estatal e Função Pública*
MADER	Ministry of Agriculture and Rural Development
MWK	Malawian Kwacha (currency)
MINAG	*Ministério da Agricultura*
MOA	Ministry of Agriculture
MSP	Medium-Scale Producer
NGO	Non-Governmental Organization
NRI	Natural Resources Institute
PAMA	*Programma de Apoio a Mercados Agrícolas*
PAPA	*Plano de Acção para a Produção de Alimentos*
OFSP	Orange-Fleshed Sweet Potato
REU	Reaching End Users project
SSF	Small-scale Farmer
SSP	Small-scale Producer
TSNI	Towards Sustainable Nutrition Intake project
UK	United Kingdom
UNICEF	United Nation' Children's Fund
USAID	United States of America International Development Agency
VAD	Vitamin A Deficiency
WFSP	White-Fleshed Sweet Potato

WHO	World Health Organization
WVM	World Vision Mozambique

EXCHANGE RATES

	Mozambique Meticais (Mt)		
Currency	**2007**	**2008**	**2009**
US$1	25	24	25
UK£	51	45	39
Malawi Kwacha (MWK)	0.178	0.167	0.184

Source: Calculated using currency converter (Oanda Corporation, 2010).

CHAPTER I: INTRODUCTION

1.1 Overall objectives

This thesis discusses the sweet potato subsector and provides an in-depth analysis of the drivers of market development in increasing consumption, marketing and production of a high-nutrient staple food – using the example of biofortified vitamin A-rich orange fleshed sweet potato (OFSP) varieties - to reduce vitamin A deficiency, a common occurrence among poor, rural populations in developing countries.

Sweet potatoes, usually white or yellow-fleshed varieties, are commonly consumed as a starchy staple in sub-Saharan African countries. Orange fleshed varieties are uncommon because the plants are less drought resistant, requiring active vine conservation in permanently damp soils and are only found where there has been an intervention to introduce them. In Zambézia province, Mozambique, where this study focuses, they were not well received in local markets. The previous projects which introduced OFSP varieties focused on the nutritional advantages the crop could represent to farmers and their families and did not attempt to work with traders and urban consumers as important actors of the entire chain. When it came to selling of residual orange-fleshed varieties farmers had to mix them in with the preferred white varieties. Traders did not perceive any advantage to selling OFSP and tended to discount them or bury them in a heap of white fleshed sweet potato. Most consumers did not perceive any advantage to eating them – the roots of OFSP varieties tended to be softer whereas local varieties were floury; they also were considered to have a strong 'pumpkin' odour and orange colour and generally were not liked.

Designing a marketing strategy to support the introduction of an improved staple food with nutritional benefits is a new area of development research and implementation. This study attempts to understand the effectiveness of various marketing pathways to sustainably introduce OFSP varieties into communities with inadequate vitamin A consumption and generate awareness along the value chain that would encourage its production and sale after the provision of subsidised planting material and agricultural and nutrition training to a target population has ceased. It proved challenging to find appropriate academic articles on approaches to the marketing of nutrient-improved crops to guide analysis. This is partly attributable to the newness of the process of crop

biofortification (Pfeiffer and McClafferty, 2007) with limited research into adoption factors yet to be undertaken. Furthermore, the available literature on agricultural marketing research in Mozambique gives very little attention to sweet potato marketing compared to higher value food crops, such as maize and cash crops, such as cashew nuts.

1.2 Background to the study

The research for this thesis was undertaken while the author was part of the Natural Resources Institute (NRI) team that was involved in the HarvestPlus Reaching End Users with Orange Fleshed Sweet Potatoes (REU) project in Zambézia province, Mozambique. NRI was responsible for the operations research component on market development, to develop a marketing strategy, to advise and train staff of the organisation responsible for implementation, the NGO World Vision, and to investigate effectiveness of the approach in increasing OFSP uptake in Zambézia. This study is particularly concerned with understanding the drivers of successful improved staple crop introduction and sustained uptake.

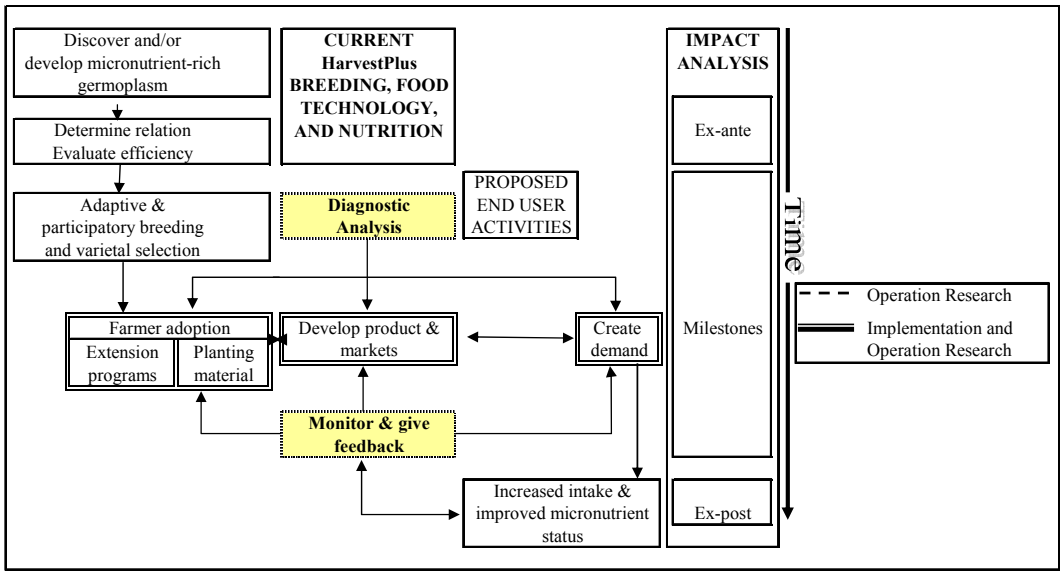
The four-year pilot project to introduce OFSP into parts of four districts of Zambézia province was implemented between 2006 and 2010. The overall purpose of the Reaching End Users (REU) project, funded by the Bill and Melinda Gates Foundation, was to ascertain the costs of biofortification of a food staple to provide widespread access to vitamin A and to compare this with conventional methods of reducing vitamin A deficiency. The international research and implementation project, managed by HarvestPlus, investigated the impact of providing planting material, delivering farmer training in OFSP production and its nutritional benefits, alongside demand creation and consumer awareness-raising and a marketing component involved training traders and linking them to farmers. Although the focus of the project was on improving the vitamin A status of children, under five years of age, the larger the number of people regularly consuming OFSP the lower the cost per person - a common measure of health programmes. Further details of the project are given in Box 1.

Box 1: The Reaching End Users (REU) Project

In 2006 a four year-project, funded by the HarvestPlus Challenge Programme of the Consultative Group for International Agriculture Research (CGIAR) was introduced in Zambézia, scaling-up an approach to introduce OFSP to new districts, targeting 10,800 beneficiary households (WVM, 2008). Entitled 'Reaching End Users with Biofortified Food' (REU), the project sought to identify sustainable strategies for farmer adoption and consumer acceptance of OFSP varieties. The project had two components: (a) field implementation activities and (b) operations research. The purpose of operations research was to design strategies that could be implemented by the implementing agencies; test hypotheses and learn with the implementation process in order to provide feedback to the implementation component and drawn key lessons for a future scaling-up programme (figure 1).

A multi-institutional international team was formed to implement the project with World Vision International (Mozambique) working in the agricultural, nutrition and marketing implementation components; and Helen Keller International (HKI) in the nutrition training component. HarvestPlus was responsible for operations research for demand creation. The International Potato Centre (CIP) was responsible for seed system operations research and the Natural Resources Institute (NRI) for marketing and product development operations research. This included developing an appropriate marketing strategy to facilitate wide-spread awareness of the product benefits of OFSP along the market chain.

Figure 1 REU project framework



Source: HarvestPlus project proposal, 2005.

This PhD research focuses on an investigation of the drivers of dissemination and analysis of the promotional approaches that were used to encourage the uptake of biofortified OFSP varieties by small-scale farmers in Zambézia, Mozambique. In particular, it examines whether inclusion of a marketing component is necessary for the development of a sustainable system to ensure adequate long-term access to biofortified sweet potato by the target and wider populations. It was initially believed that farmers could easily adopt these new varieties by making a marginal change to their growing practices and that consumers would switch to this product by changing their consumption choice given the health and nutritional information provided (Low *et al.*, 2000). This needed to be verified through an in-depth investigation of the drivers of OFSP consumer demand, trader acceptance, producer adoption and the overall production and marketing enabling environment. It was important to ascertain consumer acceptance of OFSP compared to local varieties in the marketplace; the views of traders on the costs and benefits of selling these new sweet potatoes varieties, the benefits and access to market by farmers as an incentive for sustainable production. The PhD research provided the opportunity for greater analysis of supporting elements. For example, a system for recording wholesale and retail prices was set up to enable a comparison of the various sweet potato varieties on sale and to calculate changes in the market share of OFSP over time in the main markets of each district covered by the study.

The PhD research findings also contributed to diagnostic analysis, feedback marketing operation research and milestones in marketing and product development. The results allowed fine tuning of interventions.

The design of the project intervention influenced the marketing operations research and had an impact on the investigation for this research study. The main criterion for selection of the OFSP project sites was the prevalence of vitamin A deficiency. The existing sweet potato marketing linkages and urban demand locations were not fully considered as it was not primarily a marketing project. In understanding market drivers, this research had to cover sites outside of project areas, including the main sweet potato supply areas for Quelimane (the provincial capital) which is the district of Maganja da Costa and the Malawi market for sweet potato grown in Milange district. Research was thus undertaken to respond not only to the needs of project implementation feedback but also to cover questions arising about the motivations of OFSP market actors and the sustainability of marketing facilitation project interventions – the focus of this study.

1.3 The role of PhD research within the REU Project

There were some challenges in simultaneously undertaking PhD research and responding to the project information needs. First, the academic programme had to be fitted around the project activities and deadlines and later around employment as a civil servant. For example, the literature review had to be done in a very short time in the UK before the start of the short three to four month marketing season in which much of the information about marketing activities had to be collected. Second, the academic research work looked more at understanding the OFSP marketing drivers and the collection of sufficient evidence of the factors driving the activities and this did not always coincide with project needs. For example, at one stage the project implementers were concerned about getting the produce out of the hands of producers to markets to encourage farmers to keep growing the crop. To do so some principles suggested by academic marketing research were not strictly followed, in that use was made of project transport, in some cases, to take the produce from the farmers' fields to the market in town. Such interventions tended to distort farmers' views about the project and affected traders by reduced amounts for purchase – key factors in market sustainability.

1.4 Issues associated with low vitamin A intake

The project was primarily concerned with reducing vitamin A deficiency. Low vitamin A intake is particularly prevalent in low-income countries and is a causal factor of high mortality rates of children under five, blindness in children and night blindness in pregnant women in developing countries (Aguayo *et al.*, 2005, Bosch, 2007, HarvestPlus, 2005, Low *et al.*, 2005, Welch, 2002, Sommer, 1995, WHO and UNICEF, 2005). This is often a result of diets relying heavily on carbohydrates which tend to be low in vitamin A, and limited consumption of vitamin A-rich foods such as meat, eggs and vegetables (Codjia, 2001).

Vitamin A is an important micronutrient that protects the immune system against infection and helps to form and maintain soft tissue, including skin health and promotes vision. Its antioxidant compounds protect against some forms of cancer and heart disease. It also plays an important role in absorption of iron, which is essential in preventing anaemia (Higdon, 2003, Northwestern University, 2007). Vitamin A is a group of numerous bioactive compounds which includes retinol, retinal, retinoic acid and carotenoids (Higdon, 2003). It occurs in two main forms. Preformed vitamin A is found in animal products, and is concentrated in meat, fish, liver, eggs, milk and milk

products. The second form is carotenoids, the precursor of this micronutrient, found in plants. The main sources are fruits (mango and papaya); roots (carrots, orange-fleshed sweet potato) and pumpkin, dark-green leafy vegetables and red palm oil (Bayani, 2000, McLaren and Frigg, 2001).

There are several reasons why intake of vitamin A-rich foods may be inadequate. First, the diet of rural poor people tends to be carbohydrate rich, providing the necessary energy for labour-intensive work and avoiding hunger (Ruel *et al.*, 2005). Limited incomes in rural areas prohibit regular purchases of animal foods rich in vitamin A (see table 1 for amounts in different foods); animals are often raised by rural households as savings and only sold to cover some expenses, such as school materials, school fees, soap, weddings and ceremonies. Second, people lack knowledge about the need to eat vitamin A-rich foods. This may be exacerbated in certain societies due the existence of taboos regarding the consumption of particular foods. For example, in rural Mozambique a taboo limits the consumption of eggs and liver by children. So, it is worthy to note that in developing countries the most widely consumed sources of pro-vitamin A are from vegetables, fruits and root crops (Wagt, 2001).

Table 1 Animal and plant vitamin A sources

Animal sources (µg/100g of edible portion)	
Meats	
Sheep liver	15,000
Beef, mutton, pork meat	0-4
Dairy produce	
Butter	830
Eggs	140
Milk	40
Cheese (whole fat)	320
Plant sources (µg/100g of fresh weight)	
Vegetables	
Green leafy	330-5,030
Fruits	
Mango	63-615
Papaya	228-324
Roots	
Carrots	4,600 – 12,500
Yellow-fleshed sweet potato	19
Orange fleshed sweet potato*	855

Source: USDA National nutrient database for standard references: http://ndb.nal.usda.gov/
* Sweet potato, raw, unprepared.

The Recommended Daily Allowance (RDA) of the US (Institute of Medicine Food and Nutrition Board, 2001) for vitamin A specifies the average daily intake necessary to supply the nutrient requirements for healthy people by age and sex. For vitamin A it is measured in micrograms (mcg) of Retinol Activity Equivalent (RAE). Table 2 shows the RDA for different age groups and for men and women. Adults require a higher RAE than children and the RDA for lactating women is higher than for any other group (1,200 mcg). In terms of amount of food consumption needed, a child under eight, requiring 400 mcg of RAE, would need two medium-sized (300 grams) OFSP, with a medium or dark flesh colour, two to three times per week (Low *et al*., 2005).

Table 2 Recommended Daily Allowances (RDA) for vitamin A

Age (years)	Children (mcg RAE)	Males (mcg RAE)	Females (mcg RAE)	Pregnancy (mcg RAE)	Lactation (mcg RAE)
0 – 6 months	400				
7-12 months	500				
1-3	300				
4-8	400				
9-13	600				
14-18		900	700	750	1,200
19 - >70		900	700	770	1,300

Source: National Institute of Health, USA, 2014.

1.5 Methods to combat vitamin A deficiency

Reducing vitamin A deficiency has become a public health issue in many developing countries with efforts being made to reduce its prevalence, particularly in young children (Maziya-Dixon *et al.*, 2006).

There are four main approaches being implemented by governments, NGOs and international institutions to overcome VAD: a) a clinical approach (supplementation); b) a nutritional approach (fortification) and c) diet diversification (Darnton-Hill *et al.*, 2002) which involves the promotion of consumption of a variety of micronutrient-rich foods, particularly vegetables and fruit with a shift away from current high carbohydrate-based diets (Elmadfa, 2005). A further food-based approach, the biofortification of high micronutrient crops – the method used in the REU project intervention under investigation – is only just starting to be used. The following sections outline these approaches and summarise their advantages and limitations.

1.5.1 Supplementation

Vitamin A supplementation consists of providing children, aged from six months to five years, and lactating mothers with vitamin A capsules. Children receive two doses every four to six months, while women receive one dose just after giving birth (UNICEF, 2007). This approach is commonly integrated into national campaigns and is seen as an easy and rapid way to implement on a national scale (Wagt, 2001). With the implementation of this strategy in a number of countries, more than 12 million children received the needed doses of vitamin A in 1997 (CIP, 2009). However, a major limitation is the coverage rate. The possibility of leaving out a proportion of the target population due to limited access to the vaccination sites or the distances to fixed health care facilities, illiteracy of mothers or children born at home is high (Jani *et al.*, 2008). The budgetary cost or the permanent financial support required is also significant. It was estimated that it cost US$ 0.22 to supplement a child with vitamin A in Tanzania, which is considered the lowest cost per child ratio in Africa (USAID, 2005). It can be considerably more; US$1 is often cited as the cost to supplement one child taking two doses per year in developing countries (HKI, 2006). In Mozambique, vitamin A supplementation is part of a package which also includes provision of other micronutrients such as iodine, and costs a total of US$ 0.41 per child (Ministerio da Saude, 2009).

Recognising the seriousness of vitamin A deficiency in human health, and particularly for children, efforts have been made in Mozambique by the Government, NGOs and international institutional partners to reduce it. The Ministry of Health and other international partners have periodically undertaken a supplementation programme since 1999 (Aguayo and Baker, 2005, HKI, 2006, Ministério da Saúde, 2005). In the early years vitamin A supplementation (VAS) was integrated into National Immunisation Days designed to control polio and a high coverage rate of 100 percent of children under five was obtained. This programme was phased out in 2000 and VAS was then distributed at Mother and Child Health Days in 2000 and 2001. The coverage rate dropped to 79 percent in 2000 although it rose to 91 percent in 2001. The programme was stopped due to the high cost and human resources required (Aguayo and Baker, 2005; Fiedler and Chuko, 2008; USAID, 2005). From 2002 to 2003, VAS was administered during routine child health services that aimed to supplement each child with vitamin A every six months. An evaluation carried out in 2003 showed a coverage rate of 44 percent, with the reasons including sick children not attending; missed VAS during additional vaccination campaigns and low demand of VAS for children by communities (Aguayo and Baker, 2005). In addition, the limited access to hospitals by people in rural areas and the distances to health services might also be the reason for low coverage rates.

1.5.2 Fortification

Fortification of food is another way to combat VAD, consisting of "the addition of one or more essential nutrients to a food, whether or not it is normally contained in the food, for the purpose of preventing or correcting a demonstrated deficiency of one or more nutrients in the population or specific population groups" (WHO and FAO, 2006). In the case of combating VAD, vitamin A is added to food during processing in powdered form. Examples of food fortification in Southern Africa (Lesotho, Malawi, Tanzania, Zambia, Zimbabwe and South Africa) include sugar, maize flour and wheat with vitamin A and salt with iodine (ECSA, 2008; Bégin *et al.*, 2001).

Fortification is seen as a valuable and complementary strategy to supplementation to control micronutrient deficiency (WHO and UNICEF, 2005). However, fortification tends to be used mainly in developed countries where the food industry is well developed and large quantities of processed food are consumed by the target audience (Darnton-Hill *et al*., 2002). This is not the case in developing countries where these industries are limited and target groups rarely consume industrially-processed food (Underwood, 1999).

1.5.3 Diet diversification to combat VAD

The third approach to combat VAD is based on encouraging the production and consumption of vitamin A-rich foods, such as mangos, papaya, green leaves, orange-fleshed sweet potato and eggs. Non-producing and urban households can access such produce through the market. This approach stresses the natural occurrence of vitamin A in certain food crops in increasing intake (Faber *et al.*, 2001). It is seen as a promising long-term and sustainable strategy to combat VAD in developing countries and a complementary contribution to supplementation and fortification which are unsustainable in the long term (Underwood, 1999, Welch and Graham, 2000, Low *et al.*, 2007). Diversification assumes access to a range of vitamin A rich foods all year around, which may not be the case in developing countries that rely on rain-fed agriculture (Wagt, 2001). Therefore, availability of vitamin A-rich food crops, through biofortification or genetic modification is considered a more promising way to increase adequate intake of this micronutrient in under developed countries like Mozambique (Pfeiffer and McClafferty, 2007). Accordingly, organisations working to reduce VAD are looking for suitable strategies to increasing vitamin A-food production, trade and consumption such as this case of investigating the cost-effective way of introducing and

increasing production and consumption of OFSP in Mozambique and Uganda by HarvestPlus (HarvestPlus, 2005).

1.5.4 Biofortification

Biofortification is a fourth approach which is just starting and based on "development of micronutrient-dense staple crops using the best traditional breeding practices and modern biotechnology" (Nestel *et al.*, 2006: 1). Either selective breeding or genetic modification can be used. Selective breeding consists of exploring the genetic variation in germplasm to enrich a crop, such as orange-fleshed sweet potato (OFSP) or rice, using conventional techniques of plant multiplication and selection of those varieties with a naturally occurring high level of content of the needed micronutrient. While, genetic modification involves specific gene transfer and has been applied in "golden rice" and banana, where there were reported limitations with conventional breeding techniques (Mayer *et al.*, 2008).

To tackle micronutrient deficiencies crops such as rice, cassava, sweet potato, beans and maize, these crops are being biofortified and disseminated in different parts of the world, especially those countries with problems of micronutrient deficiency problems (Mayer *et al*., 2008). In Africa, the Vitamin A Partnership for Africa (VITAA) has been promoting biofortified sweet potato in seven countries (Kapinga *et al.*, 2003). In Mozambique, the International Potato Centre (CIP) has released 15 dry resistant local varieties of OFSP for dissemination among farmers during the next years (Bouis, 2002; Nestel *et al*., 2006). Another initiative on biofortification dissemination includes the Grand Challenge in Global Health Initiative of the Bill and Melinda Gates Foundation, which supports projects on banana, cassava and sorghum breeding (Mayer *at al., Op. cit.*).
The dissemination of biofortified crops also depends on the acceptance among different stakeholders, including farmers, traders, and consumers. The acceptance of these crops will depend on their additional benefits linked to productivity and final use and demand. It is understood that market development which include information dissemination is required to support biofortified crops uptake (Nestel *et al.*, 2006). Furthermore, food crops have to provide satisfactory incentives to traders who have the key role in distributing the surplus of production from farmers to the hand of consumers.

Biofortification using orange-fleshed sweet potato (OFSP) is considered potentially important in Africa given the high level of beta-carotene in many varieties (100–1600 μg retinol activity

equivalent (RAE)/100 g); drought tolerance capacity; easy vegetative propagation; acceptability by young children and the existing production and trading experience of non-orange varieties (Ewell, 2002; Low *et al*., 2007). Acknowledging these advantages, OFSP adoption, marketing and consumption is being encouraged by governments and international institutions in many developing countries where people face vitamin A deficiency (Hagenimana and Low, 2000, Low *et al.*, 2001).

In Mozambique, institutions have been exploring awareness and acceptance of local non-orange fleshed varieties in order to introduce OFSP, since 2000. The former National Institute for Agricultural Research (INIA), now the Institute of Agricultural Research of Mozambique (IIAM) in the Ministry of Agriculture, the Ministry of Health, and the Ministry of Finance highlighted vitamin A-rich OFSP as an example of how Research Institute could integrate nutrition concerns in research and agricultural extension programmes to tackle micronutrient problems (Low *et al*., 2000). Currently the production of white sweet potato varieties is expanding countrywide and production of orange-fleshed varieties are expanding as well in some provinces where it has been introduced and promoted by NGOs, Government or international organizations. In two years (2005 to 2007) the percentage of farmers growing OFSP has increased from 2.4 percent to 4.3 percent (MINAG, 2005, MINAG, 2007a).

World Vision and CIP selected and tested nine OFSP varieties among 60 varieties initially introduced for trials in Zambézia province in 2001. The aim was to select the best OFSP plant material for farmers and consumers in terms of agronomic characteristics and taste, in order to be promoted and disseminated as a sustained and cheap vitamin A source (Low *et al*., 2005). The introduction of vitamin A-rich sweet potato varieties is considered particularly relevant and easy in areas where farmers traditionally grow white or yellow sweet potato given their experience with and crop and habits to consume it.

A study undertaken in South Africa indicated that there is high likelihood of OFSP acceptance by consumers if they are given nutritional information about it (Laurie, 2001). If this is true, the importance of sweet potato as food crop and the experience that farmers, traders and consumers have in growing, trading and consuming sweet potato in Mozambique, and particularly in the study area, become relevant.

1.6 The importance of sweet potato as a food crop

Sweet potato (*Ipomoea batatas Lam*) is native from Latin America, where it was domesticated many centuries ago (Low *et al.*, 2009). In Africa, it is believed that it was initially brought by Portuguese explorers in the 16th century to Mozambique (Srisuwan *et al.*, 2006).

Sweet potato is one of the most cultivated food crops in the world. It is ranked seventh in production after rice, wheat, maize, potatoes, barley and cassava, with more than 110 million tonnes produced annually. In Africa, Mozambique is ranked sixth in sweet potato production (860,000 tonnes) after Nigeria, Uganda, Tanzania, Burundi and Kenya (MINAG, 2007b, FAOSTAT, 2010).

In Mozambique, sweet potato is a minor staple crop compared to cereals. It is cultivated by 18 percent of farmers, mostly in small quantities often by women. It is not consumed as the carbohydrate part of the meal but eaten as the main constituent of the breakfast meal and as a snack/portable food item. In terms of national production of food crops, by weight, it was ranked third after cassava and maize in 2007 (MINAG, 2007b). It has become well established in the local farming systems as an important food crop due to its capacity to grow in poor soils and its carbohydrate and vitamin content (CIP, 1999). However, white and yellow varieties tend to be more vigorous and survive drought whereas OFSP is tender and less able to survive during the off-season. Sweet potato production is increasing rapidly countrywide: production in 2007 was 861,000 tonnes, almost double that of the 456,000 tonnes verified in 2002 (MINAG, 2007a). This expansion is the result of promotions carried out by the Government, NGOs and international organisations due to its reliability in ensuring household food security in more irregular climatic conditions, but also given its increasing demand by consumers in local and urban markets (FAO, 2004b).

According to 2008 MINAG statistics, Zambézia province, where the research was undertaken, is ranked first in national sweet potato production with 159,000 tonnes, of which 22,000 tonnes (14 percent) are OFSP varieties. The main purpose of sweet potato production is home consumption especially because it can be grown at a different time to the main food crops and in some locations it can be grown throughout the year (Whiteside, 1998).

Sweet potato marketing is found as an important informal sector economic activity especially in rural areas but the trade remains underreported and under-recorded (ORAM, 2005). There are many

small-scale sweet potato traders, who act as aggregators and as retailers. The market chains tend to be short, with surplus production being taken for sale at daily markets in district centres and in weekly itinerant markets at trading centres. Cross-border trade is important in border regions, such as the border between Zambézia province and southern Malawi. The main costs in sweet potato trading are the transport costs, collecting the bulky, perishable crop from scattered farms, and transporting it to markets by bicycles. There is very little other value addition or processing except in areas where people, usually women, have been trained in adding sweet potato pulp to donuts for retailing in markets and outside schools. The REU project also trained a couple of commercial bakers in making 'golden bread' (adding OFSP pulp to regular bread dough). This did not endure due largely to problems in obtaining regular supplies of OFSP and the project switched to working with small-scale village level bakers.

1.7 Problem Statement, Objectives and Research Questions

Vitamin A deficiency (VAD) is a serious problem in Africa and particularly in Mozambique. It contributes to the 35 percent child-mortality rate among this children under five (Aguayo *et al*., 2005) and in Zambézia province it contributes to one of the country's highest rates (46 percent) of chronic malnutrition (ANSA, 2010). Programmes providing vitamin A supplementation, food fortification and encouraging diet diversification have been ineffective in reaching all those at risk of vitamin A deficiency. Staple food biofortification, which uses conventional plant multiplication techniques to select those varieties with a naturally-occurring high level of content of the needed micronutrient, is considered potentially important in Africa.

The main challenge is discerning the best ways to support sustainable uptake of a biofortified staple crop including designing a marketing strategy to drive market 'pull'. Many market-oriented development projects become too involved in selling the improved product and ignore the existing value chains and their market actors. The NRI marketing strategy encouraged light market facilitation and an emphasis on training existing sweet potato traders to raise their awareness of the benefits of OFSP for their customers.

The overall objective of this thesis is to understand the drivers of marketing of high-nutrient staple crops in an African country and to ascertain whether focusing implementation activities on all the

actors in the value chain is necessary to ensure sustained production, trading and marketing of OFSP to alleviate vitamin A deficiency.

The specific research questions are as follows:

1. Which sweet potato subsector structure and institutions support and drive OFSP marketing for increasing its uptake by consumers and sustainable production by farmers in Zambézia?
2. How do existing sweet potato subsector structure and institutions (markets, relationships, information, rules and prices) and project-facilitated interventions influence OFSP marketing in Zambézia?
3. What factors influence OFSP price formation and OFSP marketing share?
4. How do sweet potato consumers' perceptions of nutrition, health information, included in an OFSP demand creation programme, contribute to product demand and future intention to purchase OFSP?
5. What factors affect traders' uptake to adopt OFSP marketing and why?
    a. What kind of relationships between farmers, traders, and consumers are necessary to strengthen OFSP marketing?
6. Will farmers shift from growing and selling local sweet potato varieties to OFSP?
    a. What are the major factors contributing or not to such a shift?
    b. How can these factors be explained, qualified, or quantified?
7. What other factors facilitate or constrain OFSP marketing in Zambézia?

Given the problem statement and the objectives of the research, the following two hypotheses are considered:

Ho1: The existing sweet potato subsector structure and marketing institutions in Mozambique were not favourable to promote the sustained marketing of OFSP.

Ho2: The marketing strategy and facilitation provided by the REU project were not favourable to promote the sustained marketing of OFSP.

1.8 Thesis Organisation

The thesis comprises nine chapters. The first chapter provides the background to the study and the role of the author in undertaking the research; it introduces the challenge of reducing vitamin A

deficiency in Mozambique and the use of food crop biofortification, via orange-fleshed sweet potato (OFSP) varieties to maximise vitamin A availability. It sets out the problem statement and the objectives of the research.

Chapter two presents the literature review, which introduces the functions of agricultural marketing, and then considers the possible drivers of informal agricultural marketing in developing countries including trading costs, the role of incentives particularly price incentives for the whole range of value chain participants. These various strands are pulled together to formulate the conceptual framework for this study.

Chapter three describes the geography of the study area; gives an overview of its history including the changes in economic activity since the end of the socialist era; the state of the province's infrastructure and communication; the demography and development of agricultural production and marketing systems including for sweet potato.

The research methodology used is described in chapter four. It includes a discussion of the study design and the various methods of data collection and analysis used to collect data from value chain actors. It also includes a discussion of the limitations of the methods used and the situations in which data was collected.

Chapter five presents the results of sweet potato subsector analysis, using market map and discussing its elements and relationships between functions and actors. Here, retail spot prices and time series prices of the white and orange sweet potato varieties are also analysed across the markets.

The results of sweet potato demand by consumers are presented in chapter six. This includes a discussion on whether the results support that the facilitative marketing model implemented increased the number of consumers buying OFSP. It also presents the results of the forecast of future demand for OFSP using the results of consumer surveys carried out during two years.

Chapter seven presents the findings of trader surveys and qualitative investigation. It includes the costs the traders incur, the prices and gross margins of selling sweet potato, comparing the non-OFSP varieties and the OFSP during two years. Traders operations and behaviour are also presented.

Chapter eight presents and discusses the results of small and medium-scale producers' involvement in sweet potato production and the factors driving their participation in production and marketing of the crop. In this chapter are also discussed the farm gate prices received by farmers for one or another sweet potato variety. The results are based on qualitative and quantitative surveys undertaken during two years of fieldwork research. Additionally, a section in this chapter provides an overview of the data analysis of the three data chapters (about consumers, traders and producers) giving a summary of relationships along the whole market chain, and the connection between the producers, traders and consumers, as well as the importance of prevalent supporting institutions.

In chapter nine, the overall conclusions are presented, together with answers to the research questions. The wider relevance of the thesis findings are discussed and recommendations are put forward for future work in this area, both implementation and research.

CHAPTER II: LITERATURE REVIEW

This review addresses key concepts of agricultural marketing and related economic theories with focus on understanding market drivers and how market actors are engaged and interact to operate and contribute for a development of a sustainable value chain for vitamin A-rich sweet potato. It also provides a framework to guide data collection, interpretation and analysis. It covers four main areas: i) consumer, trader and crop adoption drivers; ii) applied concepts of marketing in the context of the history of agricultural food marketing operations in Mozambique and iii) the main approaches and tools used for agricultural food marketing research, including research with consumers on the introduction of a new nutritious staple food onto the market and; iv) the literature review concludes with a conceptual framework for this research study.

Numerous concepts have been developed to interpret the functions and goals of agricultural and food marketing. The definition adopted in this study focuses on the profit-focused business activities linked to the physical exchange of products and the services that support this activity from production to consumption (Khols and Uhl, 2002). This definition centres on the necessary activities and services required to ensure the delivery of food products to consumers. This includes the marketing activities undertaken by farmers looking to obtain an income from their production, starting with the decision to choose which crops to grow, when and with which inputs for the optimal return. It also covers the activities and risks taken by the number of intermediary and retail traders.

Although this study deals with short, informal staple food marketing chains the more comprehensive definitions of marketing used in a developed country context which focus on customer demand are still relevant to a developing world informal marketing activity. The UK's Chartered Institute of Marketing defines marketing as:

> "...the strategic business functions that creates value by stimulating, facilitating and fulfilling customer demand...building brands, innovating, developing relationships, communicating benefits...with a customer-centric view [which] brings positive returns on investment, satisfies shareholders and stakeholders...and contributes to positive behavioural change and a sustainable business future" (Charles, 2007, p.1).

According to this view, marketing is not only the process of convincing customers to accept and purchase a product, but a means of constructing trust and building a good relationship in order to

foster repetition by customers and to allow formation of a market segment on which promotion is focused and targeted. Marketing is not only satisfying customers' needs for making a profit but working with them to facilitate a more sustainable, value strengthening seller-buyer relationship. In informal markets, where the shareholders are spouses and other family members, profit making and returns to capital employed are just as important; being creative and innovative are also vital in maintaining market share and having something new to tempt customers with. Branding is perhaps not so obvious, though even in developed formal markets fresh produce rarely has its own brand, but in some of the markets observed, the generic brand name '*Polpa*' has evolved.

It is important to note that aspects related to sustainability and customers' needs were undermined in some developing countries during socialist-leaning post-colonial times. In Mozambique, particularly during the centralised economy period between 1975 and 1986, marketing was solely an activity undertaken by *parastatal* enterprises (FAO, 2009). After 1986, during the subsequent process of introducing the country to a market-based economy, the construction of trust and sustainability, the building of relationships in marketing activities, communicating and providing information about benefits of the products become important aspects that had previously been completely suppressed. This is especially important to appreciate when a new product is being introduced to the market which has to compete with an existing, similar known product, such as in the introduction of orange flesh sweet potato varieties in Mozambique (Nayak *et al.*, 2001).

Agricultural marketing can be considered as a system composed of interrelated components or subsystems contributing to a final result (FAO, 2009), and involves 'a wide range of forms and arrangements of markets and hierarchical relations', ending with a purchase of a product by a consumer (Dorward *et al.*, 2008). The World Bank (2006) considers agricultural marketing system to have two complementary activities: i) the physical actions and ii) the supporting activities. The physical actions include produce assembly, storage, handling, transporting, transformation and selling. The support activities include provision of market information, advertising and promotion, development of grade and standards, finance of marketing activities and management of price fluctuation risk. All these activities are rendered much more complicated and uncertain by the very poor physical and service infrastructure that prevails in many African countries including Mozambique (World Bank, 2006).

Traders, usually informal, poorly educated with minimal resources, contribute to both sets of activities. Although often dismissively and critically described as 'middlemen', they identify products and markets; they participate in and provide transportation; they are involved in price

setting, risk taking and understanding the demands and requirements of consumers (Fafchamps and Gabre-Madhin, 2004). The next section presents a review of relevant literature about the main actors of marketing process which this research paid particular attention to and the possible factors driving their participation in marketing. This is important to understand whether these factors could also drive OFSP adoption and uptake along the marketing chain.

2.1 Consumer, trader and crop adoption drivers

This research focuses on the main actors of the agricultural marketing process particularly those likely to be involved in selling perishable staple crops such as sweet potato. It is of importance to understand their actions and behaviour that can drive the adoption and uptake of new, enhanced varieties of sweet potato. This section looks at the evolution of consumer research from earlier neoclassical theories stages of marketing research which focused on price setting through competitive interactions between buyers and sellers to the increasing interest in understanding the marketing process related to the needs and preferences of consumers, including their reaction to the introduction of new food products in the market. It also introduces the discussion about traders' participation in marketing process and the household behaviour and adoption response to product demand.

2.1.1 Consumer research and marketing

The literature on consumer research and consumer behaviour in the marketing process is wide-ranging (Gielens *et al.*, 2007; Hoeffler *et al.*, 2006; Steenkamp and Gielens, 2003). In mid and second half of the twentieth century, during the development of the modern marketing era, when marketing was seen as the matter of provision of products to consumers (Fırat and Dholakia, 2006), research focused on investigation and motivations of sellers rather than buyers and consumers (Kotler and Levy, 1973). The increase in industrial production and surpluses switched attention of researchers to consider marketing from buyer and consumer perspectives since sellers now had to design new strategies to improve their understanding of buyers in order to sell the extra production. The buyer perspective was centred on the entrepreneurial aspects of the marketing process, i.e. looking for business opportunities, how to find buyers, how to sell, how to packaging, how to transport and maximize profits at the end (Elkan, 1988). It is related to how producers and traders find customers, bargain and sell, and the consumer in the perspective of their food choice for

human wellbeing and satisfaction. So, marketing research started to look at both sides of a transaction as complementary rather than conflicting. The consumer side was researched in order to consolidate the theories of choice and consumer behaviour that could explain the demand for certain goods (Michael and Becker, 1973). According to the theory of consumer behaviour explained by Michael and Becker (1973), the behaviour of consumer choice is explained by three factors: the income, price and taste as the consumer attempts to maximise the utility of goods purchased in the marketplace. Among these factors taste of a food item was much less explored and often ignored. From basic economics and the behaviour of consumer choice, it is expected that rationally, when the consumer maximizes the total utility of goods, an increase of income will increase demand for certain goods, the increase of prices will decrease demand and the perceived good taste will also increase demand. Along with income and price – the basic drivers of purchase - taste is suggested as a driver of consumer demand. Later study (Steenkamp and Burgess, 2002) added to the factors influencing food demand, the gender and level of education as important factors on guiding the consumer behavior and demand. The gender was even pointed as an important factor of reciprocal consumer behavior which is needed for a sustainable social system and marketing perpetuation (Kolyesnikova *et al.*, 2009). It was found that women purchases were linked mostly to an obligation regarding social norms or kindness, while men express gratitude. In African countries this gender relations to purchasing behaviour become striking important considering the role of women in food purchases and preparation.

Then, the acceptance of new products by consumers is increasingly being researched in order to understand why many products are failing in the market mainly during their first years of appearance, although there is a recognition that new products play a relevant role for competitiveness of marketing firms (Gielens *et al*., 2007; Bogue and Delahunty, 1999; Mason, 1990). Thus, recent research found that preferences and taste are important drivers of acceptability of new products by consumers and marketing strategists are called to pay attention to the demanded characteristics. The demographic characteristics of consumers regarding household size and age are also important in influencing marketing demand for certain products (Gielens *et al*., 2007). Additionally, the time the new product last to take-off in the market is a matter of research for a positive performance of the firm, and it varies across the countries (Chandrasekaran and Tellis, 2008).

Consumer research underlines the role of consumer demand as driver of production and marketing process, given the recognized dependence between sales, demand and production (Cova and Dalli,

2009). Consumers are not only considered the end actors of marketing process in marketing research but the beginning of value chain with capacity to create value and interact with other actors such as traders and producers for a sustainable marketing process. They use their consumer identity and preferences to influence what the markets have to produce and provide. Hence, some studies centred their research on the models to predict the consumers' behaviour regarding product purchases (Green and Srinivasan, 1978; Vogel *et al.*, 2008). For example, Green and Vogel studies sought to understand the structure of consumers' preference behaviour towards offered product in the market in order to estimate future demand and ensure good returns to investments. But preferences are linked to information as well. Ariely (2000) in his work demonstrates that access to information by consumers influences their judgement and decision about future purchases. Among a range of information processed by consumers to make purchasing decision, nutritional information as well as taste and health are becoming striking important (Sousa *et al.*, 2006). Similar finding to the importance of nutritional information in purchasing decision came up in a research with students acting as consumers in the USA. They received nutritional information about certain foods and this influenced their food selection. Information about special attributes of certain product characteristics as well as consumer socio-economic characteristics such as income, education, gender and age are also considered key measurable variables to investigate food product demand (Burk, 1964). Thus, introducing new varieties of OFSP may require investments in information and advertising that reach the targeted population. Therefore, some research studies look at the impact of advertisement and promotions in consumer choice and future purchases (Sun *et al.*, 2003). In this study special importance on drawing the conceptual framework will be given to the purchasing preferences of consumers and their demand motivations. The investigation will try to find out which sweet potatoes varieties consumers are purchasing and how information, prices and produce availability are contributing to that.

2.1.2 Participation of traders in marketing

Trading is a profit seeking activity subject to a range of endogenous and exogenous factors (Matchotsa, 2014). Endogenous factors are those linked directly to traders such as their skills and exogenous factors those from their outside such as access to information. These are factors which affect the entry and participation of traders and the scale in which they are able to trade. These factors can also be related to marketing-related policies, distances from supply sites to the final

market, transport systems, marketing information, prices, availability of finance and credit right down to personal characteristics. These factors are briefly discussed in the following paragraphs.

a) Marketing-related policies: Policies can facilitate or constrain the activities and effectiveness of traders. Policies affecting prices of substitute crops, transport, marketing, and access to finance influence traders' operations and margins; strengthening or weakening their participation in trade. In Mozambique, under the agriculture trading strategy traders are able to trade freely and price fixing and transport monopolies were abolished in the 1990s (Conselho de Ministros, 2005; PAMA, 2003). However, the strategy lacks concrete actions to improve rural roads to facilitate the easy movement of traders and goods. It also does not give substantial financial capital alternatives to offer credit to many marketing intermediaries. From 2006 to 2009 only USD 2.4 million were planned for credit for all marketing activities around the country. These would include the creation of marketing committees, assistance to farmers on legal issues, marketing research, marketing linkages and training.

b) Farmers' organizations: Farmers in developing countries are dispersed and often far from the market (Boughton, 2007). In Mozambique the main agricultural production areas are in the north and centre, where Zambézia is located, the study area, while the main consumption area is in a long distance of more than 1000 kilometres to the south, in Maputo and Matola (Tshirley and Abdula, 2007). In terms of sweet potato, the main markets are the district urban centres and the neighbour country of Malawi. However, empirical evidence shows that in southern and eastern Africa farmers' organizations that facilitate produce assembly can reduce marketing costs for traders and contribute to their active participation in the market (Barrett, 2008). Farmer marketing groups are still quite rare in Mozambique following several decades as a centralized planned economy where the State was responsible for buying produce directly from farmers and distributing via State shops. For this reason, despite some improvements, the interaction between traders and farmers in parts of Mozambique is still in a process of consolidation for the benefit of both. For example farmers near to the border with other countries such as Malawi benefit from the intense trading activity carried out by traders between the two countries.

c) Distance to markets and infra-structure: Many farmers in developing countries are located in remote areas far from the markets, which increase transport and other transaction costs incurred by traders, preventing them to efficiently participate in the market (Alene *et al.*, 2008). Distance from supply sites to market can also influence the range of activities undertaken by traders. Matchotsa (2014) found that traders in Uganda tend to participate as

wholesalers when travelling and getting the produce from outside local markets and retail when do not travel and buy the produce locally from wholesalers. It was also noted that distance between supply sites and the markets, as a key factor in traders' activities, in developing countries, is exacerbated by poor roads and bridges which constrain the efficient circulation of transport.

d) Transport: Transport plays a key role in context of large distances and poor roads between the production sites and the markets which are common in developing countries like Mozambique. The World Bank estimated that Mozambique's road density was the lowest in Southern Africa (32 kilometers per square kilometer) (World Bank, 2006), with only one-third of farmers selling any crop from their production. Boughton *et al*. (2007) found in Mozambique that the distance from producers to the nearest paved road was negatively associated with the sales of marketed crops.

e) Demographic characteristics: Age, sex and education level are demographic characteristics which may influence on their activities and performance. Salleh *et al*. (2012) in Malaysia did not find that these had any effect on the performance of traders where years of experience in trading had a significant impact. However, earlier studies by Heck *et al*. (1995), Orser and Foster (1992), Inmyxay and Takashi (2010) and later on by Matchotsa (2014) concluded that differences in business performance was related to traders' age, gender and education. In regard to educational level, Matchotsa (2014) found that traders who participated as wholesalers had higher level of education compared to retail traders. Related to gender, in Mozambique, the involvement of female traders trading large amount of agricultural produce (particularly grain) between the production areas in the north and the urban areas of the south of the country was noted (Vletter and Polana, 2001). However, this may have changed during the last years considering the increasing rate of unemployment affecting also males.

f) Marketing information: Traders need marketing information about the price, quantities and supply sites to decide what to buy and where (MOA/MSU, 1990). They also can benefit from market information to design their marketing strategy year around related to period of supply and alternative markets which give them better returns.

g) Prices and pricing: Price reveals the expectation of buyers of a scarce good (Lüdicke, 2006). Traders can find prices of certain products attractive or not to be engaged in its trading. It depends also on the costs involved to travel to sites where the prices are good. If the pricing mechanism is not favourable for trader, he/she will not participate in the business.

Commonly, this happens when the authority sets prices which are different from those that would be determined by supply and demand (ibid.).

h) Finance: Many traders face financial constraints when starting up and running their business. In Uganda (Nkonya, 2000) the lack of financial capital prevented traders to fully participate in crop marketing. They did not have enough financial capital to purchase the produce for resale later in other markets. In Mozambique microfinance programmes only cover about 120,000 beneficiaries, of which only 2.8% are Zambézia province, the study area (Vletter, 2006). Those traders with limited capital or access to credit, who tend to rely on small sums borrowed from partners, family tend to double as retailers. This limits their ability to purchase produce (Hurst and Lusardi, 2004).

In the presence of these factors, traders adopt proper strategies to maintain their trading businesses; otherwise they leave and engage in other more rewarding activities. Nevertheless, in marketing the participation of traders is seen by other actors such as costumers and producers as being privileged, taking advantage of others. Traders and marketing intermediaries in developing countries are generally viewed as profiteers, who take advantage in the marketing process, accumulating higher margins, given the huge information asymmetry between them, their customers (buyers) and producers/suppliers (Matchotsa, 2014; Pokhrel and Thapa, 2007). The asymmetry referred to consists in available information for traders and lack of it for costumers and producers. A study in 1993 confirmed the high marketing margins in specific situations such as that of Mozambique after the civil war when agricultural market information was scarce (MOA/MSU, 1993). However, another study undertaken in Nepal found that trading margins were fair, considering all the costs and risks incurred to acquire the produce, transport, store and selling (Pokhrel and Thapa, 2007). So, trading activity is subject to good or poor margins depending on a number of factors faced by traders that need to be studied and understood.

2.1.3 Farmers crop adoption and marketing participation

The discussion around the role of households as producer, consumer and trader dates from the times of Adam Smith. The household may opt either to produce all the products it desires to consume or specialize in producing those products and services in which holds a comparative advantage, participating in the market to acquire other needed products and sell the surplus of the production (Smith, 1776; Barrett, 2008). Nevertheless, household market participation is subject to

some constraints and incentives such as prices, infra-structure and institutions. Getting good prices is not enough; households need to get improved productive technology and good market infra-structure for well-functioning market and institutions that facilitate market exchange such as marketing information and farmers' organization (Barrett, 2008; Alene *et al*., 2008). Since market participation as seller is an important source of income accumulation and way to get out of poverty (Boughton *et al.*, 2007), it gives incentive for household farmers engagement, if all market conditions are in place, especially a high demand for the product. The necessity for consumption for wellbeing by individuals creates demand and is one reason for marketing and crop adoption. Sweet potato is expected to sustainably be introduced in all marketing supply chain if enough demand is warranted.

The participation of farmers in agricultural markets is increasingly being debated, mostly comparing small-scale farmers to commercial farmers and the participation of the former in emerging high-value markets (Henson *et al.*, 2008; Boughton *et al*., 2007; Carrilho *et al.*, 2003; Dorward *et al*., 2008). The weak participation of smallholder in agricultural markets in developing countries is highlighted in some studies (HLPE, 2013). The HELPE report refers to the disadvantaged conditions of smallholder agriculture in important aspects related to contract farming, bargaining power, price volatility, relative prices of inputs and output. The absence of marketing contracts results in uncertainty on sales and income and the volatility of prices is not well explored given the poor postharvest handling and weak storage facilities. While the need for strengthening the bargaining power play a role in stimulating the emerging of farmers' organizations particularly in high-value markets, some authors emphasize that although small-scale farmers have comparative advantage over large-scale farmers in terms of mobilizing family labour, their small-scale operations increase transaction costs for non-labour transactions related to capital and market information (Poulton *et al.*, 2005; Henson *et al*., 2008). Specifically for Mozambique, it was found that market information, remoteness, measured by the distance from the village to the nearest tarred road, assets endowments and gender of household head determine the participation of smallholders in the output market (Boughton *et al*., 2007). The authors highlight as well how high-value domestic markets are increasingly offering opportunities to small-scale farmers. In turn, there is also a sceptical view that high-value markets are constraining small-scale farmers' entry due to high standards requirements demanded by informed consumers. This might be particularly relevant in case of the acceptance by informed buyers of new nutritious food as OFSP. Although the participation of small-scale farmers in high-value markets is not new (Alene *et al*., 2008), it is argued that the actual situation characterized by high quality products demanded by informed

consumers can lock smallholders into disadvantaged relationships with buyers and this require new strategies for better integration of these farmers in these marketing chains (Louw *et al.*, 2008). Therefore, it is argued that the role of institutions is becoming essential to link and facilitate the participation of small-scale farmers in high value markets (Reardon *et al.*, 2008).

2.1.4 Agricultural Marketing and Institutions

Agricultural marketing has increasingly featured on the agenda of governments and international organisations since the liberalisation of markets in the late 1980s and early 1990s (NEPAD, 2001; FAO, 1996; Kindness and Gordon, 2001). In 1996, the World Food Summit (WFS), in Rome, emphasized the role of agricultural marketing, mainly in developing countries, in supplying food to improve the nutritional status of the population. Objectives 32d and 36d of the WFS reinforced the need to promote sustainable and diversified agricultural markets development in order to meet the needs of consumers for enough and adequately balanced food (FAO, 1996). In Africa, the market access initiative designed by the New Partnership for African Development (NEPAD) aimed at diversifying agricultural production and improving market access for farmers by reducing barriers to trade for new business entrepreneurs (NEPAD, 2001). This concern has generated considerable research, in reviewing marketing activities and making recommendations to improve sustainable market access for farmers in developing countries.

Two categories of agricultural market research during post-reform period can be highlighted. First, research that focused on price analysis and markets integration (Goletti and Christina-Tsigas, 1995; Scott, 1995). This research looked at the timely product price transmission between markets and the flow of the products as conditions of good market performance. Results of such studies in developing countries have shown segmentation of agricultural markets but did not deeply investigate marketing activities contributing to that. The second category of research, centred on the causes of markets segmentation, assessing the performance of traders and intermediaries as marketing actors through their activities and the role of related institutions and infrastructures (Fafchamps and Gabre-Madhin, 2004). Results of research undertaken in Sub-Saharan Africa, particularly in Benin and Malawi, reflected high marketing transaction costs and non-existence of supporting marketing activities such as grading, brand recognition, product certification and bulking to improve marketing performance. In fact, both research categories can contribute for

better understanding of marketing operations and achievements and produce recommendations for policy improvements, especially for rural environment where it is part of community livelihoods.

Despite the recognition of the role of agricultural marketing in national and households economies, its inclusion in the conceptual framework of livelihoods approaches is limited and that concerns some researchers. For instance, a livelihood investigation undertaken by Norfolk *at al*. (2003) in Zambézia concentrated on land issues and enforcement arising from new institutions. Dorward *at al*. (2002) argue that such omissions may lead to a failure in identifying potential marketing opportunities in programmes aiming to promote rural development. The key concern is that for rural development to occur there is a need to expand the range of livelihood opportunities while minimizing risks and dependency (Ellis and Biggs, 2001). In the context of this study, sweet potato marketing as livelihood activity may potentially contribute to income generation as well as malnutrition reduction.

In spite of the increased interest expressed in the role of markets and livelihoods, a concern has been voiced that little is known about the institutions that support market exchange in Sub-Saharan Africa (Fafchamps and Gabre-Madhin, *Op. cit.*). This argument extends beyond the performance of traders and intermediaries to the institutions which enable activities of producers and behaviour of consumers (Shiferaw *et al.*, 2008; Bernard and Spielman, 2008; Cova and Dalli, 2009).

2.2 Economic Theories Related to Agricultural Marketing

This section considers how economic theory helps understanding the issues under investigation, particularly aspects of the branch known as new institutional economics, to provide greater insight into the sweet potato marketing transactions costs and market actors' behaviour in the uptake of new, distinct varieties.

Over the past 250 years, economic theory has changed from its initial focus on production and wealth distribution to the role of institutions and consumers' concerns and their behaviour. Classical economics, which evolved in Europe in the late 18th century, was primarily concerned with explaining economic growth and wealth distribution among a defined institutional framework (Spengler, 1974; Vroey, 1975). Adam Smith used the expression, 'the invisible hand' to put forward the notion that markets regulate them. In the late 1800s, during the neoclassical period, it was argued that economies were governed by "pure market", based on the notion of perfect

competition, characterised by strong contest between market participants with equal access to information, that would efficiently allocate scarce resources to different alternative uses (Vroey, 1975). This view assumed that marketing competition and good functioning of markets were enough to distribute resources among participants and ensure economic development. Later research focused on supply, demand and how their interaction determine the market price[1] of a product (Bober, 1942; Brewer, 1987). However, the failure of markets to set these adequately to benefit both parties led to the consideration of what factors were actually involved in the exchange of goods. Later research investigations explored the concept and role of institutions to explain the conventions and operations of marketing and participants' behaviour.

2.2.1 Institutions and Institutionalism

New Institutional Economics (NIE) is centred on two key concepts to analyse marketing performance: institutions and organisations. There is limited agreement about the definition of institutions (Spengler, 1974; Hodgson, 2006; Kydd and Dorward, 2001). According to Hodgson (2006), the use of the term 'institution' dates back to Giambattista Vico in his *Scienza Nuova* of 1725. In this work, Vico centred his analysis of social science on individuals and ideas as the institutions which govern the economy (Edie, 1962). The concept and role of institutions and the impact of institutional change on economic performance were later explored by North (1991, 1992). He defined institutions as the "rules of the game of a society or...the humanly-devised constraints that structure human interactions" (North, 1992b, p.5). North divides these rules into: i) "formal rules" such as laws and regulations and ii) "informal constraints" such as conventions, norms of behaviour and the conduct and enforcement of both. Later authors offer examples of formal rules which include contracts, political systems, organisations, markets, while informal rules consist of traditions, customs, value systems, religions, and sociological trends (Kherallah and Kirsten, 2002).

Hodgson's (2006) definition of institutions is similar to that of North but includes organisations and firms as institutions. Detailed examples of institutions by Hodgson include language, money, law, systems of weights and measures, table manners and firms.

[1] A list of definitions of price was given by Fetter (1912). He then arrived at the definition that "price is the quantity of goods given or received in exchange for another good".

Thus, it is now generally accepted that institutions are the overt, implicit social rules as well as the formal structures, laws and policies and enable markets to work and can constrain or promote market transactions (Shiferaw *et al*., 2008). An investigation of institutions can assist in understanding market structure, conduct and performance, as well as to remedying market failure given their role in guiding marketing processes (Hodgson, 2007).

Consideration of institutions emphasizes their importance "in shaping economic behaviour and economic performance... [and] the recognition that they respond to economic factors" (Rutherford, 1995: 1) where institutions are responsible for the allocation of resources - the organisational structure of the society (Samuels, 1995). In regard, it is argued that institutions have been established by society to organize and reduce uncertainty and risk in trade; regulating, facilitating and constraining market processes and behaviour (North, *Op. cit.*).

The importance of institutions and institutionalism in this study lies in their relevance to understand how they shape markets functioning, especially in an underdeveloped economy where informal operations are largely responsible for the marketing of staple food crops. Markets and marketing occur within a certain institutional framework. In Mozambique, due to the influences of the formal institutional framework adopted in the post-independence socialist era, between 1975 and 1986, the State through parastatal companies and cooperatives was responsible for marketing and setting prices for agricultural produce. All cash crops and primary staple crops were given set prices. Only a small part of rural retail trade was left to the private sector, and even in this, prices at rural shops, where produce was purchased from producers, were controlled. The effect of leaving out indigenous local marketing institutions, particularly small-scale traders, resulted in marketing disconnection, huge reduction of marketed produce and concomitant food shortage. The change to market-oriented economy in 1986 created a different institutional framework that favoured the emergence of private sector and informal trade which resulted in to the whole marketing chain, including consumers (Binswanger *et al.* cited by Sahn, 1994: 282).

Thus, marketing activities are undertaken in a certain institutional framework in which market actors may develop their economic activities investing their resources for their income. However, some institutional settings may constrain the development of marketing actors by not providing necessary rules, infrastructure, services and environment. The effect of this is to increase marketing transaction costs (North, *Op. cit.*) and reduce marketing efficiency, leading to higher consumer prices, post-harvest losses and disincentive for production. Institutions, as the rules of the game in

agricultural marketing, guide marketing process and the behaviour of participants. This process is structured by organisations, which are considered in the next sections.

2.2.2 Theory of Price

Price was described by one of the most prominent economists, Adam Smith (1776), as the "invisible hand of the price mechanism" which guides the market in situation of perfect competition market, characterized mainly by symmetric information of all actors, to allocate resources in society's best interest. The price mechanism refers to the process by which decision taken by consumers, traders and firms interact to result in allocation of scarce resources between various and competing demands. Then, Fetter (1912) discussed definitions of price and end up with distinction between monetary definition of price, linked to money-expression and non-monetary price, related to goods-expression. Following this discussion about either using the concept of value or good to describe price, he defined price as "the goods given or received in exchange for another good" (Fetter, 1912, p.813).

The price mechanism plays three important functions in a market. The first is signalling function, in which price raises or fall according to scarcity or surpluses of product. Thus, the variation of prices between regions or locations is an indication of availability of product. Also, the variation of price in same locations during the time may show the seasonality of surpluses. The second function is the transmission of preferences, in which consumers send signals of wants and desire demanding certain products that result in raising prices. The third function is the rationing function. Here the price raising targets only those with willingness and ability to pay with possibilities to purchase the product (Reley, 2012).

According to Reley (2012), prices serve also as incentives to producers and traders. It will be attractive for producers to produce and traders to sell a product if its price is high. Nevertheless, the effect of price may be limited by transaction costs that can narrow the marketing margins and prevent producers and traders to fully benefit from the high prices. Marketing margins represent the difference between the producer price and the consumer prices, and it can be net margin if all other transaction costs such as transport, storage, loading, labour, etc. are deducted (Abassian *et al.*, 2012). For example, in Nigeria, a study was found that transport was the highest marketing cost and accounted for 55% in all costs (Baba and Maina, 2013). To minimize transaction costs

organizations play an important role facilitating the marketing process. The next section briefly defines organizations and approaches their role in marketing.

2.2.3 Organisations

Like institutions, organisations guide marketing process. They are political, economic, social and organisational bodies with common objectives (North, 1992b). Organisations are the players of the game, they implement marketing, rather than rules and they could be of public, private or civil society origin (Poole and Frece, 2010). Examples of organisations include marketing regulatory bodies, trade unions, family farmers and schools. Organisations are subject to the existing institutional framework but also they can contribute to the change of institutions using common influence and lobbying (ibid.). Institutions and organisations contribute for higher or lower marketing transaction costs by facilitating or not the exchange process between marketing actors.

2.2.4 Transaction Costs Economics and Marketing

Transaction costs comprise, but are not limited to, the cost of exchanging products or services on the open market (Coase, 1937). It includes the whole intangible procedures in the process of getting information, seeking buyers, negotiating the deal and other associated costs such as the cost of transport related to a very poor road infrastructure, lack of information and transparency in the operation of a market, the cost of levies, bribes etc. The theory of transaction costs economics emphasize the need to recognize the existence of costs involved in running business activities (Williamson, 1979). This has been highlighted in theories preoccupied by understanding the drivers of marketing operations and the reason for existence of marketing actors and behaviour. For example, the neoclassical theory was centred on the economic analysis and understanding of the existence and functions of the firm[2] or agent as a small economic unit or organisation in marketing operations. Coase's "The nature of the firm" argues that the existence of the firm was based on "...formal relations which are capable of being conceived exactly" (Coase, *Op. cit.,* p.387). He states that transaction costs involved in any economic activity, such as marketing, defines economic agent and its capacity to expand. In the case of informal staple food marketing, the firms are likely to be small-scale traders such as sweet potato marketing intermediaries. These may incur marketing

[2] A firm is a system of relationships coming to existence when an entrepreneur lead the allocation of resources in specialized economy conditions assumed to be organized by price mechanism (Coase, 1937).

costs related to investigating the potential demand, supply, farm gate and retail prices and transport costs. All these procedures can define agent participation in the marketing process.

The relevance of transaction costs in marketing as economic activity goes beyond the aim of maximizing the profits of the firm as noted by North (1991, p.98):

> "...in the context of individual wealth-maximizing behaviour and asymmetric information about the valuable attributes of what is being exchanged (or the performance of the agents), transaction costs are a critical determinant of economic performance".

At an individual level the marketing process may perform satisfactorily in an environment of relatively low resources allocated for the marketing exchange, like that characterizing small-scale marketing agents in developing countries (Fafchamps and Gabre-Madhin, 2004). In this situation, marketing actors can afford low transaction costs for a corresponding gain. Thus, marketing institutions become important for organizing the market and reducing marketing costs (Williamson, 1975).

Analysis of transaction costs looks at the functioning of institutions to find out whether the resources use is optimised, highlighting the satisfaction of marketing participants rather than the maximization of profits. Three levels of transaction costs analysis are proposed by Williamson: a) the structure of the enterprise; b) the activities of the enterprise and c) the organisation of human assets within the enterprise. First, the structure of enterprise analyses its components and their relation for good performance. Second, analysing the activities of enterprise allows knowing and understanding the reasons of existence or not of some activities; and how they can be improved for efficient functioning of the enterprise. Third, it is assessed the allocation and working relationship of human assets of the enterprise.

The relevance of the transaction costs approach and the theory of the firm in economics and marketing analysis is highlighted by many authors to explain the rational and behaviour of marketing actors and enterprise organisation and performance (Foss, 1998; Williamson, 2002; Heide and Stump, 1995; Coase, 1937; Anderson, 1982; Williamson, 1981). However, there is some critique of their applicability to marketing analysis (Foss and Klein, 2005, Williams, 1966). Foss and Klein's (2005) analysis of the critics of the theory of firm and transaction costs found that this was due to the limitations in integrating important concepts related to innovation, entrepreneurship and bounded rationality. These concepts are developed in the next sections.

2.2.5 Innovation and New Product Entry

This study is about the introduction of new sweet potato varieties in a food system and marketing, as innovated product and process. The relevance of innovation and product development in marketing is well recognized by different authors (Zhou, 2006, World Bank, 2008). It is argued that innovation can bring new products or marketing operations and behaviour to the market resulting in satisfaction of consumers, increased product market share and building a sustainable competitive advantage in the market and distribute value along the chain (Zhou, *Op. cit.*).

Innovation is likely to bring or improve marketing public institutions that contribute for good performance of marketing activities (Dalberg, 2012). For example, innovation on cotton suppliers' payment in Zambia through SMS introduced incentives to farmers/traders using virtual wallets resulting in faster transactions. Innovation can be considered in different areas of marketing process, including marketing operations, information and communication technologies and infrastructure. In the context of increased marketing competition, existing agents must innovate to withstand the pressure from new entrants (Koster and Rai, 2008). For example, a study in Peru showed that with development and globalization of food marketing, companies are introducing nutritious and health products for benefit of consumers responding to an increasing competition and increasing informed consumers (Delgado and Pedrozo, 2007).

However, potential losses for innovators may occur during the innovation process from product development to consumer adoption since they cannot precisely evaluate the benefits before they take the action (Dew and Sarasvathy, 2007). The time for a new product to take off in the market varies between products, time and targeted cultural groups (Chandrasekaran and Tellis, 2008). Different products may have different uptake rates depending on the characteristics of the product and supporting services such as advertising, entrepreneurship/trader or farmer, manufacturing and distribution.

Beyond innovative capabilities of farmer/traders, other exogenous factors may affect new product entry to the market. Markets in underdeveloped countries generally present more logistical constraints in the process of taking the produce from the farm to the place where it is purchased by consumers. This is due to poor infrastructure, including storage facilities, roads, lack of quality standards and units of measure and lack of information and communications between market actors, making the marketing process challenging and risky (World Bank, 2008, Dorward *et al.*,

2002, Fafchamps and Gabre-Madhin, 2004). This has a negative impact on the quantity of product traded and in a number of entrepreneurs willing to engage in such constrained activity.

In developed markets, it has been observed that there is a high failure rate of new or improved food products introduced to the market. Up to 40-50 percent are estimated to fail due to consumers' risk-aversion related to food preferences and choices (Costa and Jongen, 2006). The failure rate can increase to 90 percent during the first year of the product in the market. It has been suggested that successful product development and marketing is linked to consumers' awareness of the benefits of a new product (Bogue and Delahunty, 1999). In addition, a study undertaken in Canada has shown the importance of nutrition and health information in consumers' choice of food (Basil *et al.*, 2006).

Information, particularly nutritional information, transmitted to consumers is used potentially to influence consumers' choice and product acceptance (Cranage *et al.*, 2004, Conklin *et al.*, 2005). Thus, entrepreneur skills development on know-how and use of external (to the enterprise) sources of information are considered determining factors in the innovation process, especially in new products (Avermaetea *et al.*, 2004). However, this process requires entrepreneurship capacity development to encourage engagement and investment in a new and uncertain venture such as marketing a new sweet potato variety. In developing countries context characterized by limited information and weak supporting institutions development, entrepreneurs' skills still poor and affecting innovation such as the introduction of new products in the market.

2.2.6 Entrepreneurship in Marketing

Entrepreneurship is the capacity that marketing agents (farmers and traders) have to identify potentially rewarding business opportunities and act to benefit from them (Elkan, 1988). Entrepreneurship is linked to "the alertness to profit opportunities" in economic or marketing activities (Foss and Klein, 2005, p.15). The entrepreneur's action consists of using people skills in different business areas to combine different resources or activities to produce new products, markets, services or processes (Lazear, 2005). The entrepreneur's role in introducing new products and processes appears positively linked to economic growth; by introducing new products, markets or processes, entrepreneurs raise competitiveness and challenge existing marketing enterprises to improve their performance (Koster and Rai, 2008, Hoselitz, 1952)

Considerable research has been undertaken into entrepreneurs' characteristics, motivations and perceptions to understand their failure or success as important players of the marketing process. An Indian study highlighted three principles for an entrepreneur's success in consumer marketing:

> " a) Understanding of consumer psychology, b) social embeddedness and c) entrepreneurial empowerment" (Sridharan and Viswanathan, 2009, p.455).

The first principle highlights the entrepreneur's need for a combination of methods that can influence consumers purchasing behaviour given their perception capacities about certain product. The second principle underlines the need of the entrepreneur in considering social-cultural historical aspects of the local people in his/her place of operation. The last principle is centred on entrepreneur promotion and incentives to participate in marketing process. This suggests the need for investment in the capacities and knowledge of marketing actors to influence consumers purchasing behaviour, including promotional activities of the product. Reward for this investment can be reached in different ways. Research in the USA on the perceptions of entrepreneurs of their business found out that in addition to profit aims they may be highly motivated by non-monetary gains such as independence, job satisfaction and freedom (Alstete, 2009). In addition, must be recognized that entrepreneurs are people that act in a real world with limited capacities and limited access to information – bounded rationality.

2.2.7 Bounded Rationality

The real world demonstrates the limited capacity of human being to capture and process all available information to make decisions related to an economic sphere, such as the marketing process. This limitation is known as 'bounded rationality' (North, 1992a). As a consequence of this phenomenon, individuals and communities impose certain rules and constraints to structure a process, such as marketing. The rules and constraints, for example, may comprise the value of the product, the quantities traded and the price offered for a transaction. The critics of using this theory argue that since asymmetric information, where one party to a marketing transaction has more and relevant information than other(s), will prevail anyway bounded rationality may not be a useful theory to analyse marketing institutions and firms' behaviour (Hart, 1990). The situation of asymmetric information is reality of developing countries like Mozambique, which have underdeveloped communications infrastructures and institutions and low literacy of the population. So, it is suggested that rather than strictly focusing on bounded rationality we should concentrate on important patterns of action linked to human behaviour (Schlicht, 1990). The concept discussed

above is of relevant importance in understanding marketing in Zambézia given the potential information and resources constraint that shape marketing process and traders' behaviour. Most of the traders operating in rural areas have to spent much time and walk long distances searching for marketing information and products. In this process, they are limited to certain information about the availability of product and the prices at different levels and locations.

2.3 Applied Concepts of Agricultural Food Marketing in Mozambique

Agricultural production provides the main source of food and income for the smallholder sector. Since significant amount of household expenditure in rural areas is related to food purchases, agricultural development potentially can provide enough food and reduce food expenditure (Bias and Donovan, 2003; World Bank, 2011). Furthermore, marketing of agricultural produce contributes substantially to the income of smallholder sector that have access to markets (Heltberg and Tarp, 2002b). However, access to the market for this segment of the rural population is still limited given a number of constraints, namely poor marketing information, market infrastructure, group participation, traditional marketing behaviour and so on (Jari and Fraser, 2009).

Interventions based on linking farmers to market have become common in recent years as response to limited access for rural smallholder farmers and the increasing opportunity for food marketing created by increasing urbanization (Shepherd, 2007, World Bank, 2008, Onumah *et al.*, 2007). Some of these interventions include: a) linkages between farmer and traders; b) linkages between farmers' groups (producers' organisation, associations or cooperatives) and large buyers or processors; c) the linkage between a leading farmer with the market and d) the linkage between farmers with modern value chains (Onumah *et al*., 2007; Shepherd, 2007; World Bank, 2008). These linkages potentially reduce transaction costs by fixing known exchange days and providing facilities to the timely bulking up of the produce. Such linkages are often facilitated by public extension services, NGOs or the private sector but proactive entrepreneurial farmers or traders do start up such linkages too. In some cases, a leading farmer is responsible for initiating and maintaining contact with traders and in organizing farmers to sell as a group. This method relies on trust since usually no formal contracts are signed and the reputation of the leader can play an important role (Shepherd, 2007).

However, many programmes working on these farmer-market linkages limit their focus to farmers' groups, ignoring or undermining the rural informal operations of traders and opportunities for

taking the lead in the new marketing opportunities (Fafchamps and Gabre-Madhin, 2004). Very little has been done in developing countries to understand the operations and economics of informal traders, or to link them into the marketing process to the benefits of cultivating high nutrient staple food.

Nowadays, understanding the role of agricultural production and marketing to combat food insecurity and malnutrition is increasing (Ahmed *et al.*, 2000; Mayer *et al*., 2008; Nestel *et al*., 2006). The adoption of agricultural technologies is related to increasing production, likely household income through marketing and food consumption among rural households (Ahmed, 2000). Biofortification has been the technology being promoted to contribute to macronutrient intake and nutrition. However, some questions still being raised on the productivity of new varieties, their cost-effectiveness, marketing and adoption by farmers, traders and consumers (Nestel *et al*., 2006).

2.3.1 Overview of Agricultural Marketing in Mozambique

In Mozambique, the agricultural sector consists of two subsectors, the commercial sector and the subsistence sector based on traditional agriculture (MINAG, 2007b). Commercial agriculture represents one percent of the total number of farmers and comprises those with more than ten hectares with a market-oriented growers producing primarily for sell either in domestic or international markets. The commercial subsector includes production of cash crops such as tobacco, cotton, cashew nut, maize and rice. The subsistence or traditional agriculture involves the production of staple foods mainly for home consumption but also for sell of small quantities of surplus production if market opportunities exist (ibid.). The production is rain fed and low, with low productivity and the sales per capita are also low. Agriculture is also practiced mostly by woman to ensure household food security and men are much involved in cash crop production.

Although the focus on market-oriented agriculture in Africa increased in the late 1960s, farmers started to use markets to sell and exchange their surplus many years before (Scott, 1995; Vail and White, 1980). In the traditional agricultural economy, marketing was practiced in limited ways to generate income for household needs and payment of taxes (Shaffer, 1972, Vail and White, 1980). It is also stated that in the 1950s marketing of staple food in Africa was undertaken in relatively small amounts to suppress needs of urban workers, and for that agricultural production focused on

cash crops for the market (Ward, 1982; Schaffner, 1995). This practice was observed in Mozambique during the colonial government's 'company system' when farmers were obliged to sell their surplus staple food crops, as well as producing cash crops for the large colonial companies (Vail and White, 1980). The infrastructures – roads, railways, storage - built during the colonial period aimed to facilitate the exportation of cash crops and agricultural produce to the neighbouring land-locked countries of Malawi, Zimbabwe and Zambia, rather than to promote internal agricultural food product marketing (Coughlin, 2006). Even now, the national road network is still limited in its extent, especially in rural areas, constraining marketing activities and people's easy movement.

In many African countries marketing continued to be controlled by governments after independence as means of keeping the political and economic power centrally controlled and obtaining resources from the rural areas (Lele and Christiansen, 1989). In Mozambique, governments have used their power to control agricultural marketing. Before independence the colonial government and, after independence in 1975, the FRELIMO government monopolised marketing by establishing parastatal companies and cooperatives. Agricultural prices were fixed by the government from the production level to retail and, the movement of goods were restricted (Tschirley, 1998). Even now, the Government continues to fix the minimum cotton price to be offered to farmers by the cotton companies. For almost 100 years of colonial administration, and the centralised economy after independence, farmers and traders became accustomed to a centralised marketing system, in which they were restricted in building capacity in market research, and trading operations and risk management common in a market-oriented system (Tschirley and Santo, 1998). It is understood that the long-standing directed market culture affected the change to a more market-oriented system and it will take some time and resources to be achieved.

The controlled marketing system in Mozambique formally changed in 1986 with the introduction of the Economic Rehabilitation Programme (PRE) and a new marketing sector emerged. Food marketing, through liberalised markets, was introduced and formal barriers to movement of people and goods were removed (Tschirley, 1998). However, the civil war continued until 1992, which prevented effective market development. After the war ended, the agricultural marketing chain did change, following adoption of liberalisation policies and assisted by political stability. Liberalization meant the withdrawal of the state in direct control of the marketing activities and regulation opening space for emergency of the private agricultural marketing sector. This has

increased marketing activities; the quantity of produce traded contributing to lower prices and improved access to food by people (Tschirley, *Op. cit.*).

Liberalisation of markets also led to an increased number of informal traders (MOA/MSU, 1993). Apart from being unlicensed, informal traders do not pay taxes, mostly do not have a fixed business premises and specific infrastructure (Coulter, 1996). It is likely that the informal sector started in the cities in 1980s by women selling basic foodstuffs on the streets to urban consumers, many of whom had moved from rural areas due to the civil war (MOA/MSU, *Op. cit.*). The informal sector was still forbidden in the early 1990s and it was seen as an extension of *candongueiros* (name given to traders, meaning explorers) during the central planned economy in the 1980s. During that time this sector was subject to police harassment, social control and arrest of traders and goods (Buur, 2007; MOA/MSU, 1993). Today many markets in Mozambique inherited the name *dumbanengue* ("trust your feet" in local southern Mozambique dialect - *changana* or *tchungamoyo* in the central Mozambique dialect Sena) because traders had to run away from authorities when found selling products in informal places and without a license (MOA/MSU, 1993). This informal marketing operation evolved from large cities and expanded to other provinces and rural areas in the mid-1990s, playing an important role in trade of a wide number of products, including agricultural produce, especially sweet potato (MOA/MSU, 1993) which was an affordable staple food.

2.3.2 The Role of OFSP Marketing to Combat Vitamin A Deficiency

Several recent studies argue that marketing has an important role in OFSP adoption and consumption (HarvestPlus, 2005; Low *et al*., 2005; Nestel *et al*., 2006). The authors point out that farmers producing OFSP can benefit from the existence of demand from informed consumers and marketing links to increase their income by selling surplus of the produce (Low *et al*., 2005). Rural and urban consumers, who are not involved in sweet potato production, can gain access to vitamin A-rich sweet potato through the market. Although the REU project target beneficiaries are rural children under five, VAD is not only a rural problem (Maziya-Dixon *et al*., 2006). VAD prevalence has been reported in urban areas, especially in poor households that have limited access to vitamin A rich foods and living in poor sanitary conditions. These households obtain pro-vitamin A products, mainly from vegetables and roots, purchased in the market. The key issue is to understand which marketing interventions will contribute effectively to the ultimate aim of sustainably

providing an incentive to farmers to carry on growing the crop, particularly after project intervention ends, and what will change consumers' preference in favour of OFSP.

The literature (Kherallah and Kirsten, 2002; Klein, 1999) suggests that marketing institutions in place or provided by some interventions can facilitate or constrain marketing operations. Interventions aiming to promote food crop marketing should give incentives to all marketing chain actors: farmers, traders and consumers. For example, facilitative institutions may include the existence of a free market rules, market and transport infrastructure, and other physical and regulatory, formal and non-formal facilities that can reduce transaction costs and make easy produce exchange.

From a smallholder farmer's perspective, the marketability of a crop is an important factor for its adoption, although a lot of literature assumes that smallholders produce only for home consumption (Heltberg and Tarp, 2002a). It is known that farmers sell some of their production, even for those crops grown to meet household food security needs (Bias and Donovan, 2003). Income from marketing of staple food crops, fruits and vegetables accounts for seven percent of total household income in northern Mozambique, which includes total household income from cash crop sales, the value of production kept for home consumption and off-farm income sources (Carrilho *et al*., 2003).

Mazuze (2004), in his research on adoption of OFSP varieties, in Gaza province, southern Mozambique, noted that lack of attention to marketing was one of the bottlenecks to increasing sweet potato production, particularly of newly-introduced vitamin A-rich orange-fleshed varieties. The research found that only 19 percent of farmers sold sweet potato (mostly white varieties). The reason for that were namely the high transaction costs related to poor transport infrastructure, long distances from the production sites to the market and low awareness about the nutritional benefits of OFSP. As consequence of this limited information about OFSP, there was no price differentiation between white and orange sweet potato varieties. The author recommended for further research on assessing ways to establish linkages between sweet potato farmers, traders and processors to identify potential markets, especially for farmers in more remote production zones which are less well linked to urban markets.

In light of importance of agricultural marketing on livelihood, food security and economic development, it is argued that its performance requires systematic research. The following section

of this study reviews different thinking on agricultural food marketing research in order to set up a framework in which the sweet potato marketing chain is analysed.

2.4 Approaches and Tools for Agricultural Food Marketing Research

Marketing research is defined by Shepherd (2003, p.7) as "the process of investigating a market in order to find out the sales prospects for a product". This can be done at several levels. For example: a) an individual investigation of prices prevailing, quantities requirements or market opportunities for a crop; b) it could be done also by organisations or farmers' associations to look at market prospects locally or outside the area; or c) as an academic research to understand processes, efficiency, limitations and drivers of marketing of certain crop (NRI, 2001, Mwabu and Thorbecke, 2001, Fafchamps and Gabre-Madhin, 2004; FAO, 2004a; Alene *et al*., 2008).

For farmers and agro-processors, agricultural marketing research is a valuable tool helping them to be more aware of the characteristics of a certain market and reducing the risk of product rejection by consumers or traders if it does not meet their requirements (Shepherd, *Op. cit.*). Marketing research plays a crucial role in deciding which product and distribution chain to invest in by addressing important questions about the kind of crop to produce, inputs, potential demand, prices, packaging, quality, transport and preferences of consumers (Lappin *et al.*, 1994).

Despite the recognition of the role of agricultural marketing research, it was given limited attention in many developing countries, arguably due to the lack of methods (Scott, 1995). To address this problem, in the 1980s and 1990s a number of methodological approaches were produced (MOA/MSU, 1993; Magrath, 1992), such as price analysis, rapid market appraisal, sub-sector analysis and value chain analysis.

The discussion on suitable methodologies for marketing research in developing countries became more heated in the 1980s and 1990s. It was argued that neo-classical models of marketing research had evolved from consideration of developed western industrialised markets and few of the assumptions, such as a viable credit system, were valid for developing countries (Magrath, *Op. cit.*). Magrath considered that marketing research should be extended to considering the institutional environment of developing countries, which is often different from those of developed countries. The area of new institutional economics theory was developed to analyse institutional structures affecting economic variables. It highlights the relationship between institutions,

transaction costs and behaviour for an understanding of diverse efficiency of the market (North, 1992b). Institutional economics theory is also considered of relevance for marketing investigation in developing countries, such Mozambique, where legal, political and regulatory structures are often limited and frequently substituted by informal linkages and relationships.

Some studies in agricultural marketing in Mozambique started to focus on markets and methodologies for its access and monitoring in the new free market era (MOA/MSU, 1990). Most attention was given to grain marketing research (Tschirley and Santos, 1999; Vletter and Polana, 2001) and in the operation and importance of urban markets (Bowen, 1998; Cravinho, 1998; Tickner, 1998; Whiteside *et al.*, 2002). The literature distinguishes between "staple" and "cash crops" and more attention paid to the marketing aspects of cash crops, including potential market bottlenecks (Cravinho, 1998; Tschirley and Santos, 1999; Mackintosh, Undated, Ministerio da Industria, 1999; MOA/MSU/UA, 1992b) rather than on lower value staple food crops like tubers. However, a study in Mozambique highlighted the increasing marketing of a proportion of crops grown for home consumption, with the amount of sweet potatoes being sold accounting for just over a quarter (28 percent) of production (Bias and Donovan, 2003). The importance of sweet potato markets for farmers was highlighted during the marketing diagnostic phase of the REU project as well, as one of the reasons driving the production of this crop (HarvestPlus, 2010).

Despite the increasing interest of farmers and traders in sweet potato marketing, little has been done to investigate its marketing chain and the supporting institutions in southern Africa and particularly in Mozambique (Mazuze, 2004; Gaudrault, 2008; Rees *et al.*, 2003; Tewe *et al.*, 2003). In Mozambique, one of the few studies on sweet potato marketing was carried out in the southern province of Inhambane, characterized by poor soils and a cyclical food deficit (Wandschneider and Barca, 2003). This marketing chain analysis reported the flow of the produce from the production areas to the retailing markets, including the prices and actors involved but without a deep investigation of institutional arrangements and behaviour supporting the process.

It has been observed by Scott (1995) that marketing of staple foods needs to be specific to crops, locations and time in order to bring precise recommendations which avoid dangerous generalisations. In addition, Mwabu and Thorbecke (2001) argue that each commodity system has its own particular marketing chain issues to be investigated including production system, harvesting, post-harvest handling packaging, transportation, storage needs, acceptable form and

acceptance by consumers. These statements, from earlier investigations, suggest the need to carefully study each crop in specific place as this research does.

Research in marketing in developing countries also has to consider the impact of globalisation on local production and markets (Kanji and Barrientos, 2002, Farías, 2001). The removal of trade barriers and opening of markets has brought opportunities and challenges for small-scale farmers and their supporters. While small-scale farmers can take advantage of low labour costs to grow competitively, their produce is associated with high transaction costs for intermediaries (Reardon *et al.*, 2008). Thus, the concept of "bringing agriculture to markets" (World Bank, 2008) and "linking producers to markets" (Shepherd, 2007) have been seen as ways to increase small-scale market participation and sustain rural household income and improve productivity, though not always bringing about the desired change.

Barriers to market participation and impact on livelihoods and the need for facilitating farmers' participation, through sustainable organisations and reduction of transaction costs, is receiving more research attention (Barrett, 2007). However, the limitations of a pro-farmer marketing chain approach to address market access is not a definitive sustainable solution for dynamic market inclusion if issues related to other participants are not taken in account. Such an approach could increase farmers' skills but they may lack the necessary connection to other market actors. Focusing on farmers' participation in agricultural markets raises the need for other activities, as Shepherd (2007, p.11) succinctly summarises:

> "Markets are not enough to guarantee success. They must be capable of showing a profit for the entrepreneur who is linked to farmers and the farmers, in turn, will need to be assured of higher net incomes from entering into a new linkage than they could obtain from existing or alternative activities. At a very early stage, estimates of farm profitability must be made. Such calculations should be fully costed, making realistic assumptions about production yields (i.e. using farm, not research data) and ignoring any subsidies that the linking organisation may be tempted to provide."

Supporting the need for in-depth agricultural marketing analysis, Fafchamps and Gabre-Madhin (2004) observe that market segmentation and performance could be interpreted by action of traders that are intermediaries and key agents in marketing process. Their work in Benin and Malawi on the operations and performance of agricultural traders highlights the importance of understanding the marketing actors' (traders) behaviour and constraints in market integration and income distribution among marketing participants. The role of market in profit distribution has also been

comprehensively described by Timmer (1993). Equitable distribution is related to marketing efficiency, referred to as the observation of the presence in place of the elements of a competitive market. These elements consist of a) marketability of the product, b) rationality of participants, c) large number of small participants, d) equal opportunity on access to the market; and e) access to information and knowledge. Marketability is a characteristic of some staple foods, including sweet potato, in developing countries that permits the produce to be exchanged from producers to final buyers. Participants in marketing are rational, consumers want more produce and goods for lower price and sellers want more income; agricultural marketing is already occurring, carried out by several small, including informal, participants with no power to influence the prices.

Issues related to market access and access to marketing information as well as price behaviour is being researched to understand marketing dynamic and efficiency. It is argued that access to market and information needs to be assessed to ascertain their contribution to a competitive and efficient market. Lack of marketing information is associated with barriers to entry and is seen as an assumption for efficient marketing in terms of increasing the number of participants and competitiveness (Timmer *et al.*, 1983). Information is considered essential to develop expectations that are behind prevailing prices in certain market (Anderson and Brorson, Undated). In this context, efficient markets use all available information to determine the price (ibid.). For this reason, price analyses have been used as indirect tool to determine market effectiveness and efficiency (Tschirley, 1995; Goletti and Christina-Tsigas, 1995). However, given the lack of information characterizing the developing countries and the rural areas, Dorward (2008) recommends the incorporation of analysis of "marketing structure" or subsector analysis to evaluate marketing efficiency. Important issues of marketing structure, such as the participants in the marketing chain, including traders, prices, costs, margins and profits became essential to analyse marketing performance (Timmer, *Op. cit.*).

In Mozambique, few studies have focused on agricultural traders and their marketing behaviour. A study of female itinerant maize traders in Southern Mozambique involved researching the economics of their operations, calculating their costs, prices and profits, and investigated purchasing, transportation, storage practices and other business-related behaviour (Vletter and Polana, 2001).

2.4.1 Subsector analysis

Subsector analysis results from the need to assess the economic impact of commodities, extending the earlier focus on producers and consumers performance (industrial organization theory) adding other actors such as traders, intermediaries, transporters, importers/exporters, processors in particular value chain of food system (Holtzman, 2002). As an analytical approach, subsector analysis became much popular in the 1960s and 70s when researchers studying marketing sought to focuses in specific issues and researchable questions related to a slice or vertical linkages in particular sector given the challenges of that era with increasing specialization in production and distribution of goods (Shaffer, 1968). Instead of studying production and consumption only researchers wanted to investigate part of food system looking at the actors, dynamic of activities, policies, constraints, marketing environment and other factors from the production of certain commodity up to consumption. Subsector analysis imply to choose the focus of analysis in a broad commodity system that may include massive data requirement from many components of the system. It also helps to investigate the factors or the drivers of change in a subsector even in case of introduction of new technology or product such as in this study about new nutritious varieties of sweet potato (Holtzman, 2002). The factors of change may include marketing conditions or enabling environment (infrastructures, institutions) and marketing policy changes. Good infrastructure and institutions can improve market access by facilitating the linkages between the production areas and the markets; contributing to that, infrastructure reduce transaction costs and potentially increases demand, production and distribution. Thus, policies that favour low transaction costs boosting marketing activities have potential to provide incentives to the marketing chain actors in certain subsector.

Subsector analysis is explained in different ways by different authors as:

> "The vertical set of activities in the production and distribution of a closely related set of commodities" (Shaffer, 1968, p.1446).

Or

> "…the interdependence of economic units, particularly those involved in the production and distribution process. This interdependence is seen as playing a central role in understanding the dynamics of change and evolution." (Boomgard *et al.*, 1986, p.3).

Or

> "An interdependent array of organizations, resources, laws, and institutions involved in producing, processing and distributing an agricultural commodity." (Marion and NC-117 Committee, 1986).

The first definition of subsector analysis highlights the activities carried out in each stage or node of the subsector and their actors, organized from the production, distribution, processing and consumption. The second and third definitions emphasise the rules and interdependence between the activities and organizations and institutions which support those activities. These approaches can be easily represented in a map for a better visualization and understanding of the linkages.

The key tool of subsector analysis is the subsector map, which displays the organisation of the sector and the linkages of different stakeholders as well as the environmental institutions in which the actors operate (Boomgard *et al*., 1986). Below that, and refining to marketing component, mapping of market is also possible and both can be combined. The market map is used as conceptual framework for analysing the marketing and institutional environment within which marketing actors, including producers, develop their activities (Albu and Griffith, 2005). The Market map is also used by practitioners to target and address specific issues in the marketing chain. Therefore, it is argued that if a market map is elaborated in participatory way it can improve intervention actions by understanding and addressing aspects that constrain the linkages between the actors in the market chain. Market map is a tool which comprises the participation of marketing actors in its design, identifying stakeholders, market chains, constrains and strengths, and moving from the abstract theoretical framework to oriented action by involved participants in the chain. However, the participatory consultation to the marketing actors could be time and resources consuming compared to direct observation and key informant interviews. Both tools contribute to a better understanding of subsector structure, conduct and performance by setting a framework which allows investigating the composition and interaction of subsector, including market, actors and their dynamic and behaviour and, the institutions those influence the dynamics and changes.

2.5 Conceptual Framework

A conceptual framework pulls together the theories, core concepts as well as the researcher's ideas based on prior experience, to organise and help structure the direction taken for the research study, to develop research questions and guide the data collection and analysis. In a qualitative research, the conceptual framework can be developed as participant views and issues are collected and analysed.

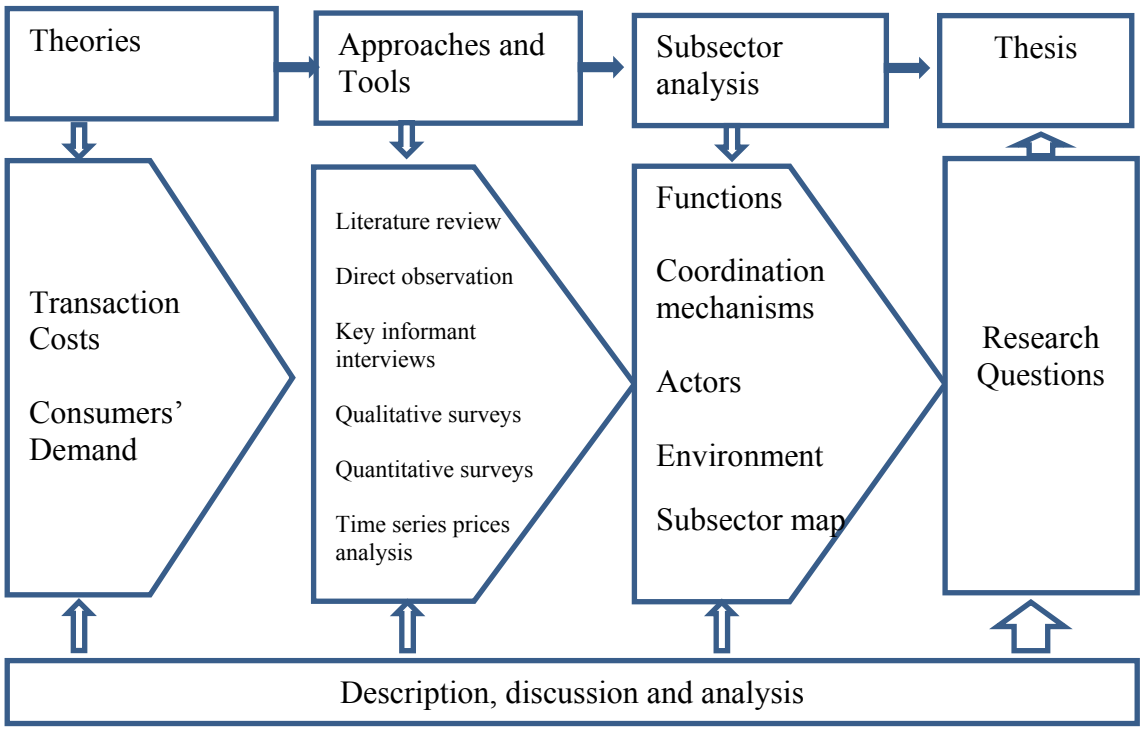
This research focuses on understanding the issues and drivers associated with the marketing of a new high-nutrient food staple crop, an orange fleshed variety of sweet potato (OFSP), from a marketing chain perspective which has as main actors the farmers, traders and consumers. In considering the sustained introduction of this crop to the market the relevance of a number of theories and areas of economics were evaluated to inform the process and guide the research.

Agricultural marketing is often studied via recourse to a number of disciplines, including economics, human geography, anthropology, psychology and sociology. A review of literature on marketing of agricultural produce in developing countries reveals a wide diversity of theories used according to the particular interest of the researcher about certain phenomena. The literature on frameworks combining introduction of an agricultural marketing opportunity with a staple food product with improved nutrition attributes, especially in less developed countries, is extremely limited.

In this study, the conceptual framework draws on transaction cost theory, which takes a transaction as the unit of analysis, as well as the consumer demand, the importance of consumer sovereignty in deciding which products are demanded (Figure 2). Transaction costs focus on the efficiency in the process of exchanging a produce at a cost in an organization or between it and the market. The framework combines transaction costs, consumer demand, price and gross margins analysis, subsector analysis approach that emphasizes both the vertical and horizontal dimensions of a set of activities of commodity, commonly called system, from production to consumption (Shaffer, 1973). The subsector approach uses the three principal elements of production and distribution system, namely the functions, coordination mechanisms and the actors/participants to investigate the efficiency and functioning of the market (Boomgard *et al*., 1986). The functions comprise the steps of transformation of the produce from production by farmers to the hands of consumers. The subsector analysis includes the changing in the form of the product due to processing, grading, as well as the economic transmission between different actors in the value chain, for example wholesaling or retailing. The functions also include detailed activities such as transportation, storage, loading and unloading the produce from the trucks. The second element, the coordination mechanisms between functions, occurs within the same enterprise using hierarchical system within the enterprise/firm with different stages of produce transformation or using the market mechanism through sales in the market between different actors or enterprises. The third element in the whole production/distribution system is the actors or participants. They perform the functions using coordination mechanisms and, the number of functions under a certain number of

actors/participants determines the vertical concentration of a subsystem. Some enterprises can simultaneously grow, process and wholesale their product, while others staple food producers or traders focus on one specialized activity. Beyond these elements, subsector analysis also considers the environment under which the transactions are taking place in terms of the rules, information flow and institutions that support or constrain the marketing activity. Within the subsector approach a number of theories are used to discuss consumers' demand, marketing, prices and crop adoption, choosing the appropriate tools for data collection and analyses in order to respond to the main research questions of the study.

Figure 2 Conceptual Framework



The preference for this approach is based on its advantage of combining the description and analysis of the vertical structure of crop marketing activity, including the performed functions between steps and correspondent actors, and the horizontal coordination related to the coexistence and competitiveness of different actors/firms performing similar function. The analysis of these elements uses the subsector map, the key tool of subsector analysis. In addition, the vertical coordination will allow analysing the relationship of actors between different functions or nodes and changes of product and preferences from sweet potatoes production to consumption; while the horizontal coordination will allows to look at the functions or nodes and abilities and linkages of

different actors namely producers, traders, transporters, consumers in the same function of marketing process (Albu and Griffith, 2005; Wildt *et al.*, 2006; Shaffer, 1973; French, 1973).

One of the limitations of using this approach is the little attention given to the actors' behaviour and relationships. In reality, we know little of how markets work, actors behave and the reasons motivate them to shift from using one technology to another or change the product traded. Thus an in-depth investigation with traders as key elements of marketing chain is proposed (Fafchamps and Gabre-Madhin, 2004). Theories about marketing actors' behaviour and institutions that influence the process, through the literature review, guide the choice of required tools to collect and analyse the data in order to respond to the research questions about the main drivers of OFSP marketing in Zambézia, accepting or rejecting the study hypothesis.

In subsector analysis, new institutional economics theory offers insight into production and marketing behaviour and stresses the importance of transaction costs as unit of analysis to explain trading behaviour. Transaction costs theory is among the theories used in Africa to understand the behaviour and drivers of agricultural marketing (Poole and Frece, 2010). Transport costs and the difference between farm gate prices and terminal market prices were used in a study in Tanzania to infer local transaction costs and trade performance (Mkenda and Campenhout, 2011). It is argued that in the context of high transaction costs farmers and traders' participation in marketing will be limited (Enete and Igbokwe, 2009; Fafchamps and Gabre-Madhin, 2004; Janvry *et al.*, 1991). This means that if relative transaction costs for OFSP are higher than that of the existing varieties farmers and traders will prefer continuing with their old varieties. Although some transaction costs can be quantified, others are difficult, especially non-market or non-tangible transaction costs (North, 1987). To estimate transaction costs in these cases some authors support the use of proxies such as the number of transactions, frequency of transactions, uncertainty and distances to markets (Coase, 1937; Wang, 2003).

Given the importance of OFSP demand for farmers' adoption (Mazuze, 2004), this framework incorporates buyers' behaviour. Demand depends on the consumers' satisfaction according to the relative prices and a consumer's taste but it is also influenced by advertisement and information as well as aspiration and copying of others' behaviours (Kotler, 1965). For example, provision of nutrition information has shown to influence consumers' purchasing intention in developed countries (Cranage *et al*., 2004), but little is known about consumers' response to nutritional

information in developing countries, where food habits are more often linked to local culture, taboos and lack of alternatives.

This framework will help to prove or disprove whether the existing marketing institutions and organisations and the facilitative approach taken by the project to develop OFSP market are the key drivers of uptake of this variety by farmers, traders and consumers compared to the non-orange varieties.

CHAPTER III: DESCRIPTION OF THE STUDY AREA AND THE OFSP MARKETING INTERVENTION

This chapter provides information on the characteristics of the study area and key elements of sweet potato marketing. Section 3.1 describes the province and districts where the research was carried out. It focuses on five key topics of relevance to the study: geography, history, infrastructure, demography and agricultural systems and marketing of agricultural produce. Section 3.2 describes the marketing of sweet potato.

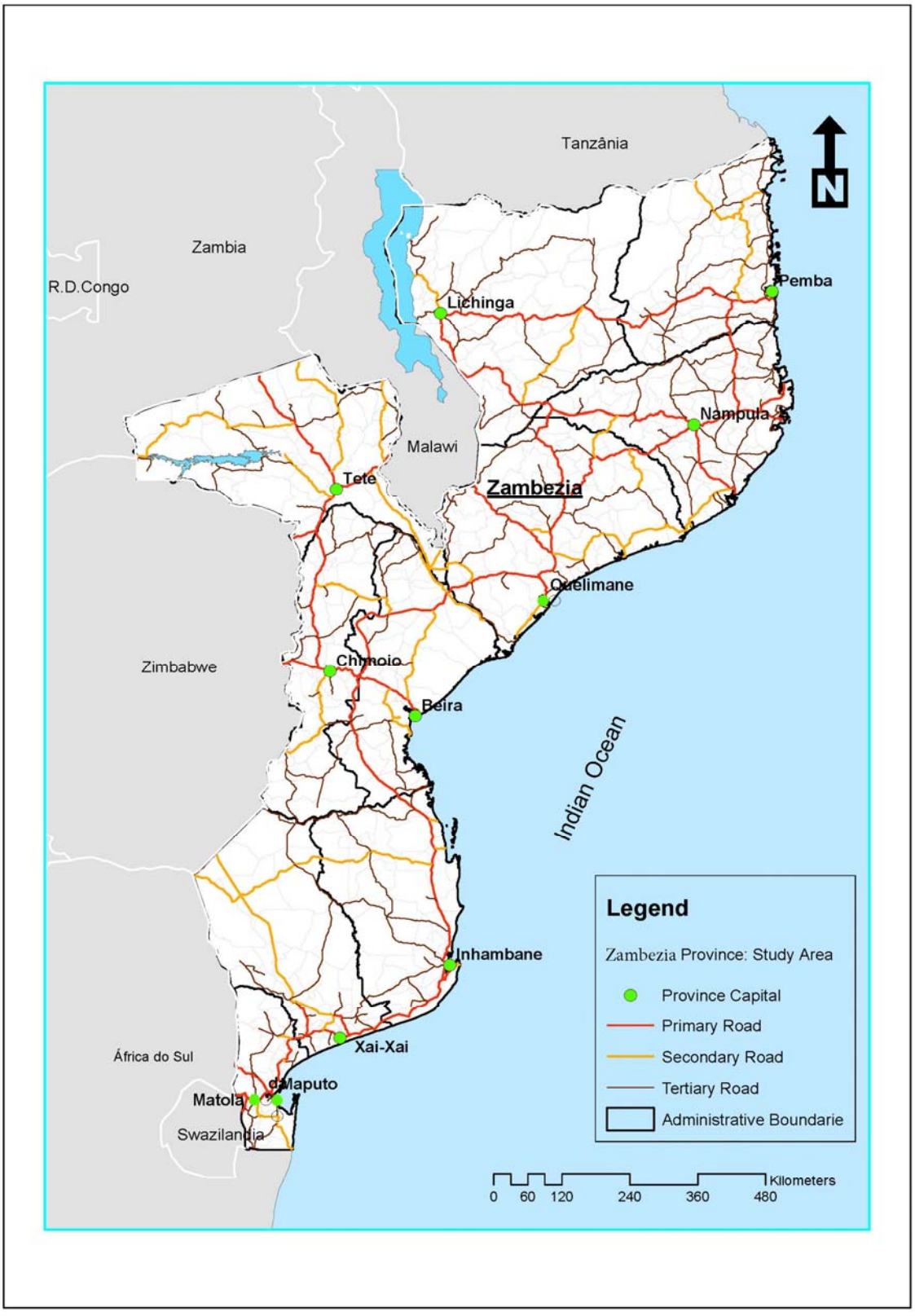
3.1 Description of the Study Area

Geography of the Study Area

Mozambique is the fourth largest country in southern Africa and shares its border with six countries (Figure 3). Its eastern boundary is the Indian Ocean, and its landward neighbours include Swaziland and South Africa to the south; Zimbabwe and Zambia to the west; Malawi to the northwest and Tanzania to the north. The country has 10 provinces, three in the south: Maputo, Gaza and Inhambane; four in the centre: Sofala, Manica, Tete and Zambézia (the study area) and; three in the north: Nampula Niassa and Cabo Delgado.

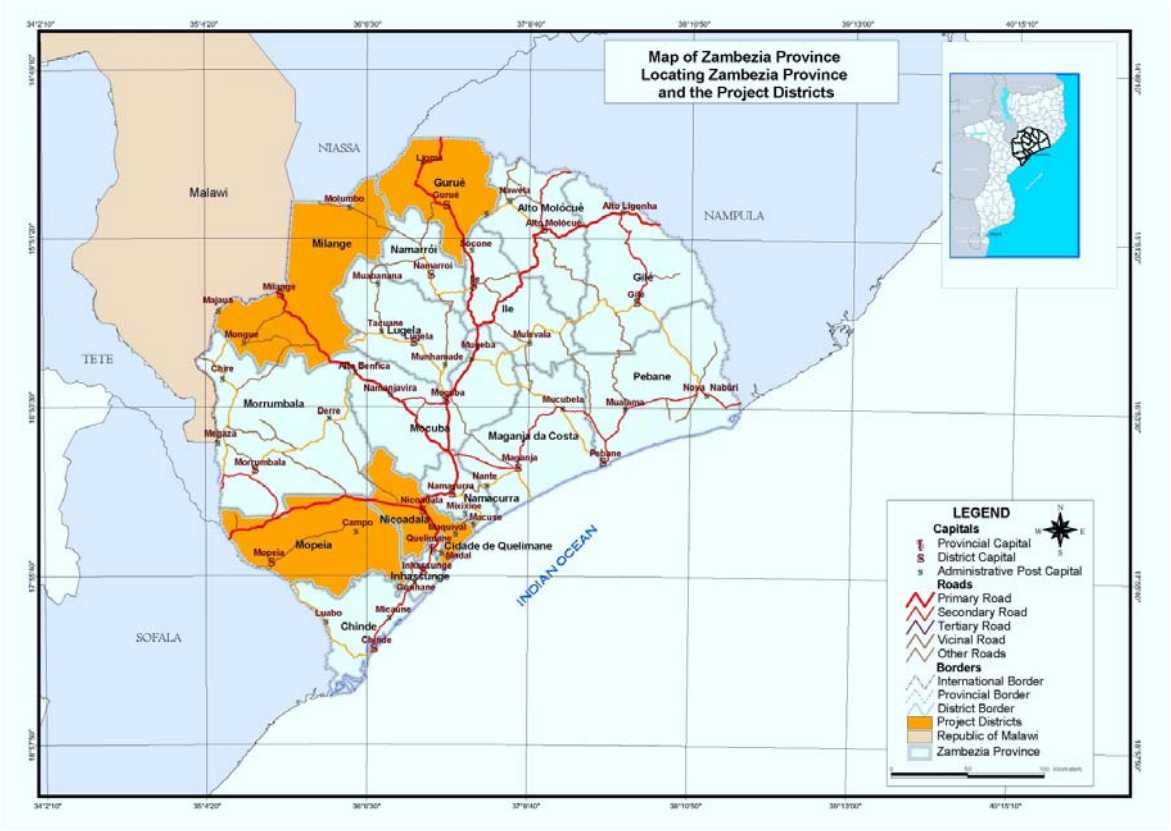
The area of study, Zambézia province in central Mozambique, sits at the axis of two important road routes – the main road linking the southern half of the country with the Northern provinces, and the road north to southern Malawi and the commercial/industrial city of Blantyre. It is bordered in the south by Sofala and Tete provinces; in the east by the Indian Ocean; in the north by Nampula and Niassa provinces and in the northwest by Malawi. The fieldwork study sites were located in four of the province's 17 districts - two districts in northern Zambézia (Milange and Gurué) and two in southern Zambézia (Nicoadala and Mopeia). The figure 4 shows the map of the province and the location of the districts of intervention.

Figure 3 Map of Mozambique



Source: MAEFP.

Figure 4 Province of Zambézia: The four study site Districts



Source: Matusse, 2015.

Milange District

Milange district is 324 kilometres to the north of Quelimane, the provincial capital, on a non-tarred road. Much of its surplus food production tends to be marketed in Malawi. The main town is located two kilometres from the official border crossing with Malawi. Milange district borders two Malawi districts - Mulanje and Phalombe. Mulanje district borders Mozambique on its eastern and southern side. It is a highly populated district with a large tea-producing area located south of the Mulanje massif. The rest of the district is characterised by smallholder farming. The Muloza River, a tributary of the Ruo River, forms the international frontier along its length. Both sides of the border have similar agro-ecological conditions and the same language, Chichêwa, is spoken although the main ethnic language in Mulanje district is Lomwe. The river facilitates the movement of traders from both sides, who commonly cross the river at the informal crossing points using canoes or by foot when the water level is low. Malawian traders buy agricultural produce in Mozambique to sell in Malawi and bring non-agricultural products to Mozambique. Blantyre, the commercial capital of Malawi, is just less than 200 kilometres from Milange and is a huge consumption centre of agricultural produce sourced from Milange district through Limbuli,

Mulanje and Chinakanaka markets, the first assembly market points on the Malawian side of the border. Further north along the border on the Malawian side are small settlements. Chiringa and Phalombe are the first assembly points for agricultural products crossing the border mainly from the Coromana area in northern Milange district.

Gurué District

Gurué district is 350 kilometres north of Quelimane on a good, recently tarred road. Surplus agricultural produce grown locally includes maize, beans, groundnuts, grapefruit and onions which tend to be purchased by traders coming from southern Zambézia as well as from southern Mozambique and from Nampula and Niassa provinces to the north. Gurué town is well known for its location amongst the Namuli Mountains and its extensive tea plantations, from which tea is exported via the port of Nacala in neighbour Nampula province. The tea plantation workers as well as the public workers increase the market for agriculture products, including sweet potatoes.

Nicoadala and Mopeia Districts

The two districts in the south Zambézia, Nicoadala and Mopeia, are 40 kilometres west and 100 kilometres south from Quelimane, respectively, and are crossed by the country's main north-south road. In Nicoadala, at the turn off to Quelimane, the main roadside market of Licuari serves as an important transit market for agricultural produce, including grains, roots and vegetables, to Quelimane. About 30 kilometres further west is Lualua market in Mopeia district, which is smaller than Licuari but is a central point used by traders buying produce in that area to sell in Licuari or Quelimane. At Lualua is the turnoff to the remote area of Posto Campo village, some 40 kilometres distant, in which the REU project was also implemented.

Quelimane, the provincial capital and international port, is largely used for export of logs and seafood that are the province's main exports. It is a large urban centre, with 193,000 inhabitants (INE, 2007b). It is located some distance from main agricultural production areas and many people are dependent on purchased food. The main staple foods sold include maize, fresh cassava and cassava flour, rice, potatoes, and sweet potato. The availability of these products varies with the time of year. Commonly, the southern districts have two cropping seasons while the northern districts have only one.

Brief History

Mozambique became independent in 1975 after 500 years of Portuguese colonization. Led by the FRELIMO (*Frente de Libertação de Moçambique*) party, the country followed a socialist orientation from independence up to reforms in the late 1980s. However, shortly after independence, in 1976, a civil war began between FRELIMO and the National Resistance of Mozambique (RENAMO). The war ended in 1992 after 16 years of fighting, in which much marketing infrastructure was destroyed and thousands of people killed (Pitcher, 2002).

The civil war between RENAMO and FRELIMO in Mozambique affected the lives of people and marketing activities in the province of Zambézia (Pitcher, 2002). The province was one where RENAMO dominated extended areas and many people were displaced, stopped to produce and moved to the neighbouring country of Malawi. Nowadays the political power of RENAMO is visible in Zambézia. During that time, the rest of the population concentrated in the city and depended on donations for survival decreasing dramatically their agricultural production and trade. With the end of the war many people returned to Zambézia and restarted their activities (Bowen, 1998). This movement back contributed to the import of production technology from Malawi and many farmers received admarc varieties of yellow sweet potatoes to produce. Also, informal marketing between the two countries increased.

Economically, after independence the country followed socialism orientation and centrally-planned economy until 1987. Under the socialist system farmers had to participate actively in cooperatives and collective fields, called State Fields (*machambas estatais*). The movement of people, including traders, and goods were restricted and supervised via the use of authorization letters issued by the local authorities. “The figure of trader has always been contested, and has been the object of policing and social control” (Buur, 2007: 1). In the early 1980s some studies forecasted the erosion of socialism and introduction of capitalism in Mozambique, which later occurred in the late 1980s into the 1990s (Pitcher, 2002). Reforms introduced in 1987, when the government set up the Economics Rehabilitation Programme (PRE), included the change from a centrally-planned to a market-type economy. This led to a free circulation of people and goods within the country and provinces as well as the flourishing of an informal market sector (MOA/MSU, 1993).

Regarding agriculture production, the civil war limited activities and worsened the food shortages. Raikes (1993) argues that the decline in agricultural production after independence was, in part, a

result of poor government policies that concentrated on the modern sector, based on large scale equipment, skills and funds which excluded the small-scale farmers. With the end of the war in 1992, people returned from the cities and refugee camps to the rural areas. Production has increased in the subsequent years as a result of expansion of the planted area but also linked to the reforms set in place by the turn of the 1980s and the good weather conditions up to 2000 (Tschirley, 1998). The largest flood in the last 50 years occurred in 2000 and affected agriculture in Mozambique and in Zambézia, during which hectares of crops were lost and agricultural infrastructures were destroyed. The following years were characterized by agriculture production recovery although with some intercalated localized floods and droughts, especially in Zambézia (TIA 2002, 2003, 2005, 2006, 2007, 2008).

Infrastructure and Communications

Generally, the infrastructure in Zambézia is poor as a result of destruction and limited resources for upgrading. In terms of roads, Zambézia benefits from the main national highway (EN1) that crosses the province and links the districts of Mopeia, Nicoadala, Mocuba, Ile, and Alto Molócue. Gurué district is not traversed by the main road but linked to the south by a tarred road. Milange is linked to Quelimane and Gurué by poor non-tarred roads, but is well linked to Malawi by a good road plus a power line, via which it receives its electricity supply. Each district has a central market where fresh produce and other products are sold. All the districts are now covered by at least one mobile phone company, although in Milange the signal is not reliable. Some communities out of the range of Mozambican mobile signal benefit from Malawian phone signals. Newspapers are only available in the provincial capital, Quelimane. However, the provincial broadcasting radio covers the entire province and is connected to the national radio in some periods of the day. Local community radios broadcasting in the local language exist in Gurué and Milange. In Milange, many of the rural communities receive Malawian radio stations which broadcast in the common local language.

Demography

Zambézia is the second most populated province of Mozambique with 4 million inhabitants, of the national total of 20 million (INE, 2007a). A large proportion of the population live in the four

districts covered by the REU project (Table 3). Most of the population live in the rural areas and the main activity is semi-subsistence agriculture or related activities.

Table 3 Population in the project Districts

	Population			
District or City	Total	%	Men	Women
Quelimane*	192,876	5	98,351	94,467
Nicoadala	232,929	6	112,212	120,717
Mopeia	115,614	3	56,011	59,603
Milange	515,029	13	248,998	266,031
Gurué	302,948	8	146,508	156,440
Total	3,898,854		1,862,091	2,030,769

* Provincial capital.
Source: Third population census, INE, 2007.

Agricultural Production

Mozambican is essentially an agricultural country. About 80% of active population is engaged in agriculture activities (Conselho de Ministros, 2006). Agricultural production is being fluctuating during the years affecting food security and nutrition. The agricultural sector reached the highest production early in the 1970s under the colonial administration, but then it fell during the subsequent decades as result of adverse weather conditions and the exodus of skilled Portuguese residents leaving behind their productive agricultural production units (Raikes, 1983).

With some years of good weather conditions, agriculture has become again the most important sector in the country's economy in terms of employment and generation of income. Although the contribution of agriculture in GDP declined between 1996 and 2006, researchers believe that this is not so much an indication of the real decline of the agriculture sector but the signal of a growing economy as a whole, reflecting the diversification of economic activity (FAO, 2004b; USAID, 2008). The importance of agriculture in the rural economy and for smallholders in Mozambique is recognised. Numerous studies indicate that it remains the main activity in rural areas, and the main source of food and income (Carrilho *et al.*; 2003, Massingarela *et al.*, 2005; Bias and Donovan, 2003; Bowen, 1998; Chaliane, 2002; MOA/MSU/UA, 1992b; MOA/MSU/UA, 1992a).

Zambézia is essentially an agricultural province as the rest of the country and most of the population live in rural areas depending on agricultural activities for their livelihood. With a total area of 105.000 square kilometres, about 10.5 million hectares, it is estimated that in the province

1.4 million hectares is available for agriculture, summing up to a total of 7 million hectares available all over the country (MINAG, 2008). The main crops in the province are cereals (maize, sorghum and rice), legumes (beans and groundnuts), onions, garlic and tubers. The most cultivated tubers in the province are cassava and sweet potatoes, which are grown by 79% and 27% of families, respectively. Nationally, the province is ranked fifth in production of sweet potatoes. A study undertaken by World Vision in Zambézia, which involved 1,644 households in eight of seventeen districts, found that about 35 percent of households produce sweet potato and most of them grow white varieties. OFSP is cultivated by ten percent of producers and sold by approximately four percent of households in the province (Scott, 2009). But, orange sweet potatoes varieties were only being grown by four percent of families and the province was ranked sixth nation-wide (TIA 2007). Zambézia is also known by its tea and coconut trees plantations, the later ranked first in Mozambique and one of largest in the world. The agricultural sector is completed with important cash crops such as cotton, pigeon pea, cashew and tobacco. Nevertheless, the use of improved inputs and assistance by extension services is limited to cash crops and the use of improved hybrid seed maize by few producers close to Malawi border. The production of sweet potatoes depends on the local varieties vines kept from previous season.

These crops are produced by both farming systems prevailing in Zambézia, the small-scale and the medium-scale sectors. The small-scale farming system, also known as the family farming sector, consists of farm areas of less than 10 hectares and accounts for 99 percent of the total national agricultural land (MINAG, 2007b). The medium-scale farming system, also known as commercial sector, accounts for one percent. For both systems and depending on the region and the type of crop, one to two production seasons are common practice. Both systems are mainly rain-fed.

These two farming systems differ basically in their aim and use of available resources. In small-scale farming, farmers primarily produce for family consumption and, if there is a surplus, they sell some produce in the local markets. The average plot size is 1.2 hectares in which usually shifting cultivation and intercropping is practiced. Family members provide the labour force for farming, though casual labour (*ganho-ganho*), paid in cash or kind, is used on bigger plots as well (Negrão, 2001; Wulff and Torp, 2005). In the small-scale farming system the use of improved seeds, fertilisers and irrigation is limited (Massingue *et al.*, 2004; FAO, 2006). This results in low productivity and production. Medium-scale farmers cultivate more than a ten hectares average plot and prioritize commercial farming. It is practiced overwhelmingly by private farmers, joint

ventures and occasionally by cooperatives, using a remunerated workforce with a view to supplying urban and export markets (Wulff and Torp, 2005).

Small-scale farmers dominate the agricultural sector and play an important role in the economy of Zambézia province. The agricultural surveys of the Ministry of Agriculture found that almost 99% of producers were in regime of small or medium holdings and only one percent was large holdings (TIA 2007). Together these farmers contribute a significant share of the GDP. In 2006, agriculture generated an estimated 25.2 percent of GDP in Mozambique (USAID, 2008).

Agricultural Markets in Zambézia, Mozambique

Categorization of markets and types of participants in these dynamic formal and informal marketing activities is not easy. Agricultural marketing literature identifies various typologies of markets and types of traders in Mozambique, particularly in Zambézia (Bowen, 1998, Santos *et al.*, 2002, Tickner, 1998, Whiteside, 1998). The Agricultural Marketing Information System (SIMA) of the Ministry of Agriculture classifies markets according to their geographic location, level of trade and type of market (Santos, *Op. cit.*). In terms of market place location, SIMA distinguishes provincial markets, located at provincial capital, and the district markets in district capitals.

In terms of level of trade, markets are divided into retail (market place and shops, called *loja* in Portuguese); wholesale shops (*armazenista*) and producer or local markets mostly used as the nearest local market where farmers sell their produce. In this typology, *lojas* and wholesale shops commonly sell large and standardised units (sale by weight) while traders in district and municipal markets sell small amounts of non-standardised units (sale by volume).

Santos (2002) identifies two types of markets in terms of organisation: formal and informal markets. These markets are differentiated by the use, or not, of standardized units and recognition by authorities, with obligation of payment of a market fee, but currently both types of markets are using non-standardized volumetric units of sale (heaps, cans, baskets, basins, etc.) and fees are also collected in some informal markets. The informal sector developed with emergence of informal retailers and wholesalers with lower amounts of start-up capital who became more important in food marketing than retail and wholesale marketing in formal shops and district warehouses (Santos, *Op. cit.*).

Another type of market, named rural periodic market, was identified in rural areas of central and northern Mozambique, particularly in Zambézia (Bowen, 1998; Tickner, 1998; Whiteside, 1998; Ministério da Indústria, 1999). These markets spread rapidly in Zambézia, especially in the north of the province, during the 1990s (Ministério da Indústria, 1999). According to Tickner (1998), the periodic markets were established in rural areas to allow producers, who are scattered and spend most of their time producing, to bulk up and sell or exchange their produce regularly once per week, per month and even once a year. This kind of market has become common nowadays. By the later 1992, some 87 periodic markets were operating in northern Zambézia (Bowen, *Op. cit.*).

Such markets facilitate and reduce the costs and risks of trading as well by supplying produce at an identified point and at a determined time or period. This system of periodic markets (*feiras*) in Mozambique was introduced by Arab and Portuguese traders in earlier centuries and the evidence of Portuguese culture on market days is the prevailing names of *feiras* for the days of the week in the Portuguese language (*segunda feira, terca feira*, etc.) (Tickner, *Op. cit.*). In Milange district, these markets commonly operate twice weekly and are concentrated close to the border with Malawi enabling bulking and exchange of products between producers, traders and consumers of the two countries (Tickner, *Op. cit.*). The dynamic of these markets and their interactions, both within Mozambique and between Mozambique and Malawi, need an in-depth investigation to fully understand their contribution to the growth of rural economy and the process of agricultural marketing.

Typology of Traders in Zambézia

All of these markets, mentioned above, are operated by different types of traders in a complex and dynamic operational structure and it is hard to obtain a clear picture of the mix of traders with specific markets and produce traded since different categories of traders can participate in more than one category simultaneously or at different times. The categories of traders are classified differently by different authors. The Agricultural Marketing Support Programme (*Programa de Apoio aos Mercados Agricolas*-PAMA) in Mozambique summarises the categories of traders in two provinces in northern Mozambique as follows: a) small scale non-licensed traders; b) small and medium scale formal traders and c) large scale licensed traders (PAMA, 2008a). About ten categories of traders were identified in Zambézia by Bowen (1998). These included micro buyers,

bicycle traders, rural producer-traders; part-time itinerant traders and professional itinerant traders. Tickner (1998, p.17) distinguishes six groups of traders both in rural and urban areas:

i) Local itinerant traders, who take the produce to the nearest town and sell it;

ii) Itinerant traders, who have regular contact with a bigger trader to whom they sell the produce;

iii) Primarily consumer goods sellers, who also purchase limited quantities of selected crops;

iv) Some traders who initially operated as itinerant traders moving between markets but who have gradually established a permanent selling outlet usually in local town, where they live with their family;

v) Buying-agents for urban-based traders – these traders often have stores or shops in towns, and access to transport (their own or hired);

vi) Urban retailers or traders who have established shops in towns, but who come to such markets to extend their trading operations.

A key role is played by small-scale itinerant traders and/or retailers who link production and consumption at different levels including through provincial markets, district/municipal markets, roadside markets, local markets, periodic markets and informal exports (Tickner, 1998; Tchale, 2001). Most of these traders are men (Whiteside, 1998; Bowen, 1998). Women can frequently be found in rural periodic markets selling produce from their own fields rather than acting as a permanent itinerant trader. Women are also involved in selling cooked food for market participants in periodic markets (Tickner, 1998). However, the active role of women as itinerant traders in other parts of the country has been reported. Women traders from southern Mozambique have been observed buying maize, beans and groundnuts in central and northern Mozambique, including Zambézia, to sell in the deficit regions of the south (Cravinho, 1998; SIMA, 2007c; SIMA, 2007a; SIMA, 2007b; Vletter and Polana, 2001). This process is facilitated by existence of transport infrastructure and a reliable transportation system which uses the main road linking the south and north of the country. Conversely, the poor linkages and transport between districts and villages constrain the movement of people and marketing activities (Abdula, 2005).

Marketing linkages between production areas and the main markets in Zambézia also depend on other aspects such as market size (related to population density) and diversification of income-generating activities (to provide cash buyers). Producers in southern Zambézia, in districts of Nicoadala and Mopeia (research study areas), in terms of food marketing rely on demand from

Quelimane urban market due to its high population density and a large proportion of the population engaged in relatively high income non-farm activities (ORAM, 2005). An inventory by ORAM has found that the main agricultural products traded in Quelimane from the southern districts were rice from Nicoadala, Mopeia and Maganja da Costa and pineapples from Nicoadala. However, this report did not include the significant role of these districts, especially Nicoadala and Mopeia, in supplying vegetables and fruits to the Quelimane market (MAE, 2005b; MAE, 2005a) nor of the quantity of sweet potatoes sourced from Maganja da Costa.

In northern Zambézia, marketing of agricultural produce is linked to demand in food-deficit Malawi. Large quantities of produce surplus from Gurué and Milange district were reportedly sold in Malawi (Ministério da Indústria, 1999, AIM, 2010). In 2010, the district agricultural officials estimated that more than fifty percent of maize produced was exported informally to Malawi (AIM, 2010).

The lack of up-to-date information on food crop marketing in Zambézia is not exclusive to this province, as noted in a PAMA report analysing policies and procedures constraining smallholders' access to input and output markets in Mozambique. It urged interested partners to work together and conduct studies in subsectors, such as maize and cassava, to provide information and knowledge to overcome the limited access to output markets for smallholders (PAMA, 2003).

In 2005, the Government of Mozambique approved the National Agricultural Marketing Strategy, which replaced an earlier strategy of 2001. In 2006, the Action Plan for Poverty Reduction (PARPA II) was approved and stressed the role of agricultural marketing for national economic growth (Conselho de Ministros, 2005, Conselho de Ministros, 2006). To implement this policy, focus was given to the development of markets through the PAMA within the National Directorate of Rural Development (DNDR). Among other activities, this involved an implementation of some infrastructural and organisational programme to support improvement of agricultural marketing and traders' capacity building in Niassa and Cabo Delgado provinces, but not Zambézia the biggest agricultural producer (PAMA, 2008b). This was an additional effort to support agricultural marketing, to be done in conjunction with the national Agricultural Marketing Information System (SIMA) part of the Ministry of Agriculture since 1991. SIMA collects and disseminates marketing information related to prices, product availability and transport for 26 products, including sweet potato for the last four years.

3.2 The Promotion of OFSP in Zambézia

3.2.1 Towards Sustainable Nutrition Improvement Project

It was in response to the vitamin A deficiency prevalence that a research project entitled *Towards Sustainable Nutrition Improvement Project* (TSNI) was implemented between 2002 and 2005, in two districts of Zambézia province, aimed at improving smallholders' access to high-yielding orange-fleshed sweet potato varieties rich in beta-carotene[3]. The project that benefited 827 households also looked at increasing OFSP demand and market development as important components of an approach to ensure sustainable adoption of the crop, the spread of consumption and expansion of production areas. The results of this project[4] showed that it was possible to increase vitamin A intake and reduce VAD among rural households. Some impact on agriculture knowledge as well as some behaviour change was also achieved despite the short-term period of implementation (Low *et al*., 2005). The intervention trained selected farmers to buy and sell at fixed and premium price graded sweet potatoes of producers from intervention areas. This was stimulated by marketing promotion campaigns targeting potential consumers. The result was that 32% of households producing sweet potatoes sold some in intervention areas and 83% of it was OFSP, attracting farmers to continue growing the new crop (Low *et al., Op. cit.*).

Key interventions to support uptake of OFSP in Zambézia

In the agricultural implantation component, the farming model in each location village was based around a group[5] of 100 farming households, who would each grow up to 0.5 hectares of OFSP. Each group was assisted by a promoter – a "master-farmer" type, who was trained by project extension staff to provide information and technical assistance to the group members. In addition, a further 12 farmers[6] were recruited, in each extension zone who were willing to grow a larger areas of OFSP, between 0.5 ha and two hectares, primarily for sale. These were termed "Medium-scale producers" (MSP), and a total of 104 were recruited in all four districts. The farming group

[3] The precursor to Vitamin A
[4] Implemented by Michigan State University, the Nutrition Division of the Ministry of Health, World Vision Mozambique, Helen Keller International, the Southern African Root Crops Research Network (SARRNET), and the National Agronomic Research Institute of Mozambique (INIA) - now IIAM
[5] These agricultural groups were based in existing one or mostly two or three church groups. This facilitated the project to achieve the targeted 100 household members in each village using existing and more stable local organization.
[6] The recruitment of MSP were based on principles set by the project that included marketing orientation and experience of the farmer in other crops and capacity to grow sweet potato in area not less than 0.5 hectares.

members were to be provided with two kilograms of sweet potato vines, sufficient to plant 0.003 hectares, the roots from which were intended to be largely consumed by the household themselves. Furthermore, each agricultural group had to have seven nutritional promoters, each assisting ten mothers of children under five years old.

3.2.2 The Marketing Component of the REU Project

The marketing component of the REU project was divided into two with implementation undertaken by World Vision Mozambique and operations research undertaken by the Natural Resources Institute (NRI). According to the REU project framework (see Chapter I), the marketing component was concerned initially with undertaking diagnostic work on the existing sweet potato value chain. This involved carrying out a number of marketing investigations, including assessment of previous marketing strategies, in order to provide adequate information for implementation and scaling up. This involved undertaking detailed market chain analyses to identify market actors, and trading constraints and opportunities to feedback into the implementation process and identify areas that project implementation staff could address. From these initial diagnoses, a marketing strategy was developed to guide project implementation, which would ensure that surplus production particularly that of the MSP, could find a ready market. For example, after marketing failure to absorb the produce in hands of producers in some areas in 2008 some departments of project implementation suggested direct intervention in the marketing process taking the produce from producers to the markets rather than a facilitative approach. In contrast, this research suggested the formation of marketing committees to help the linkages between the farmers and markets which improved market access in 2009.

This research contributed to the operations research activities on sweet potato marketing. The field work carried out during the study provided feedback to the implementation team particularly to the marketing component through regular reports and meetings with NGO staff. It also contributed to the lesson learning and best practices identification activities of the project. In parallel, the research and data collected fed the PhD work as it was designed from the beginning, including the questionnaires, providing the needed information and data to respond to the research questions. Additional questions to questionnaires were added to cover PhD research requirements when needed.

The interrelationship between the three components (seed system, demand creation and market development) of the REU project is summarized in figure 2. The diagram shows how the REU activities fitted within the wider HarvestPlus programme approach for developing biofortified crops rich in micronutrients. The REU implementation and operations research has also supported the Impact Assessment activities, including ex-ante and ex-post evaluations. This thesis also draws upon the impact assessment datasets.

The World Vision marketing implementation team involved one marketing coordinator and ten agricultural extensionists. It was responsible for undertaking marketing activities according to the project strategy designed. This stressed the need for market facilitation rather than intervention. Marketing facilitation activities such as radio commercials and programme, promotions, road signs, murals, and training of traders and farmers and linking them each other were implemented.

Other complementary activities were carried out to diversify OFSP consumption and widen targeted consumers. The marketing implementation team worked with industrial and small-scale bakers to make OFSP bread (named "golden bread") rich in vitamin A as a way to stimulate the market for OFSP.

3.2.3 Marketing Strategy

The strategy for all four project districts was to facilitate improved market access for OFSP through working with existing sweet potato traders to develop their awareness of OFSP and link them to producers while increasing consumer awareness of the benefits of the product to increase demand. The overall aim was to strengthen the capacity of farmers and market actors, mainly small-scale retail/assembler traders, to sell their produce. This was done through i) the provision of training to sweet potato traders on the nutritional and commercial advantages of selling OFSP, ii) developing linkages between farmers and traders and other stakeholders in the marketing chain and iii) by creating demand through radio messages and other publicity, aimed mainly at consumers. Following a review after the end of year 1, it was decided that there was a need, in addition, to provide business and marketing training to marketing committees – groups of medium-scale farmers and some small-scale producers - interested in producing for the market in a number of locations.

The project approach has consisted of facilitating the linkages between project farmers – mainly more market-oriented medium-scale producers (MSP) rather than the small-scale farmer group members (SSP) - and existing sweet potato traders and other buyers rather than to establish alternative trading routes. Activities have focused on raising awareness of the benefits of the product and increasing consumer demand as well as developing linkages between farmers and traders to ensure that available supply could be marketed. Initial work concentrated on identifying sweet potato traders, mainly retailer traders, and then providing them training on basic marketing topics and of the benefits of OFSP. In 2007, some 103 traders from seven markets received training. Trained market traders received small portable OFSP promotional boards while sellers of processed products, such as cakes and bread received a larger display board. Later, larger, permanent advertising boards were placed in some markets and directional signs, advertising OFSP, were placed in urban areas. Traders were taken to meet farmers, mainly MSP, and shown their OFSP plots and farmers were taken to meet traders at the nearest large market. A trader database was compiled to collate contact numbers of traders and other large or regular purchasers. This was distributed to extensionists and promoters. Extensionists were also encouraged to get phone numbers of local traders. MSP farmers were introduced to bakeries making golden bread and to other processors or institutional buyers, such as hospitals. Radio spot messages and programme were broadcasted on local radio stations on OFSP availability and its health benefits. Other market development activities included organising urban OFSP promotion days and painting of informative wall murals and signs in towns and near markets.

The challenge was to avoid directly intervening in marketing, such as by transporting farmers' produce to market or buying produce from them, and getting farmers to understand that they were responsible for selling their own produce, although the project staff would do everything possible to grow the market and create demand. The aim to not increase dependence on the project by getting involved in crop purchase and transport was challenging, as many farmers are used to a new promoted cash crop being purchased by the promoters (a private company, government and some NGOs) at a fixed price. However, the compensation provided to medium-scale producers whose production was disturbed during the CIP-managed yield assessment exercise, not surprisingly, was seen by farmers as the project buying produce. When MSP were asked about buyers of OFSP, 23 percent (13/56 MSP) of those who had sold any OFSP mentioned the project as a buyer. This also had repercussions, in some areas, for farmers' views on what constituted a reasonable price.

The marketing model was initially very similar in each of the four project districts although as more came to be known about each area and their specific problems and needs, zone-specific activities were derived. For example, OFSP production was largest in Milange and farmers, mainly MSP, produced large amounts and needed to find market outlets. The project arranged for radio messages about OFSP benefits and availability in particular locations to be broadcasted on Malawian radio stations. Road signs announcing the name of a village and that it had OFSP production were put up along the main road and many signs were put up in Milange town. A covered stall was constructed in the market close to the border crossing at Muloza in Milange district to promote OFSP sales. An initiative was launched to link OFSP medium-scale farmers with traders in the Phalombe district of Malawi.

The marketing activities to promote and facilitate the linkage between the supply and the demand of sweet potato had advantages and challenges. The marketing model raised actors' awareness about OFSP and its nutrition and health advantage, especially consumers who play a key role for marketing functioning. It also created the needed links between suppliers, intermediaries and end users, filling the gap of weak marketing institutions. Under the model producers and traders were helped to start up marketing activities by learning basic marketing skills such as small business plan. It also encouraged traders and producers to use their resources to participate in the market to ensure that marketing activities continued normally after phasing out the intervention. However, the model had its limitations as well. There was a temptation of subsidizing transport, helping traders to get to supply sites free of transport charges distorting the marketing margins earned by traders. In this effort of linking producers to buyers, there was a wrong perception of farmers that the intervention was the main responsible of finding a market and helps them to take the produce to the buyers. Some producers reported rotten produce while waiting for the intervention to collect it.

CHAPTER IV: METHODOLOGY

4.1 Research Methodology and Methods

In the context of the conceptual framework, various techniques were used to collect secondary and original data. The challenge of finding suitable evidence for the research questions, defined in section 1.7, resulted in the methodology and methods described in the following section.

4.2 Study Design and Methods for Data Collection

The study started early in 2007 with a rapid appraisal of the study areas to obtain an overview of the marketing issues such as types of produce sold, prices obtained and varieties available, the actors involved in the production and marketing processes and the challenges they faced. Then a literature review was undertaken in order to gain an in-depth understanding of the concepts of agricultural marketing and the economic theories used to analyse marketing operations. Particular focus was given to relevant publications and data related to agricultural marketing in Mozambique and in Zambézia province specifically. Using research methods described in section 4.2.2, fieldwork and data collection were carried out between 2007 and 2010.

The initial fieldwork involved detailed information gathering on the organisation of the sweet potato subsector. This involved collecting data about supply sites, markets, routes between supply sites and the main consumption areas; identification of marketing chain actors and their horizontal and vertical linkages which was undertaken using direct observation and key informant interviews. The relationships among and between producers, traders and consumers were investigated. This work included the understanding of the linkage of market actors with the marketing regulatory institutions including informal rules and the REU project.

During visits to the markets in the study area, spot prices were collected and sacks and sweet potato heaps and sacks were weighted to enable price calculation and subsequent data analysis [Appendix 6 figures A1 and A2]. The diagnostic work also included mapping (obtaining geographic coordinates) of the markets and their supply sites, tracking relevant supply routes onto maps and photographic documentation in order to design the subsector map, estimate distances from supply sites to market and identify relevant marketing institutions.

The second step of fieldwork entailed collection of detailed marketing activity information and market organisation from traders to learn how subsector structure and institutions shape marketing operations. A market data collection system was set up in four main markets of the study area: the Central market in Milange (an urban, town-centre market); the Central market in Gurué (an urban town-centre market); Licuari market in Nicoadala (a roadside market) and Brandão market in Quelimane (an urban town-centre market). One long-standing sweet potato trader (subsequently referred to as a reference trader) was contracted in each market to record weekly price data (the importance of price is highlighted in the literature review – Chapter II) and the flow of sweet potato, including quantities of both OFSP and non-OFSP, into their market. They also recorded the supply locations and the type of transport used to carry the produce to the market. The reference traders were trained and equipped with electronic scales to weigh heaps and sacks, which are the common measures used in sweet potato marketing in Zambézia. In addition, two formal trader surveys were conducted in 2008 and 2009 during the peak of the marketing season which starts in June and ends in July [see questionnaires in Appendix 1] to capture their demographic variables (age, sex, education), activities, financial capital to run the business, prices, costs, margins, relationship with other actors in the marketing chain and the intervention, experience selling sweet potato and other crops.

Third, two formal quantitative surveys with medium-scale producers and two qualitative investigations, one with small-scale producers and another one with medium-scale producers, to obtain detailed information about their marketing experiences and results were undertaken [Appendix 2]. The first quantitative medium-scale producers' survey took place in 2007 and it was led by CIP team in collaboration with NRI, particularly this PhD research, and the second was led for this PhD research and conducted in January and February 2010 to assess the marketing season of 2009. The first qualitative survey covered medium-scale producers and the small-scale producers, both took place in 2008 as follow up to the results of the first quantitative medium-scale producers' survey.

Fourth, two quantitative surveys were conducted targeting consumers in the main markets of the four districts studied, including Quelimane, the major market in the province given its position as provincial capital and its linkage to the main sweet potato production areas and district markets [questionnaire in Appendix 3]. These were undertaken in 2008 and 2009 to assess the demand for OFSP by consumers, their knowledge about the produce and its benefits, and their willingness to buy in the next future if the produce was available in the market.

Finally, sources of secondary data were identified and used to provide additional information. These included REU Project reports: milestone reports, non-published work and impact reports. Further information on prices was obtained from the national Agricultural Market Information System (SIMA) prices time series, which were combined with price and quantities of sweet potato collected by reference traders[7] [Appendix 4, forms 4a and 4b].

4.2.1 Methods, Sampling Frames and Sample Sizes

As outlined in section 4.2, six surveys and two in-depth qualitative investigations were undertaken during the research period. The four surveys of traders and that of consumers were carried out during the sweet potato marketing season between June and July in 2008 and in 2009 at the same time in the same markets in four districts (Milange, Gurué Nicoadala and Mopeia) and Quelimane city. The markets selected in 2008 were the Central market in Milange town and the '*Feira da Amizade'* – a daily market close to the Malawi border; Mangassanja, Mbessa and Coromana rural markets in correspondent villages in Milange; Central market and Paróquia in Gurué town; Licuari in Nicoadala district, Lualua in Mopeia district and Brandão in Quelimane town. Given the low number of potential respondents in Mopeia, this market was dropped in 2008. The districts selected were those where the OFSP project was being implemented, apart from Quelimane which was included as it is the major consumption site in the province and because of its proximity and market linkage to Nicoadala district according to physical observations and the diagnostic marketing investigation undertaken earlier by NRI (Coote, 2006b).

In 2009, the same districts were surveyed to evaluate the evolution of sweet potato marketing compared to the previous season but some markets were dropped for various reasons explained in this section. In Milange, the Central market, Mbessa, Mangassanja and Coromana were revisited. The *Feira da Amizade* market was excluded given its similarities to the Central market. In Gurué, the two markets included in the survey in 2008 (Central and Paróquia) had been converted into one new market, called Ana Rita where the 2009 survey was undertaken.

Carrying out the two surveys, of consumers and traders, simultaneously was practical and provided operational and logistic advantages because the targeted groups were in same place, at the marketplace. Consumers were the first group to be interviewed when traders were busy in the early

[7] Reference traders are experienced traders in the studied markets who were selected and trained to collect marketing information.

hours (from 6am to 8.30am) selling their produce to consumers, who were buying sweet potato for cooking for their breakfast. Later on, in the afternoon between 4pm and 6pm, it was possible to interview the consumers again coming to purchase sweet potato for their next day breakfast. The traders were interviewed from 9am to 3pm when they were less busy with customers.

The two quantitative surveys of medium-scale producers (MSP), one in 2007 and another in 2010, included all producers registered as MSP by the REU project in all four districts, actually resulting in a census of producers. The follow up small-scale producers' qualitative investigation was carried out in the same four districts but with a sample purposively selected by project promoters to enable the researcher to learn about their marketing experiences since the last marketing season (the previous producer survey only included MSP). Each small-scale producer was interviewed individually to share his/her reasons for growing the crop; the interaction with other subsector actors; the quantities sold; the place where the produce was sold; the bargaining process and experience of selling other crops. The following subsections describe the details of sample selection for each survey or investigation.

4.2.2 Sweet Potato Consumers Survey

The purpose of the consumer survey was to estimate demand for sweet potato and orange-fleshed sweet potato though collection of data on quantities purchased and consumers' purchasing frequency in the four districts where the REU project was implemented. The questions were formulated based on topics suggested by marketing literature on the linkage between consumer demand and other factors such as prices including discounts; buyers' preferences; individual and household income and household demographic characteristics. The purpose of this survey was to provide evidence relating to whether increasing demand stimulates trading and production and to see if promotion make traders and producers increase their rate of OFSP purchase and consumption. The survey also looked at sweet potato consumer profiles, including age, gender, size of household and decision making on sweet potato purchasing. Other issues, related to consumers' knowledge, information and attitudes about OFSP benefits, were also covered. In 2008, a sample of 416 of respondents was opportunistically selected in the markets at Quelimane, Licuari-Nicoadala, Gurué and Milange. The enumerators interviewed all consumers they could find in the market who had bought sweet potatoes. Using the same methodology, in 2009, 491 consumers were surveyed

(Table 4). Although a sample of 100 consumers was planned for each market, in some cases it was not possible to reach the targeted number because of the shortage of buyers and of produce.

Table 4 Sweet potato consumers interviewed per market in Zambézia, 2008 - 2009

District	Market	Sample size in 2008	Sample size in 2009	Market Characteristics
Milange	Central	103	101	Urban market in town centre
	Feira da Amizade	64		Market in trading area on edge of town
	Coromana	16	40	Rural periodic market
	Mbessa/Mangassanja	1	41	Rural periodic market
Gurué	Ana Rita		102	Urban markets in town centre
	Central	67		
	Paróquia	36		
Nicoadala	Licuari	27	100	Rural transit market
Mopeia	Lualua		5	Rural market
Quelimane	Brandão	102	102	Urban market in centre of provincial capital
Total		416	491	

Source: Consumers' surveys 2008 and 2009.

A one-page questionnaire of 33 questions was designed to be administered in four to five minutes. This recognised and respected the fact that consumers are usually hurrying to use the sweet potato they have just purchased for their breakfast. The interviews had to be undertaken with enumerators standing, and if necessary, following the buyer on his or her way back home [Appendix 6 figure A3]. This time shortage was taken into consideration when designing the questionnaire to minimise the length of the interview.

For this survey, four enumerators, speaking Portuguese, Mozambique's official language, and the appropriate local languages, were selected and trained. Consumers were free to stop the interview if they wanted to and allowed to not respond to questions if they didn't want to. The local market authorities were contacted in advance to request permission to carry out the surveys, which required giving an estimation of the number of days it might take.

4.2.3 Sweet Potato Traders Survey

The trader survey aimed to assessing sweet potato and orange-fleshed sweet potato (OFSP) marketing, focusing on traders' activities, to understand their role in the market chain, especially in

integrating a new biofortified sweet potato variety in their daily business activities. Its main purpose was to develop a typology, including the concentration, of sweet potato traders operating in the markets in the four districts covered by the REU Project in Zambézia. This included quantifying traders' demographic characteristics, such as age, gender, education and size of household. The survey also intended to understand how traders had become involved in sweet potato trading and their marketing experience in trading OFSP. For this, data on traders' operations including their supply sites, quantities traded, marketing costs, and prices paid as well as traders' behaviour relating to their participation in the market bargaining process with producers and consumers throughout the year and their relationships with other marketing actors were collected. An additional purpose was to assess marketing margins of the main sweet potatoes varieties which is an important driver of traders' engagement, according to the literature.

They were few sweet potatoes traders in these markets and all of them present in the selected markets during the two days of survey were interviewed. The interviews were undertaken outside of the traders' busy hours, from 9am to 3pm. Four enumerators speaking both Portuguese and local languages were trained to administrate the survey using a formal questionnaire [Appendix 6 figure A4].

There were fewer sweet potato traders in the markets in 2008 compared to 2009 (table 5). This difference is, in part, due to the reduced production in 2008 following a period of drought. In the periodic market of Mbessa, in Milange district, it was reported by market officials that around 20 traders were trading in sweet potato during the previous year's (2007) marketing season but during the study in 2008, only two traders were found. The local market official indicated that the scarcity of the produce was forcing traders to go directly to farmers' fields or homes and even dig up the roots if they wanted supplies.

Table 5 Sweet potato traders interviewed per market in Zambézia, 2008 - 2009

District	Market	Sample size in 2008	Sample size in 2009	Market Characteristics
Milange	Central	7	9	Urban market in town centre of the town
	Feira da Amizade	6	--	Market in trading area on edge of town
	Coromana	10	9	Rural periodic market
	Mbessa/Mangassanja	6	18	Rural periodic market
Gurué	Ana Rita	--	18	Urban markets in town centre
	Central	7		
	Paróquia	7		
Nicoadala	Licuari	5	10	Rural transit market
Mopeia	Lualua	1	6	Rural market
Quelimane	Brandão	9	7	Urban market in centre of provincial capital
Total		58	77	

Source: Traders' surveys 2008 and 2009.

4.2.4 Producers' Survey and Qualitative Investigation

For the producers survey they were separated in two main groups: the medium-scale producers (MSP) and the small-scale farmers (SSF). Table 6 shows the sample distribution of the surveys and qualitative investigation undertaken.

Table 6 Sweet potato producers interviewed per district in Zambézia, 2008 - 2009

District	MSP survey 2008	MSP qualitative investigation 2008	Small-scale farmer' qualitative investigation 2009	MSP survey 2010
Milange	74	21	30	87
Gurué	22	--	20	14
Nicoadala	10	1	24	13
Mopeia	--	2	24	14
Total	103	24	98	128

Source: MSP surveys and qualitative investigation (2008, 2009 and 2010), SSF qualitative investigation (2009).

4.2.5 Medium scale Producers (MSP)

Farmers who produce larger quantities of crops which are intended for sale are referred to as medium-scale producers. In the Reaching End Users (REU) project, some existing sweet potato producers who planted enough for sale were encouraged to plant larger areas of OFSP to supply

local and/or urban markets. The rationale for this was to spread the benefits of OFSP consumption to a wider group of consumers and, through the gains from sales, provide a further incentive for farmers to include it in their cropping system. In 2007 and 2010, 106 and 128 farmers, respectively were selected and registered as medium-scale producers (MSP) in the four districts – Milange, Gurué, Nicoadala and Mopeia - covered by the project activities. These farmers had to agree to plant between 0.5 and 2 hectares of OFSP, although it was realised after the first survey of MSP, in 2007, that more than 50 percent of the farmers had not planted even half a hectare. This, it transpired after a qualitative follow-up investigation with the farmers, was due to various reasons including poor weather conditions (lack of rainfall at planting time); lack of or insufficient access to OFSP planting material and concern about the market for the produce (WVM, 2008). As result, the project decided to reduce the required area for farmers to be considered MSP, to 0.25 hectares in 2008 (Dove, 2010).

The aim of the two surveys undertaken in 2007 and 2010 was to evaluate whether MSP had succeeded in selling their OFSP and to identify the factors that contributed to this, particularly those related to the market facilitation activities carried out by the REU project. The 2009 survey collected and analysed information about MSP's adoption, production and marketing experiences in 2009 and plans for 2010 and thereafter, following project closure in mid- 2009, to ascertain the sustainability of the activities implemented. For consideration of sustainable adoption analysis, data from the 2010 survey are compared with those of the 2008 survey. A structured questionnaire, in Portuguese, with a few open responses, was designed for individual interviews with the MSP to be completed either in Portuguese or in local language. The list of MSP was provided by the World Vision Mozambique implementation team. This list included all MSP who produced OFSP in any of the last three years of project implementation: 2007, 2008 and 2009. Few farmers which produced the crop in previous years were not found in 2010 despite to alerting them during an initial trip before the start of the survey. Some of them changed residence by then. Experienced enumerators from the CIP team were trained and divided into two sub-teams, one in Milange and another one in Gurué districts. The Gurué team had to cover Nicoadala and Mopeia districts in the south as well given that all the three districts together had fewer MSP than Milange which comprised almost 70 percent of the whole sample.

Initially, in 2007, the number of sweet potato producers considered as medium-scale producers (MSP) by the project was 108, distributed in three districts (Milange, Nicoadala and Gurué) of the four covered by the project. No MSP was listed from Mopeia district. The first survey in 2007

covered 106 of the 108 producers considered by the project as MSP. Of all producers, 74 were in Milange, 22 in Gurué and 10 in Nicoadala.

The second and final MSP survey undertaken between January and February 2010 interviewed a total of 128 MSP in all four districts under project implementation about their production and marketing experiences in 2009. This included the 61 farmers listed by the project for 2009 plus others 67 producers who have grown OFSP as MSP in at least one of the past three years or have become MSP recently. The large number of MSP was in Milange (87) and the rest in Gurué (14), Nicoadala (13) and Mopeia (14). In total, 76 producers of the 106 MSP included in the 2007 census were revisited during the second and final MSP census undertaken in 2010. This represents 71.7 percent of MSP followed up.

4.2.6 Small-scale Farmers (SSF) Qualitative Investigation

A small-scale farmers' qualitative investigation was undertaken in the four REU project districts (Gurué, Milange, Mopeia and Nicoadala) between December 2008 and January 2009. A total of 98 farmers were interviewed, in order to get independent dialogue and to control for the risk of capturing only biased experiences from talkative farmers which can occur when focus groups methods are used. Two scenarios were considered in selecting the sites: i) sites closer to the main markets or with easier access to market according to the experience of project extension staff, marketing technicians and researchers; ii) sites far from the main markets and where farmers are more likely to face difficulties in selling their produce. The decision was based on previous interviews and observations, and other marketing studies (Gaudrault, 2008). The Project promoters of each group selected were asked to indicate five to six members and were reminded to include fifty percent of woman if possible. Of the 98 small-scale farmers interviewed, 47 were women. Additionally, 13 project promoters[8] were interviewed. Of those, eight were both project promoters and medium-scale producers and six were promoters and small-scale farmers. The SSF investigation included individual interviews with all promoters for each group participating in the study. The purpose was to understand their own experiences, knowing that they received assistance from the project extension agents, and comparing that with the SSF views about OFSP marketing experiences in each zone.

[8] Promoters are contact farmers having direct linkage with the extensionists. They had responsibly for passing on information and technical assistance given to them by the extensionist to the farmers.

4.2.7 Methods for Data Analysis

Data analyses for the quantitative surveys (MSP, traders and consumers) were based on descriptive statistics of the variables and comparisons across and within the districts and with the literature.

The price data analysis focused on comparisons of means between OFSP and non-OFSP and across the markets, and use of graphs to illustrate differences and price movement and seasonality. Statistical testing for differences of prices between OFSP and non-OFSP was undertaken using the non-parametric Mann–Whitney *U* test (Sawilowsky, 2007). The null hypothesis for this test is that there is no difference between means of the two samples of the two types of sweet potatoes, and the alternative hypothesis is that there are differences between the means of the two samples.

The qualitative investigation studies aimed to explain reasons behind respondents' actions. A summary of key results and comparisons between districts was compiled. This information is supported by summaries of fieldwork notes of interviews to key informants and field visit observation.

The research work undertaken attempts to show the operation of the current sweet potato marketing chain organisation and the potential for the new product (OFSP) uptake and to provide greater insight into the main determinants for sweet potato marketing participation. The following four chapters discuss the findings and results of the investigations starting with the organisation of sweet potato subsector and including the participation of farmers, the role and motivation of traders and issues related to the demand by consumers.

4.2.8 The role of PhD Research within the REU Project

This study was part of marketing operation research of REU project led by Natural Resources Institute of the University of Greenwich, within the whole multisectoral team which included four other institutions, namely the World Vision, CIP, HarvestPlus and Helen Keller International (see the project framework in Figure 1). The PhD research set up marketing data collection system to record marketing information such as prices, produce flow, transport and distance from the marketplaces to the supply sites and other relevant information some of it fed the project needs. As marketing operation researcher I had to carry out marketing investigation that could help the project to strengthen some marketing activities and address possible market constraints. The investigation

on the access and factors affecting access to markets by different type of OFSP producers helped to improve the marketing strategy implemented by the World Vision implementation team. In addition to that, the analysis of flow of produce from producers to the main markets suggested new activities to link producers and traders and the need of organizing farmers looking for markets in committees.

There were some challenges carrying out simultaneously a PhD research and responding to the project needs. First, the academic work was conditioned to the project activities, thus, the literature review at campus had to be done in short time before the starting of marketing season, in the field, in which much of the information about marketing activities had to be collected. Second, the academic work looked more on understanding the OFSP marketing phenomenon and the evidence of the factors driving the activities, and this do not every time overlapped with the project needs. For example, the project was concerned in getting the produce out of the hands of producers, by any means, as incentives for farmers keep growing the crop. Therefore, the best practice principles suggested by academic research were not strictly followed, such as the use of project transport, in some cases, to take the produce from the farmers' fields to the market or the juice processors in town. However, having noted these challenges, I now think that the regular knowledge sharing and presentation of PhD results during the joint meetings with other institutions participating in intervention contributed to a better understanding and assimilation of the results and suggestions from this research.

CHAPTER V: RESULTS – SWEET POTATO CONSUMERS

Research Question: What are the drivers of OFSP Marketing in Zambézia?

The specific research questions are:

a. How sweet potato consumers' perception of nutrition and health information, included in OFSP marketing and demand creation components, contributes to current demand and future intention to purchase OFSP?
b. Which marketing intervention components of the REU project had the greatest impact on consumers and demand creation?

5.1 Results from the Consumer Surveys

White-fleshed and yellow-fleshed sweet potato varieties are well known, cultivated and consumed in Zambézia (MINAG, 2007b; Scott, 2009). The introduction of new orange-fleshed varieties (OFSP) during the last decade started with public awareness campaigns among farmers and consumers by previous projects, and later on with traders (HarvestPlus, 2010, Low *et al*., 2005). This may have increased consumers' knowledge about OFSP and thus their willingness to try it.

The consumers' survey investigated whether consumers were aware of OFSP, they had tried it and if this knowledge contributes to increased future consumption. The results are summarised in table 7. At the end of the REU project in 2010, OFSP was known across all six markets included in this study. This is a significant change compared to the situation found in 2006 when the marketing diagnostic study was undertaken (Coote, 2006). Overall, a large percentage of consumers (81 percent) were aware of OFSP. Most informed consumers are in Gurué (97 percent) and Nicoadala (91 percent) compared to Milange-central (88 percent), Quelimane-Brandão (74 percent), Milange-Coromana (55 percent), and Milange-Mbessa (46 percent). The earlier exposure to the produce and efficacy of communication campaign used during the REU project may have contributed to this differentiation. It is worth to note that Gurué and Nicoadala were somehow exposed to these varieties in earlier OFSP projects. The TSNI and Eat Orange project implemented in Nicoadala from 2002 to 2006 used the kiosk in Nicoadala market of Licuari to sell the roots from farmers growing in surrounding project areas. Gurué used to receive some OFSP roots from the

neighbouring district of Ile where an NGO called ADRA was introducing the crop. Conversely, the district of Milange, bordering with Malawi, had a massive distribution of yellow Admarc varieties of sweet potato after the civil war and have a strong marketing relationship with Malawi where this sweet potato variety is grown. In Coromana, the project implementation areas are also not close to the market, and due to the demand from Malawian traders, who come across the border and contact directly the farmers, OFSP is less regularly sold in the market in sizable quantities.

Consumers received information about the benefits of OFSP in different ways. Different communication approaches implemented by the project in the study areas had different impact. Most consumers (61 percent) in all markets knew OFSP from radio messages broadcast for the project and inter-personal communication (34 percent). Some of them (8 percent) had seen the road signs placed by the OFSP REU project. Consumers not only were aware of OFSP as a nutritious crop but they have also tried it (86 percent) and 40 percent in all markets have eaten some products made from sweet potato, such as juice, golden bread, biscuits and soup. As result of these experiences and knowledge, 54 percent of consumers in all markets surveyed choose to purchase OFSP because of nutritional and health benefits. High percentages of consumers demonstrating this behaviour are in urban markets of Gurué (68 percent), Milange (66 percent) and Nicoadala (66 percent). The differences of consumers' behaviour between rural and urban markets might be associated with the easy access to information in urban areas using different sources.

Interestingly, where a relatively low knowledge of OFSP was reported, e.g. in Mbessa/Mangassanja (46 percent) and Coromana (55 percent), both these areas were only able to receive broadcasts from Malawian radio stations and were not able to receive broadcasts by the district community radios in Milange district. These areas would have been able to receive the public awareness spot messages prepared for the project and broadcast by Malawi Broadcasting stations Radio 1 and 2, over a short period. Urban consumers in Milange town would have been able to receive both the Malawian radio stations and the local community radio station, Radio Tumbine, which broadcast project messages more frequently. The high percentage of urban consumers being aware of OFSP in Milange can also be explained by the access to other sources of promotion such as murals, project vehicles and signs.

In interpersonal communication, an important role was played by trained traders in disseminating OFSP messages, calling attention to their customers and colleagues about the presence of "*polpa*" – the Portuguese translation of "fleshed" – in order to attract consumers. This indicates the importance of two things: raising awareness of the established traders and working with them. It

took a lot for convincing project partners that this approach was a viable and sustainable uptake pathway.

Table 7 Consumers' knowledge about OFSP and intention to purchase in Zambézia (%)

Item	Sweet potato markets by district						
	Milange-Central market	Milange-Mbessa/ Mangas.	Milange-Coromana	Gurué-Ana Rita	Nicoadala-Licuari	Quelimane-Brandão	All
N	102	41	40	101	100	102	491*
Consumers aware of OFSP	88	46	55	97	91	74	81
Consumers know OFSP through:							
-Radio	78	22	20	78	70	50	61
-Personal communication	50	10	12	24	36	27	34
-Road signs	18	0	5	4	14	4	8
Vitamin A and health messages as determinants to buy OFSP	66	20	20	68	66	45	54
Consumers have already tried OFSP	88	49	68	93	94	87	86
Consumers have eaten OFSP processed products	44	2	30	55	57	27	40
Consumers say OFSP is regular in the markets	45	15	0	84	57	22	44
Will buy OFSP in the future?							
-Yes	90	56	60	91	92	75	82
-Possibly	6	39	33	4	7	20	14
-No	2	5	3	1	1	5	2
-Don't know	2	0	4	5	-	-	2

Source: Consumers' survey, 2009.
*The total number includes 5 consumers from Lualua market, which were excluded from the table.

5.2 Potential Demand for OFSP

In order to understand the potential demand of OFSP, respondents were asked about their future intentions to buy OFSP (Table 7). Overall, a high percentage of sweet potato consumers (82 percent) indicated their intention to buy OFSP in the future if it was available in the market. This figure was particularly high in Licuari (92 percent), Gurué (91 percent) and Milange (90 percent) markets, which are closer to urban markets, where OFSP is well known because of given health and nutritional messages and sweet potato is regularly sold during the marketing season. However, the intention to buy in the future was lowest in rural areas of Mbessa/Mangassanja and Coromana because of limited access of consumers to different promotional messages compared to the urban areas.

A significant percentage of consumers are choosing OFSP as a result of their awareness of its nutritional and health benefits. More than half of consumers in all markets bought OFSP due to the benefits they can get from the product, based on information learned from the nutritional and health messages broadcast on the radio. The choice of OFSP by informed consumers is high in urban (Milange and Gurué) and rural (Licuari) markets, where the access to information and supply of the produce during the season are regular. According to the results in table 23, OFSP appeared to be more regularly available for consumers in Licuari (84 percent), Gurué (57 percent) and Milange (45 percent). However, in the urban market of Quelimane with limited supply, and rural markets of Mbessa and Coromana, with limited access to information, a relatively low percentage of consumers referred to OFSP benefits as one of the reasons to buy it. Thus, it can be concluded that if consumers are informed about the benefits of eating the product and they can access it from the market, they are more likely to try it. The acceptance of OFSP among sweet potato consumers supports the claims from traders (section 6.1) that they were selling OFSP faster than WFSP, and farmers who argued that they were substituting some production areas of white varieties with orange ones (section 7.1).

To understand how consumers decided which type of sweet potato to buy (orange, white or yellow) respondents were asked if it was their own decision to buy a certain type of sweet potato or whether they had been told or encouraged to buy a particular type of potato by someone else (table 24). The results showed that more than half of the consumers interviewed had been told or directed to buy a certain type of sweet potato, and that they were following the instructions of their parents or employer. This means that the buyers' knowledge about OFSP may play a role in decisions taken in

the market place but the knowledge of the people making these the purchasing decisions at home is still crucial to increase the proportion of OFSP consumed within the households. Thus, training of traders to raise awareness of customers may not reach all sweet potato buyers. Radio programme and spot messages may be vital in raising the awareness of household decision makers to purchase a nutritious sweet potato.

Most of those buyers directed to buy a certain type were in the urban markets in Quelimane (68 percent), Milange (67 percent), Gurué (66 percent), and the transit market of Licuari (65 percent). In the rural markets of Mbessa/Mangassanja and Coromana a relatively low percentage of buyers were directed to purchase certain types of sweet potato (24 percent and 48 percent, respectively). These results suggest that different strategies may be needed for urban and rural markets when attempting to influence sweet potato preferences within households. Direct promotion in the markets could impact buying decision makers in rural areas whereas dual strategies may be necessary in urban markets, where most buyers are directed.

Overall, of those consumers directed to buy a specific type of sweet potato, 47 percent were children under 18 and 47 percent were adults between 18 and 35 years old (Table 8). The percentage of children sent to buy sweet potato is high in urban markets of Quelimane (70 percent), Gurué (51 percent) and Milange (41 percent). Why were they sent? There are differences between urban and rural; purchasing may reflect different occupations in the urban and rural areas. In urban areas, most people may be busy with their jobs and income generating or household activities, while in rural areas, after the harvesting season, adults have free time to visit the markets. This highlights the need for different strategies to promote new food crops in different areas and for certain target groups. While direct promotion in the markets may be effective in rural markets, in urban markets comprehensive wider range of approaches to target people in different activities may be necessary. These issues should be considered in future initiatives.

Table 8 Consumers directed to purchase sweet potato in six markets of Zambézia (%)

	Markets						
	Milange-Central	**Milange-Mbessa/Mangassanja**	**Milange-Coromana**	**Gurué**	**Nicoadala**	**Quelimane**	**All markets**
Sample (n)	102	41	40	101	100	102	486
Buyers told the type of SP to purchase (%)	67	48	24	66	65	68	60
Children under 18 told the type of SP to purchase	41	20	32	51	32	70	47
Adults (18-35) told the type of SP to purchase	52	50	58	43	59	30	47

Source: Consumers' survey 2009.

Through marketing, the nutritional benefit of OFSP is being extended to a greater number of beneficiaries around the project intervention areas. It was found that a high proportion of OFSP consumers (77 percent) were not producers of the crop; they access the product exclusively through the market (Table 9). The highest proportion of buyers which are non-producers of OFSP is in Nicoadala, where many consumers transit through. It is somehow surprising that nearly a quarter of buyers actually grow OFSP. It is possible that those, or whose families, are the ones who have run out of produce but have developed a taste for OFSP. From this research is not known the proportion of sweet potato producers need to cover their consumption need.

Table 9 OFSP consumers with own production in Zambézia (%)

		Districts and markets			
		Gurué-Ana Rita	**Milange-Central**	**Nicoadala-Licuari**	**All**
Type of consumer	n=	56	19	27	102
Producer of OFSP (%)		36	5	7	23
Non-producer of OFSP (%)		64	95	93	77

Source: Consumers' survey, 2009.

5.3 Conclusion: Answers to Research Questions

This research found that information about health and nutrition benefits of OFSP was important to increase OFPS demand. More than half of consumers interviewed confirmed this finding. The consumers' survey results have shown that OFSP nutrition and health qualities are known by consumers around the project areas as a result of public awareness campaigns implemented by the REU project. Little was known about OFSP by consumers in this area before the intervention starts in 2007, according to the diagnostic work (Coote, 2006a), although the fieldwork during this research and later during consumers' survey found that white varieties of sweet potatoes were commonly used locally for breakfast or snack. Nevertheless, the different strategies used to pass the nutritional and health information of new varieties to consumers were characterized by unequal efficiency and had different impacts.

Some marketing components of the REU project implemented to raise public awareness among consumers had more impact than others. The consumers' survey indicates that radio spots[9] and programmes were the most cited source of information by interviewed consumers compared to road signs and personal communication, contributing to the decision for purchasing OFSP. Additionally, the results show also that most consumers were directed from home to buy OFSP in the marketplace, which implies that to be effective on message dissemination this strategy of using radio also reached sweet potato buyers' decision makers at home.

Other activities which had an additional impact but were less cited by consumers included the promotion of OFSP products such as biscuits, golden bread, soup and juice, which were done in localized places in urban areas and during events days in rural areas. Market signs that were alerting buyers about the markets and availability of OFSP and wall murals extolling the benefits of eating OFSP also helped. Although consumers have ranked these activities as those which informed them about OFSP benefits in the survey, other factors which may have some influence as well include painted project vehicles with orange colour and OFSP promotion days.

[9] The importance of radio on disseminating nutritional and health messages was highlighted in study that assessed the acceptability and the willingness to purchase golden bread (white bread rolls which incorporated OFSP pulp) (Milestone 20 of REU project). This investigation found that 74% of 141 consumers in Quelimane, Zambézia, preferred to receive information about golden bread by radio.

CHAPTER VI: RESULTS – SWEET POTATO TRADERS

Research Question: ***What are the drivers of OFSP marketing in Zambézia?***

The specific research questions are:

- What factors affect traders' uptake of OFSP marketing?
- What kind of relationships between farmers, traders, and consumers affect OFSP marketing?
- What is the role of geographic location of traders in OFSP marketing in Zambézia?

6.1 Results from the Traders' Surveys

Sweet potato is a secondary staple crop in Zambézia. About 35 percent of households produce sweet potato and nine percent of families sell it to generate income (World Vision Mozambique, 2009). The points of sale are local markets, roadsides, district markets, passing traders and neighbours (World Vision Mozambique, *Op. cit.*). To assess marketing performance and OFSP marketing uptake, traders were surveyed and recorded data about quantities sold, prices, costs, relationship with other traders, farmers and consumers; and existing marketing facilities or constraints. This included understanding the current support facilities on marketplace, transport, access to information and credit.

Box 2: Market development activities

OFSP market development was stimulated by the intervention in some functions and involving some market actors. There was an informal contract between farmers and project intervention in order to ensure that the surplus of production could find the market. It was in this context that the intervention invested in the visibility of the product using mural paints and vehicle paints, road signs, radio programmes, theater, OFSP promotion days and so on to create public awareness aiming to increase OFSP demand. Additionally, traders were trained in small business operations and their knowledge about the advantage of consuming high nutritious and healthy sweet potato variety was improved to help them to pass the information to the customers when selling in the market, therefore increasing the demand for their business. So, consumers were able to receive information from the implementation programme using different strategies and also directly from traders, implying a high exposure of consumers to OFSP consumption advantages and improved their knowledge and demand for the produce. The consumers' survey described in chapter six assesses whether consumers buying the produce in the markets are informed about it and what is their intention to buy it in the next future.

To complete the market cycle, after training, traders were taken by implementation teams composed by marketing specialist and agriculture extensionists to meet farmers in their production fields. Agricultural extensionists used to keep the records of the surplus of production of each farmer in all sites as they assisted farmers from the beginning of the production process. Farmers were also taken to meet and bargain with traders in the market. The purpose was to create a sustainable linkage between them in order to maintain the marketing chain functioning after phasing out the intervention. But it was found that the risk of doing so was the temptation of subsidizing traders transport and the intangible transaction costs such as the time traders prospects the market and bargain. Indeed, some farmers expected that the intervention would continue taking producers to their fields or take them to the market to sell their produce. It should be noted that, the marketing research suggested a change in marketing strategy, i.e. by creating marketing committees to take over the linkages activities and seeking of new marketing opportunities.

6.1.1 Sweet potato traders' profile

Table 10 gives a profile of sweet potato traders in seven markets. This PhD research included traders' surveys in which all the few sweet potato traders present in the marketplace were interviewed. Most of the traders were retailers (93%). The presence of wholesalers was significant in the transit market of Licuari in Nicoadala (40%). As transit market, in Nicoadala some traders were gathering produce in large quantities to resell to retailers coming mainly from the near city market of Quelimane. Looking at gender distribution in these markets, an equal participation of men and women is noted in sweet potato marketing. However, in some markets the participation of women is higher than men as referred by Vletter and Polana (2001) who investigated the maize itinerant traders in Mozambique. This research found that in the markets investigated the percentage of women engaged in selling sweet potato was higher than men - Mbessa: 83 percent; Coromana: 78 percent and Lualua: 67 percent. All these markets are in rural areas where many traders are also producers and mainly are women as observed also by Tickner (1998). Given their proximity with the rural markets they can take the produce to the markets. In these areas of sweet potato production, retailing is also associated with women, as stated by a woman trader in Mbessa:

> "Sweet potato marketing is women's activity in this area; men are involved in trading high value crops such as maize and manufactured products".

In turn, the participation of men in sweet potato marketing is higher in district capitals (Milange: 67 percent and Gurué: 89 percent), which might be associated with limited employment in urban areas and the limited opportunities. Additionally, in these town markets the participation of women is constrained by the distances to supply sites, which are 15-20 km away. In Gurué the roads to the supply sites are particularly hilly and to get there traders use bicycles, which may be difficult for women traders. To overcome this difficulty, in Milange some women traders hire riders of bicycles to transport their produce. In terms of age, most traders are aged between 18 and 35 years, but a considerable number (30 percent) of traders found in Licuari are under 18 years. The level of formal education is low, with 64 percent of traders having no formal education, although 35 percent can read and write. The illiteracy of traders is higher in rural markets than in urban markets. A high percentage of traders are heads of households, mainly in southern Zambézia (Licuari: 90 percent; Lualua: 83 percent and Brandão: 86 percent) and Gurué (78 percent) in the north. In rural markets in Milange, northern Zambézia, the high participation of women contributes to the lower percentage of heads of households given that, usually, this status is attributed to men in Mozambique (Uaiene and Channing, 2009).

Table 10 Sweet potato traders' demographic profile in seven markets in Zambézia (%)

Item	Markets							
	Milange-Central	Milange-Mbessa/ Mangas.	Milange-Coromana	Gurué-Ana Rita	Nicoadala-Licuari	Mopeia-Lualua	Quelimane-Brandão	All
n	8	17	9	17	10	5	7	73
Category of trader								
-Retailer	100	100	89	100	60	100	100	93
-Wholesaler	0	0	1	0	40	0	0	7
Gender:								
-Male	67	17	22	89	50	33	57	49
-Female	33	83	78	11	50	67	43	51
Age (years):								
-Under 18	0	6	0	5	30	0	14	8
-From 18 to 35	89	72	56	89	50	83	57	73
-More than 35	11	22	44	6	20	17	29	19
Education (level):								
-Illiterate	0	44	56	11	30	67	0	29
-Read and write	11	11	22	11	30	33	14	35
-Basic school(1-7)	56	39	22	50	20	0	14	21
-Secondary school (8-12)	33	7	0	28	20	0	72	15
Head of household[10]:	57	67	33	78	90	83	86	70

Source: Traders' survey 2009.

The study assessed the marketing performance of traders. The quantities of sweet potato of any variety sold by trader per week in the markets studied are given in table 11. It varies from market to market. An average number of five sacks per week were sold in each market. The number of sacks sold was highest in Mbessa/Mangassanja market (9.5 sacks/week), where sweet potato is more demanded during the periodic market days[11] by local consumers and Malawian traders. Retailers in small markets such as Lualua sold fewest sacks (2.1 sacks per week). Although Licuari is a larger and busier market, traders sold as few sacks (2.1 sacks per week) as such as the smaller market of Lualua.

[10] Head of household concept is used in Africa to refer to those people who have to care of dependents within a family ensuring social, material and financial support and taking the lead of the major decisions. In the United States the same concept is used as filing status with certain requirements related number of relatives, marital status, etc., to categorize taxpayers.

[11] Periodic markets are most common in northern Zambézia. In Milange they function twice per week and are scheduled in such way that traders and buyers can move from one market to another in different days. This arrangement allows traders from Malawi to transport produce from Mozambican markets to other markets in the other side of Malawi (see: Ticker, 1998 and Bowen, 1998).

The results were disaggregated by type of sweet potato traded to evaluate the market share of OFSP as the new crop in this marketing chain. The number of sacks of OFSP sold was higher than non-OFSP varieties in Gurué, a district that benefited from three years of OFSP vine distribution by the REU project as well as previous exposure to the sale of OFSP from other districts where another NGO had introduced it. A higher proportion of OFSP was sold also in Licuari and Milange markets. While Licuari benefited from previous OFSP projects (TSNI and Eat Orange projects), production in Milange was good and consumers awareness about OFSP improved with the messages broadcast in Malawian radio one and two in addition to all produce publicity put in place by the REU project.

No trader was selling OFSP in Coromana, one of the villages covered by vine distribution in Milange. The lack of OFSP in this market is attributed, in part, to the weak participation of farmers nearby the market in the OFSP production promoted by REU project. There was also high farm gate demand around Coromana for OFSP from Malawian traders, following radio messages about health benefits and vitamin A content and encouraging traders to go to the farmers' fields purchase the produce. Thus, farmers mostly preferred to sell in the field to Malawian traders instead of taking the product to the market.

No less important is the quantity of sacks of OFSP sold in Quelimane urban market – Brandão (1.7 sacks/week). Although the markets in this town are supplied with sweet potato from Maganja da Costa and Nicoadala, they benefited from Project public awareness radio programme that increased awareness of, and demand by, consumers. As result, there are some OFSP supplies from the nearest project district of Nicoadala and rarely from the more distant districts of Gurué and Ile. Traders, aware of OFSP demand around Quelimane, when travelling to look for supplies of other high value products in the north of the province they buy some sacks of OFSP to sell in town.

The OFSP market expanded in new outlets. In Quelimane, it started to be sold in few restaurants, hotels, outside of supermarkets and in front of butcheries. Now, OFSP is being sold in marketplaces like "3 de Fevereiro", "Peixe" and 'FAE' without a well identified large sweet potato space. Other individual traders on the roadside within the city can be found selling OFSP.

Traders in other markets have claimed that consumers recognize OFSP as a good and healthier product and they sell it for a higher price than the white and yellow varieties. They reported also that they could sell OFSP faster than other varieties. However, there is limited supply in certain

periods of the year, according to the traders; and the prices they offer farmers are higher than those of other varieties. Two factors contributed to the increased price of OFSP related to non-OFSP. One is the price asked by informed and trained producers by earlier projects to charge premium price, and another is the increased demand of the product by informed consumers.

Table 11 Amount of sweet potato sold per trader per market in Zambézia (average number of sacks per week), 2009

	Districts and markets							
	Milange-Central	Milange-Mbessa/ Mangas.	Milange-Coromana	Gurué-Ana Rita	Nicoadala-Licuari	Mopeia-Lualua	Quelimane-Brandão	All
Item n=	9	17	9	17	10	5	7	73
All Sweet potato	5.6	9.5	5.8	5.3	2.1	2.1	4.7	5.0
Non-OFSP varieties	3.3	9.3	5.8	2.2	1.2	1.6	3.0	3.8
OFSP varieties	2.3	0.2	0.0	3.1	0.9	0.5	1.7	1.2

Source: Traders' survey 2009.

Sweet potato supply varied during the last two seasons and between the markets studied. Table 12 shows the comparison of the quantities of OFSP and non-OFSP (white and yellow varieties) sold by traders in 2008 and 2009. For comparability purposes, there were selected four main town markets in correspondent four districts, Central market in Milange, Ana Rita in Gurué, Licuari in Nicoadala and Brandão in Quelimane were data collection was consistent in 2008 and 2009. The reduction of number of markets and traders in 2009 calculations for comparison purposes resulted in changing the overall average amount sold per trader. For example, the amount of OFSP sold including all seven markets (Table 18) is 1.2 sacks, but reducing the number of markets to four, the figure changes to 2.0 sacks (Table 19). The results indicate that traders' sales of OFSP have fallen slightly from 2.5 sacks per week in 2008 to 2.0 in 2009. The absence of produce in some markets contributed to this quantity decline of OFSP, particularly, Licuari market in Nicoadala district and Lualua in Mopeia district. The shortage was also due to the emergence of new OFSP market opportunities along the roads and in Quelimane. In addition, the bad weather conditions in 2008 limited the production and supply of sweet potato. This affected both white and orange-fleshed sweet potatoes. In 2009, the rains were relatively good resulting in a good harvest and produce supplies, especially in the northern districts of Milange and Gurué. However, the availability of sweet potato in the markets varies frequently depending on the planting time, harvesting, but also on the time spent by traders in the field looking for it. Normally, in the markets located in the

districts towns, at the start of the season retailers wait for farmers or itinerant traders coming in the marketplaces to sell their produce. Prices in marketplace are lower at this time. Once the harvest stabilizes and the quantity of produce starts to decline in the market, retailers have to travel to production areas to obtain supplies. During this period, the shortage of produce in marketplaces results in rising of prices.

In Gurué town markets, the amount of OFSP traded by each trader increased from 2008 to 2009. From an amount of 2.3 sacks sold weekly per trader in 2008, it increased to 3.1 sacks per week in 2009. The supply in this district was higher than the previous year. Interest in selling OFSP increased. The number of sweet potato traders in this market and Milange also raised (Table 12). However, in the other studied markets the amount of OFSP sold decreased. The decline in amount of OFSP sold in Licuari, Coromana and Lualua markets may be due to two reasons. First, the high OFSP demand from emerging markets in Quelimane city pushed up the wholesale demand in Licuari and Lualua roadside markets, reducing the quantities retailed locally. The emergence of new places selling OFSP from Licuari and Lualua, including outside hotels, is an example of this observation. As result of increasing sweet potato marketing in general and the good production in 2009, the marketplace in Licuari was expanded in 2010 and the rear area reserved for sweet potato wholesaling. Second, reduced availability of OFSP in Central market in Milange and rural Coromana market in Milange district may result from the high farm gate demand from Malawian traders who have learned about OFSP benefits from Malawian radio messages broadcast on behalf of the REU project in 2008. For example, a medium scale producer (MSP) located in Mugoliwa, Coromana, sold 11 sacks of 50kgs at his farm to Malawian traders who came three times in groups of three, four and five traders seeking for OFSP supplies.

Table 12 Amount of sweet potato sold per trader per market in two seasons in Zambézia (average number of sacks per week)

	Milange-Central	Gurué-Ana Rita	Nicoadala-Licuari	Quelimane-Brandão	All
2009 marketing season					
n=	9	7	8	5	29
Non-OFSP varieties	3.3	2.2	1.2	3.0	2.4
n=	7	13	2	2	24
OFSP varieties	**2.3**	**3.1**	**0.9**	**1.7**	**2.0**
2008 marketing season					
n=	7	13	3	9	32
Non-OFSP varieties	8.1	4.5	2.3	4.7	4.9
n=	5	7	1	1	14
OFSP varieties	**2.6**	**2.3**	**3**	**2**	**2.5**

Source: Traders' surveys 2008 and 2009.

In sweet potato trading, in Zambézia, traders commonly use sacks of 50Kgs for packaging, transport and storage of the produce. These sacks are usually called 50Kgs sacks regardless the type of produce carried. But, given the difference of weight between different produces such as maize and sweet potato the final weight contained in sack of 50Kgs will be different. In order to assume an approximate weight of these sacks, a number of sweet potato weight measurements were made and the results are shown in table 13. The weight of sweet potato 50Kgs sack varies greatly even within the same market. In Milange market the weight of 50Kgs sack vary from 36.8Kgs to 46.6Kgs and in Nicoadala it varies from 25Kgs to 55.2Kgs. This variation is duo to the manner how producers and traders pack the sacks. It was observed in the field that traders, when in production sites looking for supplies, tend to fill the sacks more than the producers do when packing to sell to traders. On the other hand, traders accuse producers, if they fill the sacks, to include small roots at the button and to not fully fill the sack.

Table 13 Weight of sacks in Milange and Nicoadala

Number of measurements	Weight of 50Kgs sack in the Market of Milange	Weight of 50Kgs sack in the Market of Nicoadala
1	44.0	25.0
2	37.0	50.0
3	35.3	55.2
4	41.2	-
5	46.3	-
6	45.6	-
7	45.6	-
8	46.6	-
9	36.8	-
Average	**42.0**	**43.4**

Source: Author field measurements.

The study also assessed the starting financial capital for traders to engage in sweet potato marketing. Table 14 shows the amount of money traders used to start their business activities and how much they currently have to purchase sweet potato for retail. Some traders had difficulty in answering this question while other traders had no such expenses because the sweet potato was from their own fields. It was a hard task to obtain sensitive information about the money they have to continue running the business. Instead, they were asked about the quantities of sacks they could afford to purchase at a certain price prevalent at the time of the interview. In all, more than half of

the traders had responded to the two questions about starting and current financial capital. On average traders had Mt135 (US$ 4.5) to start their sweet potato trading. The average amount available to purchase more produce was Mt280, which means an increase of more than 100 percent from the starting capital. This increase on working capital may reflect some gains from trade, which may contribute to more investments in the marketing activities. Furthermore, the low amount of initial capital required to buy sweet potato, compared to the starting capital of other products, facilitates the entry of new traders in sweet potato marketing chain, as confirmed by some traders. Some of the most traded food crops by informal traders in Zambézia include cassava and maize. For example, it cost Mt750 for buying one 50Kgs sack of dried cassava in Quelimane wholesale market and in Milange district the same sized sack of maize is sold for Mt250 in wholesale market (SIMA, 2009).

The amount of starting capital is lower in markets located in the north of the province (Milange and Gurué) and higher in the south (Nicoadala, Mopeia and Quelimane) as result of different demand and production potential. Within the northern markets, traders in the rural periodic markets of Mbessa (Mt75) and Coromana (Mt60) needed much lower starting capital compared to traders in urban markets of Milange and Gurué, where they have to travel to supply sites. In the south, traders in the capital, Quelimane, needed much higher amount (Mt540) to start selling sweet potato, supplied mostly from far production areas such as Maganja da Costa (150 km), Nicoadala (40 km) and Lualua (75 km), implying added transport costs. These differences on the level of starting capital between the two regions result from higher production and low sweet potato demand in the north compared to the south.

Although the starting capital is relatively higher, in some places it may be successfully multiplied. It was shown to be the case in Milange, Gurué and Mopeia, where the current trading capital was much higher than the initial trading capital. In these markets, most traders were selling OFSP during the survey. For example, in Lualua, Mopeia district, the OFSP kiosk trader has increased his starting capital from Mt250 to Mt2,250 selling his produce for Mt10/kg, as a high value product, compared to Mt3/kg for non-orange varieties in the local marketplace (Table 20). This trader was selling his produce to road passengers on the main north-south road; and he takes some sacks to sell in Brandão market in Quelimane city.

The spatial distribution of the current capital to run sweet potato business is related to the traders' gender as well. Men traders operate predominantly in urban markets where the starting capital to

run sweet potato business is higher and women appear in rural periodic markets (Mbessa and Coromana) where they bring their own produce to sell.

Table 14 Starting and current financial capital of sweet potato traders in Zambézia (Mt)

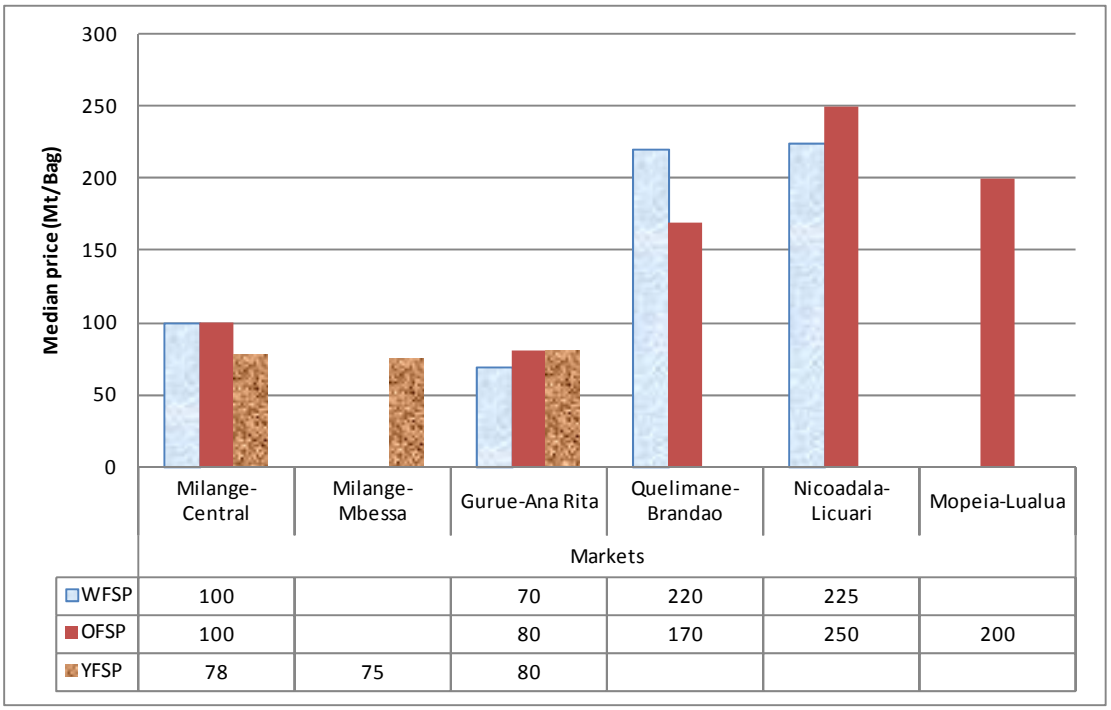
		Districts and markets							
		Milange -Central	Milange-Mbessa/ Mangas.	Milange-Coromana	Gurué-Ana Rita	Nicoadala -Licuari	Mopeia-Lualua	Quelimane-Brandão	All
	n	9	3	2	16	8	1*	7	46
Starting capital: Median(Mt)		100	75	60	100	275	250	540	135
	n	9	4	2	14	6	1*	7	43
Current capital to purchase SP: Median(Mt)		300	75	60	600	250	2250	540	280

Source: Traders survey, 2009.
*Trader declared to operate REU project constructed kiosk.

6.2 Sweet Potato Farm Gate Prices

Farm gate prices are those declared by traders to have been paid to farmers in the field. Figure 5 presents the median prices paid by traders interviewed in selected urban (Milange-Central; Gurué Ana-Rita, Quelimane–Brandão) and rural markets (Milange-Mbessa; Nicoadala-Licuari and Mopeia-Lualua) to farmers in Zambézia province for three varieties of sweet potato. The prices, in Meticais per sack, vary greatly between markets. It should also be appreciated that the sack size and weight is not standardised. In most cases the weight and volume of a full sack depends on who packs it. Traders reported that, when possible, they pack the sack tightly to maximise weight and minimise inclusion of non-marketable root sizes, while when farmers do the packing they include smaller roots with low commercial value at the bottom to maximise the number of sacks sold. In some cases, there is no agreement between farmers and traders on the way the sacks are packed. The disagreement on the size and quality of roots can lead to breaking off of purchasing negotiations. Therefore, although without a formal agreement, traders and farmers bargain to reach a satisfactory compromise for both.

Figure 5 Farm gate prices of sweet potato declared by traders in Zambézia, 2009 (Meticais/sack)



	Milange-Central	Milange-Mbessa	Gurue-Ana Rita	Quelimane-Brandao	Nicoadala-Licuari	Mopeia-Lualua
WFSP	100		70	220	225	
OFSP	100		80	170	250	200
YFSP	78	75	80			

Source: Traders' survey, 2009.

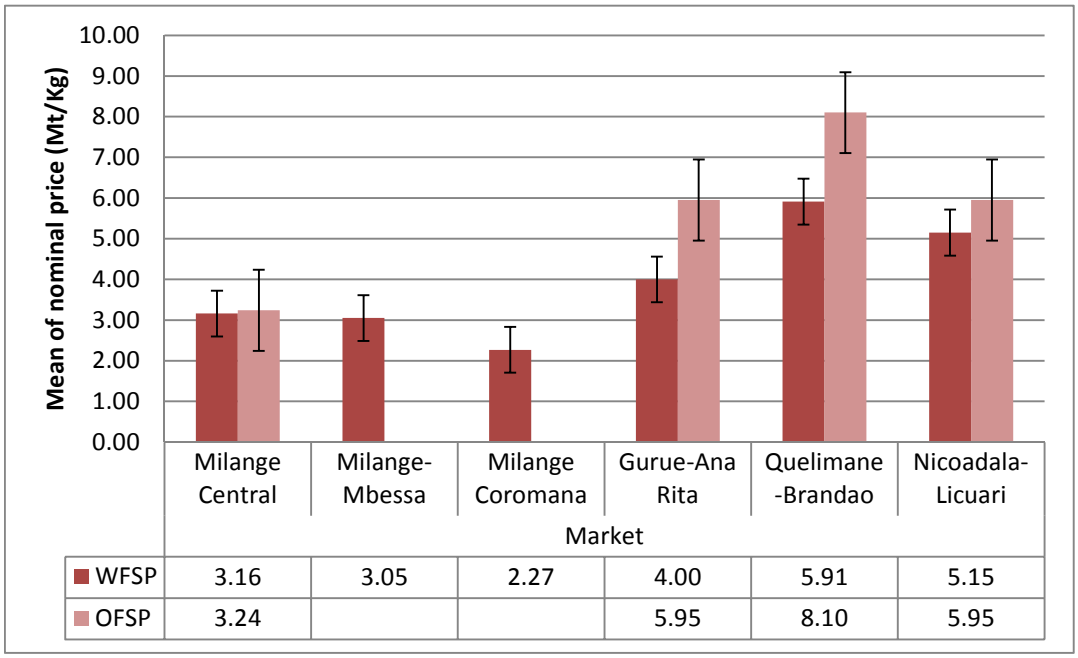
Sweet potato prices differ by region. It can be seen that sweet potato prices offered by traders in the south of the province (Quelimane, Nicoadala and Mopeia) are higher than in Milange and Gurué in the north. The higher production in the north compared to the south is due to comparable better agro-ecological conditions and contributes to the higher prices in the south. Some traders exploit this price differential by bringing the produce, mainly OFSP varieties, from Gurué to sell in Quelimane. Although Milange and Gurué have lower prices compared to the districts in the south, traders rarely buy sweet potato in these districts to sell in the south, where demand is high, due to high transaction costs linked to the long distance (324 kilometres), poor transport links to Quelimane and lack of information about the specific location sites and quantities available. On a few occasions, traders may take produce from Gurué to Quelimane rather than from Milange to Quelimane. One of the reasons for this is that while traders have a direct journey from Gurué to Quelimane, from Milange to Quelimane they have to change vehicles in Mocuba, which involves physical effort to shift the produce from one truck to another.

OFSP farm gate purchasing prices are similar to those of white varieties, but differences are observed in some places. These differences are evident in Licuari, where farmers are charging Mt25 more per sack for OFSP. This could be a result of high demand of the produce by informed

consumers as we saw earlier that this area benefited from previous OFSP projects. It can also reflects accumulated experience and knowledge of farmers about the benefits of OFSP, which they have been growing it for longer than in other regions, and they have been encouraged to sell it at higher price as greater produce quality (Low *et al*., 2005).

The relative high demand of sweet potato, especially for OFSP, in the south Zambézia due to transit of massive consumers by main road N1 and the highly populated cities such as Quelimane and Gurué in the north contributes to increase OFSP prices and attract traders to this business. Fafchamps and Gabre-Madin (2004) have pointed out how important intermediary traders' behaviour is to interpret the marketing process. While in rural periodic markets, mostly, producers sell their produce, in the south traders travel from Quelimane to Licuari and Lualua looking for supplies to satisfy the existing demand and take advantage of high retail prices. Figure 6 gives the nominal retail spot prices of white-fleshed sweet potato (WFSP) and OFSP during 2009 marketing season in selected urban (Milange-Central; Gurué Ana-Rita, Quelimane –Brandão) and rural markets (Milange-Mbessa; Nicoadala-Licuari and Mopeia-Lualua). Sweet potato retail prices follow the same pattern as farm gate prices. For example, higher prices were observed in the southern part of the province, compared to the north, with the exception of Gurué, where prices were higher than in the south. The price of OFSP was clearly higher compared to the price of white varieties in this market and the other two southern markets. In these markets, consumers were more exposed to the orange varieties through previous projects and strong public awareness in case of consumers in Gurué.

Figure 6 WFSP and OFSP retail spot prices in different markets in Zambézia



	Milange Central	Milange-Mbessa	Milange Coromana	Gurue-Ana Rita	Quelimane -Brandao	Nicoadala-Licuari
WFSP	3.16	3.05	2.27	4.00	5.91	5.15
OFSP	3.24			5.95	8.10	5.95

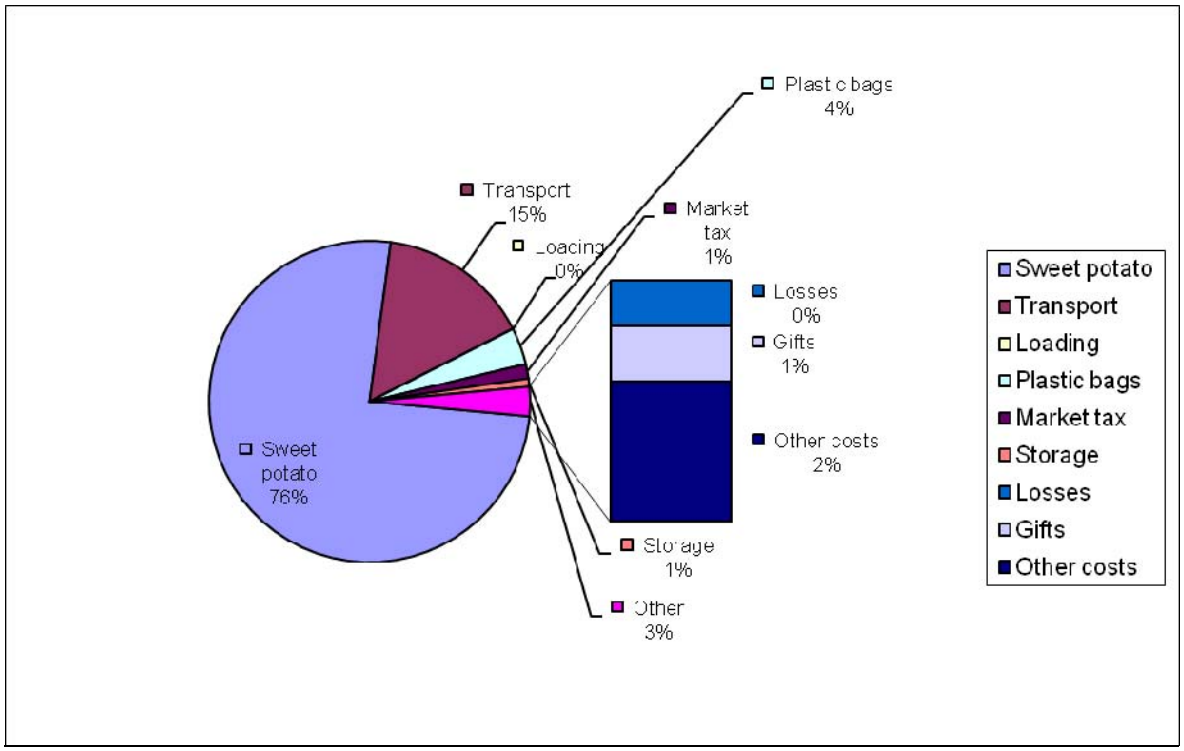
Source: Traders survey 2009.

6.3 Sweet Potato Trading Costs

Sweet potato trade activity includes several trading costs, depending on the market structure and its supply chain management. Marketing costs' data was collected in Milange-Central (see figure 7) and Quelimane–Brandão (figure 8). Generally, the most trading costs listed by traders during the survey of this study were the cost of sweet potato purchases, transport, loading, plastic bags, market taxes, storage, losses - rotten and broken roots - gifts and other implicit costs such as food and casually accommodation when travelling to supply sites. These trading costs are not homogeneous. For example, some costs observed in the southern Zambézia marketing chain, such as storage and loading, are insignificant or traders avoid them in the north. In Milange, north, retailers pay a comparable smaller amount of money for storage and they load the produce from bicycles themselves while, usually, in Quelimane the produce arrives at the main market in a truck and is stored in a hired local storage.

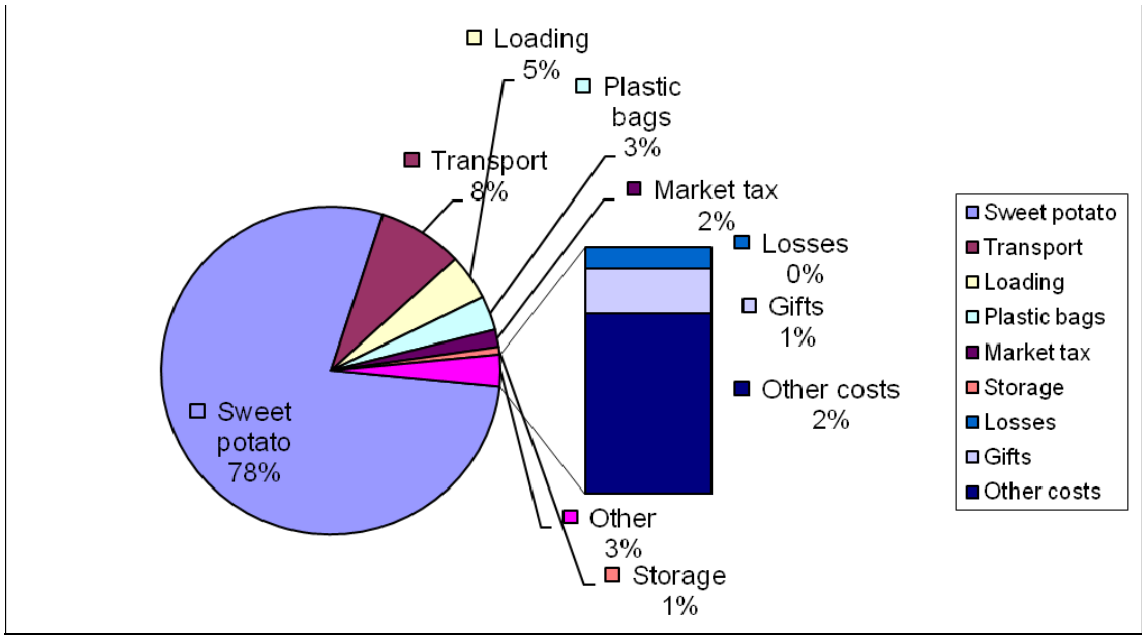
Figures 7 and 8 show that in the two regions the cost of purchasing the produce is the major cost in the sweet potato marketing chain (about 76% to 78%), followed by transport costs (about 8% to 15%).

Figure 7 Sweet potato trading costs structure in Milange-central market



Source: Traders' survey, 2008.

Figure 8 Sweet potato trading cost structure, Brandão-Quelimane

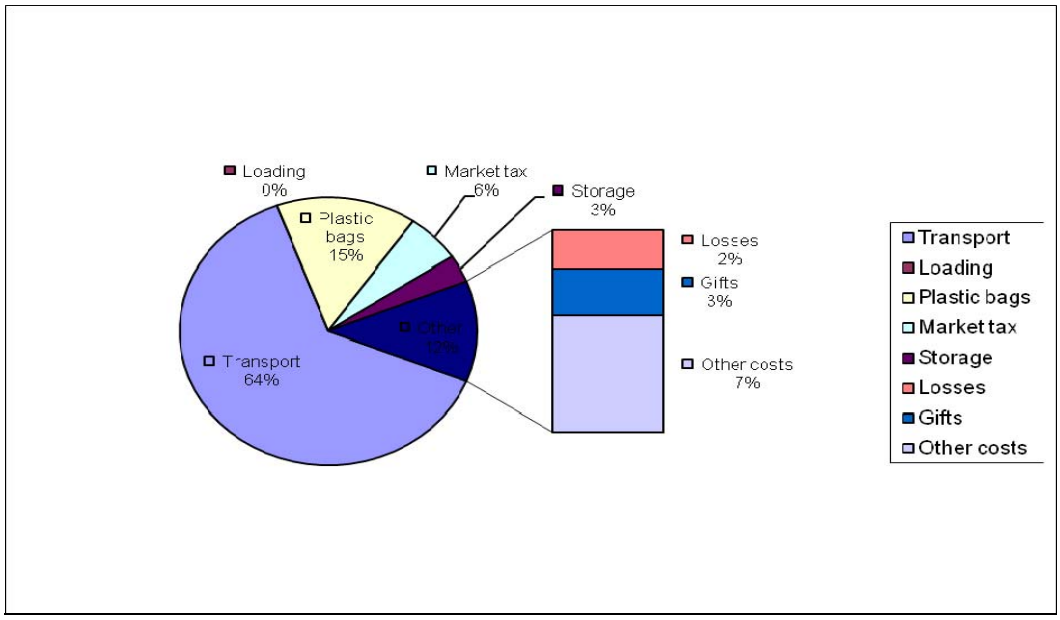


Source: Traders' survey, 2008.

To deeply understand the trading costs involved in sweet potato marketing chain, the purchasing cost was left out and other costs disaggregated (Figures 9 and 10). The result shows that in both

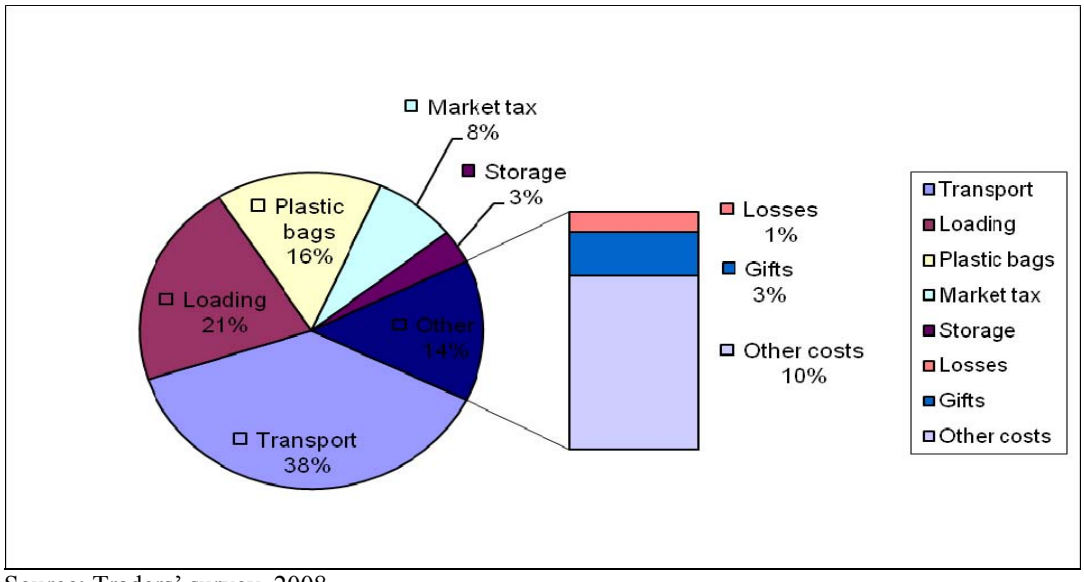
market places representing the northern and southern regions, transport is the major cost of sweet potato marketing activity with 64% in Milange and 38% in Quelimane. Transport costs are higher in Milange than Quelimane as result of poor roads in Milange and good tarred roads linking the capital, Quelimane, to the supply sites. Other significant costs include loading in Quelimane (21%), plastic bags and market taxes.

Figure 9 Disaggregated sweet potato trading costs, Milange



Source: Traders' survey, 2008.

Figure 10 Disaggregated sweet potato trading costs, Brandão-Quelimane



Source: Traders' survey, 2008.

6.4 Sweet Potato Marketing Gross Margins

This section focuses on the analysis of traders' marketing margins including their variation between the types of sweet potato traded using 2009 survey (Table 15). Given the high variability of data obtained and the lack of significant number of traders, the table shows means and median margins. The aim is to assess whether traders are getting reasonable margins selling sweet potato and if there is a difference in margins between the two varieties that may encourage traders to switch from selling white varieties to selling OFSP.

The overall weekly marketing average margin for all markets where the study was carried out and for trading all sweet potato varieties was Mt371 (USD$12.3). This means that the traders' activity generates an income of approximately Mt1,484 per month, which is slightly above the minimum monthly wage for the agricultural sector in Mozambique, fixed at approximately Mt1,315 (Governo de Moçambique, 2009) which possibly makes sweet potato marketing an attractive activity and part of Zambézia people's livelihoods. This may demonstrate that the price of sweet potato is worthwhile against the transaction costs, which contributes for existence of traders in the process (Fafchamps and Gabre-Madhin, 2004).

The margins vary according to the type of sweet potato traded and the location of the market. For all markets, traders selling simultaneously orange-fleshed and white-fleshed sweet potato had higher margins (Mt782) than others. However, margins for traders selling exclusively OFSP (Mt591) were higher than WFSP (Mt206) and six of the ten highest margins were from traders who reported selling only OFSP during the week of the interview. The difference in margins is significant in some markets. For example, two traders selling exclusively OFSP in Brandão/Quelimane got higher marketing margin (Mt524) than seven selling all varieties of sweet potato (Mt89). However, margins are lower for traders selling exclusively OFSP in Licuari/Nicoadala and Ana Rita/Gurué than those selling all varieties in the same markets. This may suggest that in Nicoadala and Gurué high trading costs of selling OFSP are not offset by the higher price offered in contrast to what occurs in Quelimane. OFSP retailing prices in Quelimane are higher than in Gurué.

In terms of variation of margins between the markets, OFSP marketing generated high margins in Mopeia (Mt1,235), Gurué (Mt749) and Quelimane (Mt524). The margin in the Lualua market in Mopeia district is higher than other markets though it was calculated from the only trader who was

selling OFSP. This trader was selling from the kiosk constructed and left by the OFSP REU project. More of these sales were for roadside passengers and tourists in the main national road. This trader also used to travel to sell his produce in Quelimane where prices were higher during the week of interview. The demand of OFSP in nearer Quelimane city increased and traders travel to Lualua looking for supplies, which results in lack of produce in Lualua marketplace.

The table also shows that rural periodic markets (Mbessa/ Mangassanja and Coromana in Milange) had lower margins than the town market of Milange. Although rural markets may present lower trading costs related to transportation and initial price to purchase the produce because many traders are also producers, the comparative high price of sweet potato in town markets, due to high concentration of informed consumers, contribute to the high margins. This is not observed in Brandão market in Quelimane that presents relatively lower margins (Mt89) than the rural market of Coromana in Milange (Mt128). Sweet potato price is attractive in Quelimane but costs of transport from the supply sites of Maganja da Costa district Licuari and Lualua, including storage increase the costs, minimizing the margins. In Licuari market in Nicoadala, marketing margins are the lowest amongst all studied. Licuari is a transit and crowded market with high selling prices (section 8.2) but the farm gate prices are also high due to increased demand from retailers, road side consumers and wholesalers from Quelimane town.

Table 15 White and orange-fleshed sweet potato gross margins in Zambézia (Meticais/week)

	Districts and markets							
	Milange/ Central	Milange- Mbessa/ Mangassanja	Milange/ Coromana	Gurué/Ana Rita	Nicoadala/ Licuari	Mopeia/ Lualua	Quelimane/Brandão	All
All varieties								
n=	8	17	9	17	10	5	7	73
Mean (Mt)	734	77	128	879	61	390	89	371
Median (Mt)	[235]	[37]	[54]	[634]	[36]	[185]	[257]	[140]
SE	(595.67)	(24.04)	(12.00)	(203.18)	(34.79)	(185.34)	(260.42)	(94.25)
Selling orange-fleshed sweet potato exclusively								
n=	n.a.	2	n.a.	10	2	n.a.	2	16
Mean (Mt)	n.a.	48	n.a.	749	15	n.a.	524	591
Median (Mt)	[n.a.]	[48]	[n.a.]	[547]	[15]	[n.a.]	[524]	[386]
SE	(n.a)	(20.51)	(n.a.)	(209.25)	(176.78)	(n.a.)	(653.37)	(158.63)
Selling both white and orange-fleshed sweet potato simultaneously								
n=	6	1	n.a.	2	n.a.	n.a.	n.a.	9
Mean (Mt)	866	78	n.a.	840	n.a.	n.a.	n.a.	782
Median (Mt)	[235]	[78]	[n.a.]	[840]	[n.a.]	[n.a.]	[n.a.]	[250]
SE	(771.05)	(n.a.)	(n.a.)	(119.50)	(n.a.)	(n.a.)	(n.a.)	(532.84)
Selling white-fleshed sweet potato exclusively								
n=	2	14	9	5	8	5	5	48
Mean (Mt)	273	81	128	1182	46	221	-85	206
Median (Mt)	[273]	[31]	[54]	[434]	[36]	[102]	[257]	[87]
SE	(111.72)	(28.66)	(45.33)	(597.48)	(30.05)	(93.47)	(270.56)	(79.29)

Source: Traders' survey, 2009.
n.a: no observations.

Retail gross margins per kilogram were calculated for the two types of sweet potato as a ratio of weekly gross margin for traders selling exclusively OFSP or non-OFSP by the number of kilograms sold by week calculated from the number of sacks sold times the mean of weight of sacks. The mean of weight of sacks were calculated using the repeated measurements of weight in the districts of south and north Zambézia (See Table 13). The average weight of sweet potatoes in the north Zambézia was 42Kgs and 43Kgs in the south. Table 16 summarizes and compares the retail gross margins of OFSP and non-OFSP in four markets. In two of the three markets the gross margins of OFSP were slightly lower than those of non-OFSP. However, the gross margins for OFSP were largely higher in Quelimane market of Brandão where the OFSP price is higher because of increased demand as consequence of increasing consumers' awareness and the fact that it is not a production area, it depends on supply from the neighboring district of Nicoadala. The results in Tables 23 and 24 shows that, although OFSP per kilogram gross margins are slightly lower in some markets, OFSP weekly gross margins (medians) are higher than those of non-OFSP. This result highlights that retailers are getting higher returns per week for OFSP because of the higher OFSP price (see difference of prices in 2009 in Chapter VIII, Table 28) compared to non-OFSP and not

only because of the quantities of sacks sold per week, as suggested by retailers, which for example are lower in Nicoadala.

Table 16 Medians of Retail Gross Margins of OFSP and Non-OFSP by Market (Mt/Kg)

	Milange/Central	Gurué/Ana Rita	Nicoadala/Licuari	Quelimane/Brandão
OFSP	--	4.2	0.4	7.1
Non-OFSP	2.0	4.7	0.7	2.0

Source: Author calculations using traders' survey 2009.

More than 90 percent of 73 traders interviewed are engaged in sweet potato trading to generate income. Thus, it is expected that most of them will be encouraged to continue in the activity if marketing margins are good enough and/or the transaction costs are minimised, as discussed in chapter III.

Profits from OFSP trading are associated with experience of traders of selling the produce. A positive and statistically significant correlation (r=0.7) was found between the number of years traders had been selling OFSP and their marketing margins. Traders selling OFSP for more years tend to get higher margins. This result may reflect the accumulated knowledge to convince sweet potato consumers to buy these varieties telling them the nutritional and health advantages associated with the produce. Then, experienced OFSP traders could easily differentiate WFSP and OFSP heaps and sell the orange as superior produce for a higher price. More years of experience may contribute to building linkages with suppliers, more easily get needed information, improve bargaining skills needed during trade negotiations and so reduce transaction costs.

6.5 Why Traders Sell OFSP

To complement quantitative data collected from traders on all varieties of sweet potato, some traders responded to specific question about OFSP. From 73 traders interviewed, 34 were selling OFSP and they explained their reasons selling this new produce. Table 17 shows the result of the frequency of the reasons mentioned.

Forty-one percent of traders interviewed stated that they sell OFSP because its vitamin A content makes the produce demanded. One trader mentioned that consumers want OFSP because it 'empowers' the human body; this was one of the message used by the REU project in its changing

behaviour programme. Some 24 percent said that they sell OFSP because consumers appreciate it for other different reasons such as colour, texture and taste. Other traders sell OFSP looking primarily to generate some income independently if it was OFSP or not. To sum, traders are engaged in OFSP trade to generate income for their living adopting a crop that is profitable because is appreciated by informed consumers about vitamin A content and nutritional benefits.

Table 17 List of reasons for selling OFSP mentioned by interviewed traders

Number of traders selling OFSP during the survey (N=34)		
Reason to sell OFSP	Number of traders	Percentage (%)
Is appreciated by consumers	8	24
Profitable	2	6
Income generation	3	9
Vitamin A content	14	41
Is OFSP producer	6	18
Empowers the body (*dá força*)	1	3
Total	34	100

Source: Traders' survey, 2009.

6.6 Conclusion: Answers to Research Questions

Traders sold significant quantities of OFSP per week in many markets covered by this study. Large quantities were observed in northern districts markets of Gurué and Milange where agro-ecological conditions of sweet potato production are comparatively better than in the southern districts. In the north, traders in Gurué sold larger quantities, which would be associated to the fact that consumers and traders in this district had earlier marketing experience of OFSP produced in neighbouring district of Ile where a different OFSP project was implemented. In the southern districts of Nicoadala and Mopeia districts, traders sold reduced quantities of produce, despite the fact that they were involved in previous TSNI and Eat orange projects. The reason for that might be associated to the proximity of these markets to the main urban centre of Quelimane, where traders sold significant quantities.

In general, traders continued selling more non-OFSP varieties than OFSP after two years of project implementation, however, the quantity of OFSP sold increased in some markets from 2008 to 2009 seasons with intensification of production, training and public awareness campaigns. This contributed to the flourishing of new outlet markets of OFSP in urban markets reducing quantities sold in rural markets such as Licuari and Lualua in Nicoadala and Mopeia, respectively. The

prevalence of high proportion of non-OFSP varieties even in areas where different project components including public awareness were running can be explained by the normal barrier that new products face when entering into new markets because of consumers' risk-aversion preference as noted by Costa and Jongen (2006). Nevertheless, the number of traders selling OFSP rose from 14 in 2008 to 24 in 2009 in the markets surveyed. Marketing of OFSP varieties was taken up by entrepreneur traders those found it as new business and rewarding opportunity (Elka, 1988).

Low starting capital facilitates traders to begin selling OFSP. The money necessary to purchase and trade sweet potato is lower than what required for other commodities traded in Zambézia such as maize. Traders pointed out the facility to buy the initial produce with a limited amount of money as one of the reasons to sell sweet potato. Although selling OFSP needs relatively more money than non-orange varieties, traders stated that they could sell OFSP faster that non-OFSP.

In terms of costs of marketing southern Zambézia is more favourable than the north, even though costs have a similar structure in both regions. The total marketing costs consist of purchasing costs, transport, loading, plastic bags, market taxes, storage, losses - rotten and broken roots - gifts and other implicit costs such as food and accidental accommodation. However, loading costs are common in the south where trucks are used to transport the produce, while in the north most traders and intermediaries use bicycles. Apart from purchasing costs, transport is the major cost in sweet potato trading. It is higher in the north where roads are poor and bicycles are commonly used than in the south with relatively good roads and traders use trucks to transport the produce.

The relatively high revenue, associated to higher prices, generated by traders selling OFSP in Zambézia may drive marketing of the produce. OFSP is selling for higher prices compared to non-orange varieties during the marketing season in most markets. This results in higher weekly marketing gross margins for traders selling OFSP compared to those selling non-OFSP varieties. This also increases traders' income and their current capital to improve marketing operations. This is possible given the increased acceptability and demand associated to consumers' awareness about OFSP vitamin A content and health benefits to which the project has contributed.

CHAPTER VII: RESULTS – SWEET POTATO PRODUCERS

Specific research questions:

1. Will farmers shift from growing and selling local sweet potato varieties to OFSP?
    a. What are the major factors contributing or not to such a shift?
    b. How can these factors be explained, qualified or quantified?

7.1 Small-Scale Producers

The literature highlights that the possibility of selling surplus represents an incentive for farmers, including small-scale, to adopt or devote part of their resources to produce certain crop (Smith, 1776, Mazuze, 2005, Boughton, 2007). In this research two groups of farmers, according to sweet potatoes area, in the project implementation districts were studied (see Chapter 3.2 on project implementation): the small-scale and the medium-scale producers registered by the project. Qualitative investigation of 98 small-scale farmers, undertaken in 2008, looked at the experiences of small-scale producers producing, consuming and selling OFSP in the four districts. Results showed that their main purpose of growing OFSP was home consumption and sale of a small surplus, if marketing opportunities existed. Similar results were found in project impact assessment done by IFPRI for the REU project (Arimond *et al.*, 2010).

Sweet potato producers in the project implementation area were taught about the best practices of growing OFSP and the health benefits of consuming the produce, particularly for children. Small-scale farmers were supplied with small amounts of sweet potato vines to ensure sufficient production for home consumption during the three-month sweet potato season, but it is known from previous experience in Mozambique that small-scale farmers sell some amount of their agricultural production to generate an income (Bias and Donovan, 2003). To ascertain whether this was the case with the small-scale OFSP producers, a qualitative investigation was undertaken to understand the main reasons of these producers to take up OFSP production, their experiences in selling OFSP, if any, plans for next season based on their production and marketing experiences.

As discussed in Chapter II, many of the market access constraints existing in developing countries are related to transport system inadequacies such as weak road infrastructure, transport availability, communications and distance to markets. Marketers in Zambézia face some of these constraints.

The small-scale producers in this investigation were divided in two groups: those with good access to markets and those with limited access. This classification was based on the distances to the nearest market and the availability of an adequate transport (this included access to motorised transport and bicycles - a popular and highly used source of transport in Zambézia to move agricultural produce and people). The central assumption made was that shorter distances to markets and the existence of motorised and non-motorised transport systems were key conditions for improved market access for producers. However, even where good market access existed, if producers did not sell their OFSP it means other constraints need to be considered in analysis. The information on small-scale producers growing enough to sell was verified with the relevant REU project agricultural extension officer and the World Vision marketing coordinator in order to include both areas with or without good market access. Table 18 shows some important parameters to define easy market access for producers.

The summary of the results of small-scale producers' (SSP) qualitative investigation on marketing participation and perspectives are shown in table 19. Most SSP in the four districts (Milange, Gurué, Nicoadala and Mopeia grow OFSP primarily for home consumption but sell some if marketing opportunities exist and they have surplus available. Of the 98 SSP, 93 percent grow OFSP for home consumption while seven percent were looking primarily for sell their production. The percentage of farmers producing for selling is within the range of proportion of farmers selling any variety of sweet potato in Zambézia reported by a study undertaken by World Vision in the same province (Fote *et al.*, 2009). This study found that five percent of all sweet potato farmers in the northern districts of Zambézia and 15 percent of all southern districts sampled sold some sweet potato. The REU project baseline survey of 703 households undertaken by IFPRI in 2006 found 25 percent of farmers selling any variety of sweet potato (Brauw *et al.*, 2010). The difference is that this survey included in its sample the district of Milange which is largest producer of sweet potato and has very active sweet potato marketing along the border or on the other side of the border with Malawi that may have increased the proportion of farmers participating in marketing.

Table 18 Distances from the main sweet potato sites to the main markets in Zambézia

District	Production sites	Main markets	Distance (km)	Conditions of the road and transport
Gurué	Mangone	Municipal market of Gurué	7-15	Not tarred roads and hill. Bicycles
	Naiuma	Municipal market of Gurué	31	Not tarred but good road. Mostly bicycles are used and rarely trucks are available
	Epalague/Ruace	Municipal market of Gurué	48	Not tarred but good road. Irregularly trucks pass linking Gurué to Cuamba
	Niusse	Municipal market of Gurué	78	Not tarred but good road. Irregularly trucks pass linking Gurué to Cuamba
	Niusse	Cuamba/Niassa	70	Not tarred but good road. Cut by a river during rainy season
Milange	Simbe/Vulalo	Municipal market of Milange	27	Not tarred. Bicycles used mostly
	Nhazombe	Municipal market of Milange	13	Not tarred but good road. Bicycles used mostly
	Tambone/Liciro	Municipal market of Milange	77	Not tarred but good road. Vehicles used
	Tambone/Liciro	Municipal market of Mocuba	123	Not tarred but good road. Bicycles used mostly
	Lualua/Liciro	Municipal market of Milange	75	Not tarred but good road. Rarely used by trucks and bicycles
Mopeia	Vundo/Posto campo	Lualua	40	Not tarred but good road. Rarely used vehicles and bicycles
Nicoadala	Nhanguo	Licuari	4	Tarred and good road. Vehicles and bicycle mostly used by
	Julião	Licuari	7	Not tarred but good road. Bicycles used mostly
Quelimane	Brandão	Licuari	40	Tarred and good road. Vehicles and bicycles mostly used
	Brandão	Nicoadala	30	Tarred good road. Mostly used by vehicles and bicycles
	Brandão	Maganja da Costa	150	Segment tarred and another not paved. Good road. Mostly used by vehicles

Source: Measured and compiled by the author, 2008.

Of the four OFSP project intervention districts, Nicoadala (12 percent) and Mopeia (8 percent) in southern Zambézia were found to have the most SSP producing OFSP primarily for the market. This may be due to two main reasons. First, vegetables are more traded in the south than in northern Zambézia, where grain, particularly maize, and beans are more produced as commercial crops (MAE, 2005b; ORAM, 2005). Second, in the south, the proximity of the SSP supply sites to the demanding large urban markets (Licuari transit market and Quelimane town markets) that are more familiar with the orange-fleshed varieties, due to their experience with the previous two OFSP projects, exposes more farmers to market opportunities.

Table 19 Main reasons for growing OFSP, marketing and planting future plans by small-scale producers in Zambézia

		Districts			
	Overall	Milange	Gurué	Nicoadala	Mopeia
n=	98	30	20	24	24
1. Villages		Nhazombe Simbe Tambone Lualua/Liciro	Mangone Epalague Naiuma Niusse	Nhanguo Julião Momede Dugodiua	Mudiba Simogo Posto Campo Vundo
2. HH consumption as primary aim to grow OFSP (%)	93	97	95	88	92
3. Marketing as primary aim to grow OFSP (%)	7	3	5	12	8
4. SSP accessed market (%)	61	53	45	83	63
5. Average quantity sold per season (sacks/producer)	1.87	1.6	3.07	1.74	1.02
6. SSP planning to increase acreage next season (%)	85	80	70	96	92

Source: Small-scale producers' (SSP) qualitative investigation, 2008.

Although most SSP grow OFSP for home consumption, selling is appealing if market opportunities exist and surpluses are available. Some farmers reported this in the following ways:

> "I produced OFSP for home consumption but because I had surplus I decided to sell some amount."

> "OFSP was for home consumption and for selling some amount to earn some money for home expenses."
>
> "I produced OFSP primarily for home consumption because I was told that it contains vitamin A and it was good for health. However, I sold some amount to obtain money to buy clothes, salt and pay maize milling."

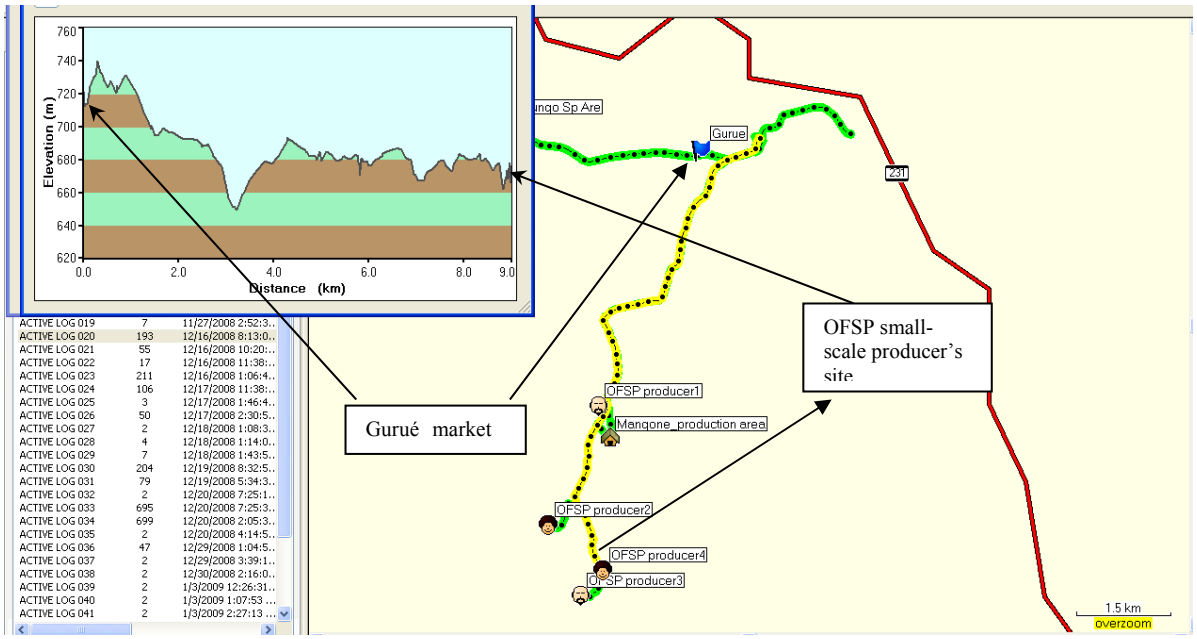
In general, SSP were able to sell the target quantities but this varied according to districts and the market access of the different production sites. This concept of being able to sell the intended amount is an important one. Although it may be possible to sell smaller amounts, if a famer is not able to sell the portion set aside for sale, it is likely that they will report that market access is a problem or that they feel dissatisfied with marketing opportunities even though they may have not been very active in searching out such opportunities. Obviously, farmers were likely to report good market access in places where they were satisfied with the quantities they were able to sell and the price offered. Overall, 61 percent of SSP interviewed were able to sell the quantities of OFSP they wanted to. More producers in the southern districts (Nicoadala and Mopeia) reported having sold the quantities they wanted to compared to those in the north of the province (Milange and Gurué). This is expected result considering that the southern districts benefited from two OFSP projects that increased consumer's awareness. In contrast, a district like Milange in the north was more exposed to Admarc Malawian yellow varieties that increased marketing relationship for this special variety. In general, it is also likely that it would have been harder to find markets for larger quantities as the product was still relatively unknown. The average amount of OFSP sold per SSP, for all districts, was 1.87 sacks weighing approximately 50 kilograms (i.e. 94 kg).

In fact, the possibility of being able to sell some surplus appears to have an impact on producers' willingness to continue growing the crop and even increase the acreage grown. Most farmers (85 percent) in the overall districts showed their intention to increase their OFSP acreage in the next season if planting material is available. This intention is highest in those districts (Nicoadala and Mopeia) where the percentage of farmers who sold the quantity of OFSP they wanted was also highest.

The data was disaggregated to village level to understand details of small-scale marketing experiences given the variability between villages within the same district. This variability is mainly related to the distances between the production sites and the potential markets, improved roads and transport. Another important factor on market access, especially in Gurué district, is the dirt roads that limit the circulation of bicycle – the most used transport to take produce to the

market. Some OFSP small-scale producers in this district sell their produce at home when there is scarcity but also they are doing so due to the difficulties in transporting a sack of sweet potato by bicycle because of the steepness of the inclines encountered in this mountainous terrain. Figure 11 shows that a farmer has to climb a cumulative height of about 200 metres from his area (Mangone) to get to the town market in Gurué (a distance of nine kilometres).

Figure 11 Pathways from production site to the market, Gurué, and Zambézia



Source: Author's path tracking using GPS, 2009.

In Milange, in the villages closer to the Malawi border such as Lipale and Nhazombe farmers benefited from the fact that Malawians – the main sweet potato buyers in this area - were increasingly buying OFSP following radio commercials spots broadcast by radio one and two in Malawi in behalf of the REU project.

Impact Study on Changes in OFSP Marketing

The results of an impact study undertaken by IFPRI (2010), based on the baseline and end line surveys in the REU project intervention areas, found that at the end of the project more farmers have been involved in OFSP marketing responding to increasing demand (Table 20). The table

shows positive changes in proportion of producers involved in marketing process. The difference between the proportions of farmers that who sold OFSP in 2009 was higher than that of 2006 in all districts covered by intervention. The high proportion of change in sales (0.250) was observed in southern Zambézia, in Mopeia and Nicoadala districts, which support the results of the small-scale farmers' investigation. The reason for that was also highlighted and related to the exposure of farmers, traders and consumers in this region to OFSP in previous projects increasing their knowledge about agronomic and marketing operations and health benefits of the produce. Consistently with the small-scale investigation, the impact study showed that Milange district had the lowest change on proportion of producers selling OFSP (0.064). The earlier referred distribution of Admarc non-OFSP varieties during emergence period in this district and fact that this was the first experience with OFSP may have influenced in this comparative low proportion of sales.

Table 20 Changes in proportion of producers who sold OFSP in Zambézia (2006 – 2009)

Districts	2006 survey means	2009 survey means	Difference
Overall districts	0.035	0.164	0.129
Milange	0	0.064	0.064
Gurué	0.098	0.216	0.118
Mopeia/Nicoadala	0.036	0.286	0.250
No. Of observations	201	201	201

Source: Adapted from IFPRI impact assessment (Brauw *et al*., 2010).

7.2 Conclusion: SSP: Answer to Research Questions

Small-scale producers shifted from producing non-OFSP to produce OFSP. One of the reasons of this shift is the possibility to access the market to sell the target quantity of new sweet potato variety (OFSP) although marketing was not the main reason to grow the crop. About 61 percent of 98 producers interviewed were able to sell the quantity of produce they wanted to and 85 percent, especially in areas characterized by easy access to market, intended to increase their acreage given the good experience they had with increased demand for OFSP. It means that the demand and the institutional framework set by the project facilitation were able to create the necessary environment for OFSP marketing although a large proportion of producers grow OFSP for their home consumption. A higher percentage of small-scale farmers selling (83 percent) were observed in

Nicoadala followed by Mopeia (63 percent), both districts in southern Zambézia. Conversely, the districts in the north of the province had comparatively fewer farmers selling the produce. An explanation for this result is the different demand resulting from difference on public awareness about the product from other earlier OFSP projects like TSNI and Eat Orange that occurred in the south (Low *at al*., 2005). The reasons linked to the demand for OFSP observed in the intervention areas are similar to those described in the literature by Delgado and Pedrozo (2007) who highlight the innovation, minor changes in introduced product, and length of period of public awareness campaign about nutritional information of interest for consumers when introducing a novel product. The distance to markets was stated as one of the constraints to reach the markets by farmers. The distance to the main markets varies from 4 to 150 Km and the main transport used by farmers and traders to get into supply sites or markets is bicycle. Although some of these distances can be quantified the investigation showed that some markets are not accessible given the steepness of mountainous terrain especially in northern Zambézia.

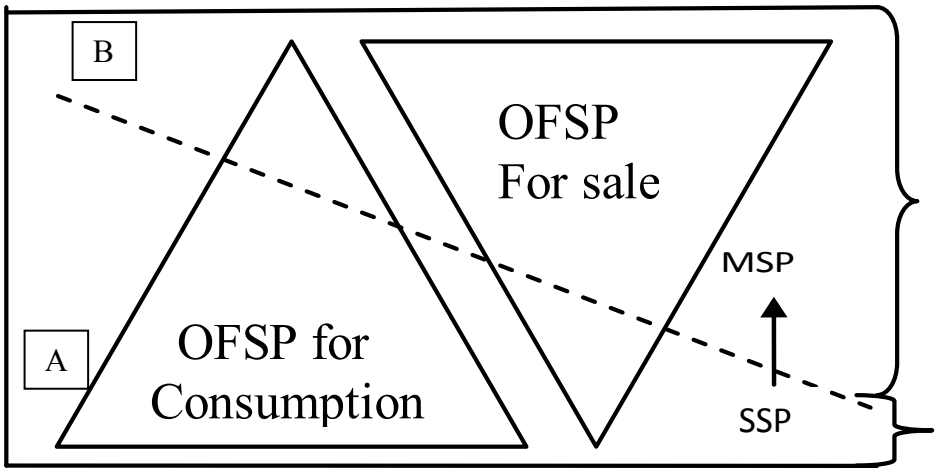
7.3 Orange-Fleshed Sweet Potato Medium-Scale Producers

7.3.1 Results of the Qualitative Investigation

The MSP qualitative investigation undertaken in 2008 as follow up to the MSP quantitative survey showed that there was a mix of success and failure on marketing OFSP for a number of reasons. Many so-called MSP are more like ordinary project farmers in terms of area producing OFSP and the quantity produced. The list used to identify MSP for the survey was based on the names of producers who received enough vines to plant to qualify them as MSP. However, not all producers had the required area to be considered a MSP. Only 23% of the 105 farmers interviewed had fields of more than 0.5 hectares; 71% produced in areas less than 0.5 hectares and 6% had no OFSP area for a variety of reasons. In terms of production, 76 farmers produced two or more sacks, and the top farmer, in Lioma, Gurué, produced 110 sacks alone. 18 farmers produced between 0.5 and 2 sacks while 9 had no production to sell. However, some farmers who had problems to access the market in this year were planning to continue planting and take advantage of project marketing facilitation (establishment of marketing committees and linkages to markets) during the following season. The role of project facilitation worked as a component of marketing institutional framework that allow producers to enter in the market as noted by North (1992).

Compared to MSP, it is interesting to note the small-scale farmers' ability to manage their small production, shifting from consumption and gifts to marketing, according to market opportunities. This rarely happened with larger producers who manage relative larger quantities than SSP. Figure 12 shows the pattern of two different types of sweet potato farmers and their dynamics during the development process and possible shifting from small-scale production to medium-scale production. Under the REU project, medium-scale producers (MSP) were encouraged to produce for the market, while small-scale farmers (SSF) were encouraged to produce enough to meet household consumption needs. During implementation, it was observed that 85% of SSP have responded to the demand of OFSP by showing their intention to increase acreage to meet future marketing opportunities moving from position A of small production to become MSP in position B. The interrupted line in the figure separates SSF (A) and MSP (B) behaviour triangles.

Figure 12 REU implementation model: small-scale producers' (SSP) and medium-scale producers' (MSP) sweet potato production and marketing patterns



Source: Author.
Note: Farmers' development process (influenced by access to resources, risk, willingness, marketing, information and entrepreneurship)

There were farmers in Nicoadala who did not need facilitation from the project to sell their product because they had already found a market. However, this did not mean that generally the market was operating smoothly. Some traders linked to producers in these areas could not buy as much OFSP as they wanted to due to the relatively low supply and the absence of a bulking or assembly place. Producers wanted to sell their produce that was found unacceptable by traders given their small size.

To understand and evaluate OFSP market access, MSP were asked about their production, sales, frequent buyers and possible other options and strategies to use sweet potato surplus. Although MSP grow sweet potato primarily for sell, previous survey has found that almost half of them failed to produce enough amounts to supply the market in 2007 (MSP survey, 2008). From this evidence, it can be argued that the first premise to evaluate market access is to ascertain whether the producers have harvested enough for sale. Second, an assessment of the amount sold or bartered compared to that have been harvested may give a realistic parameter of access to the markets.

7.2.2 Results of MSP Quantitative Survey

It was found that 110 of 128 MSP interviewed for this study in January/February 2010 have harvested some amount of OFSP in 2009 (table 13). The large number of producers who harvested was concentrated in Milange district (70) followed by Gurué (14) and Mopeia (14); Nicoadala with 12 MSP had the lowest number of producers harvesting. However, it is important to note that not all MSP interviewed in Milange harvested OFSP in 2009, while in the others three districts all producers interviewed harvested. Only the group of MSP who harvested could provide useful information about their experiences on selling sweet potato in 2009. Nevertheless, producers with reduced amount of produce may prefer not to participate in marketing.

In general, it was found that market access for MSP, in sense of selling at least a minimal amount of the production, expanded. In total, 83 of 110 MSP who harvested OFSP have sold some amount of their production (Table 21). This represents 75.5 percent of producers in all four districts. The rest of 27 producers or 25 percent did not find markets to sell, although some of them reported exchanges of sweet potato with other products or services. Seven MSP of 27 who did not sell their production used it to barter or to pay farming labour, mainly weeding and land preparation. Taking into account this proportion of farmers who bartered the percentage of farmers who sold or exchanged OFSP rises to 81.8 percent.

There is a spatial difference in market access between districts. The proportion of MSP who sold some amount of OFSP was higher in Nicoadala (92 percent) and lower in Milange (71 percent). Similar result was observed with the proportion of amount of OFSP sold by district (Table 21). The highest percentage of sales was reported in Nicoadala (80 percent), followed by Gurué (67 percent).

Milange had the lowest proportion (49 percent) and in Mopeia 52 percent of production sold. This means that Nicoadala not only had most producers selling from those who have harvested but also that these producers sold a highest proportion of their production compared to other districts. On the other side, Milange with low proportion of producers selling had the lowest proportion of produce sold as well. These findings suggest that even with the same project marketing activities across the four districts there are other factors playing a key role in OFSP marketing. For instance, Nicoadala may have benefited from his proximity (40 km) and good linkage to the large consumer market of Quelimane city, the capital of Zambézia. To recall as well that this district benefited from a previous OFSP project, that increased awareness about OFSP among farmers and consumers. Most of fresh produces, mainly vegetables, consumed in Quelimane are from Nicoadala, and concretely from Licuari market where many produces are bulked and easily transported by available trucks. The situation in Milange is quite different with some MSP spread away from the existing supply sites and out of the active rural periodic markets near to the border with Malawi, the principal market for agricultural produce in this district. The informal Malawian market is the principal one for producers in Milange, therefore the REU project promoted OFSP in Malawi through commercial broadcast in two radio stations, telling the buyers the advantages of OFSP and the locations in Milange buyers could find the produce. This has resulted in increasing OFSP demand from Malawians in areas bordering Malawi (MSP qualitative research, 2008). This demand may have contributed to raise OFSP prices but not yet much more than the local varieties.

Despite the overall high proportion of MSP participating in marketing of OFSP, the results show that some of them are not able to find buyers for their produce. Twenty MSP producing about 96 sacks in all four districts did not sell or barter their produce. A large proportion (15) of them is located in Milange district, where remote and distant areas from the main informal cross border market with Malawi are likely to face limited linkage with buyers.

Table 21 Number of MSP interviewed, quantities of OFSP produced, sold, bartered and proportion of sales by district in Zambézia, 2009

	Districts				
	Overall	Milange	Gurué	Nicoadala	Mopeia
Number of MSP registered in the last three years (2007/8/9)	176	119	19	15	23
Number of MSP interviewed	128	87	14	13	14
MSP who harvested (n)	110	70	14	12	14
Quantity produced (sacks)	1,283	720	140	289	134
MSP selling (n)	83	49	12	11	11
Qt sold (sacks)	748	353	94	231	70
MSP who did not sell but exchanged for other products or services (n)	7	6	0	0	1
MSP neither selling or exchanging (n)	20	15	2	1	2
Qt produced by MSP who did not sell and exchange (sacks)	95.6	68.6	8	6	13
Qt exchanged with services or products (sacks)	70	52	5	5	8
Proportion of OFSP sold (%)	58	49	67	80	52

Source: NRI and CIP MSP survey 2010.
Note: Common sack size in Zambézia is 50 kilograms.

Three farmers of this group were concentrated in the village of Lipale-Coromana and two in Tambone and others spread in different villages including some where others MSP have sold their production. A previous qualitative investigation with small-scale producers in 2008/9 under the same operation research activities showed that small-scale producers in Lipale-Coromana could easily access Malawian markets through regular visits from Malawian itinerant traders looking for OFSP. This contrast may be related in part to the quantities produced by each group of producers. Small-scale producers sold a range of 2-12 sacks of 50 kilograms in Lipale-Coromana and they were happy with the quantity sold. It is expected in theory that MSP with relative large production areas would produce more and therefore supply more produce to the market. However, in the same village there is evidence from the data that those MSP who did not sell had low production ranging from 0.04 to 2.5 sacks. The other two MSP in Tambone produce 5 and 5.5 sacks each. From this result, it can be argued that the use of quantities of OFSP sold to evaluate market access it is important but may not be conclusive. The marketing access has to be assessed through the market surplus; the amount of sweet potato sold or not has to be linked to the amount produced and

available to be traded to draw a realistic picture. Tambone is a remote village about 75 km from Milange town on the way out to Mocuba and Quelimane cities. This distance to the area of major concentration of the main buyers (central markets and Malawian traders) may be the principal reason of lack of market access in this area, which is exacerbated by erratic transportation system and limited local demand.

Some other initiatives of using OFSP, such as using OFSP to barter, are arising from MSP. A significant amount of OFSP was bartered for other products or used to pay labour, mainly weeding and land preparation to respond to the limited market access in some areas, but as well as producers' livelihoods strategy. Of the 70 sacks bartered in four districts the highest amount was observed in Milange (50 sacks) where more producers faced limited access to market compared to other districts. The lowest amount bartered was observed in Nicoadala and Gurué, with relative good market access, which may mean that it is part of producers' marketing strategy or risk management on rationalizing their production in situation of limited market access.

It was showed above that OFSP marketing access was not uniform across the four districts studied and even among MSP in the same district. There are districts with more MSP selling larger quantities of produce than others. To understand the spatial distribution of the best and worst sellers, MSP were ranked low according to the amount sold, excluding the amount exchanged, and categorized in quartiles of OFSP sales. The first quartile comprises MSP who sold more and the fourth quartile those who sold less. The results were crossed by district and are reported in Table 22.

In the first quartile (top sellers), it can be observed that most producers are from Milange and Nicoadala, while few MSP in Gurué and Mopeia are falling into this group. Looking at the second quartile, Milange leads with more MSP selling much sweet potato (65 percent) and Gurué appearing as the second (19 percent). In the fourth quartile, the category of producers with fewer sales, again Milange has more MSP (78 percent). This indicates a great variability on access to markets in the same district. Milange presented low proportion of MSP selling and low proportion of sales but has more MSP in the top sellers' category than other districts. Very important to note is that Milange contributes more for the category of MSP with fewer sales than in other categories. Some of the reasons of this distribution have been pointed out but further analysis are being carried out to understand which factors may contribute to be a good MSP seller not only in this district.

Nicoadala district presents a second high proportion of MSP in the first quartile and it was observed earlier that the proportion of MSP selling and the proportion of sales were also the highest among the four districts. The result suggests that in this district, most MSP had access to market and they could sell relatively large quantities.

Gurué district compared to others is regarded as an intermediary market contributing with some top sellers MSP and also some producers into the last quartiles; while Mopeia has more MSP selling smaller amounts of OFSP.

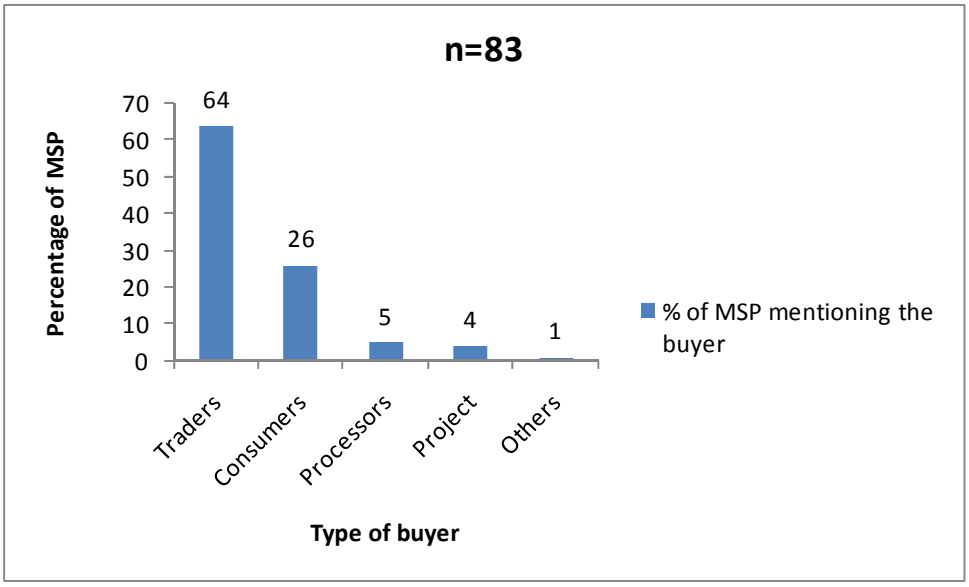
Table 22 Percentages of MSP by quartiles of sales by four districts in Zambézia

District		Quartiles of OFSP sales (1=More sacks sold; 4= few sacks sold)			
		1st quartile	2nd quartile	3rd quartile	4th quartile
	n=	27	26	30	27
Milange (%)		48	65	67	78
Gurué (%)		11	19	10	7
Nicoadala (%)		26	12	3	4
Mopeia (%)		15	4	20	11
All		100	100	100	100

Source: MSP survey, 2010.

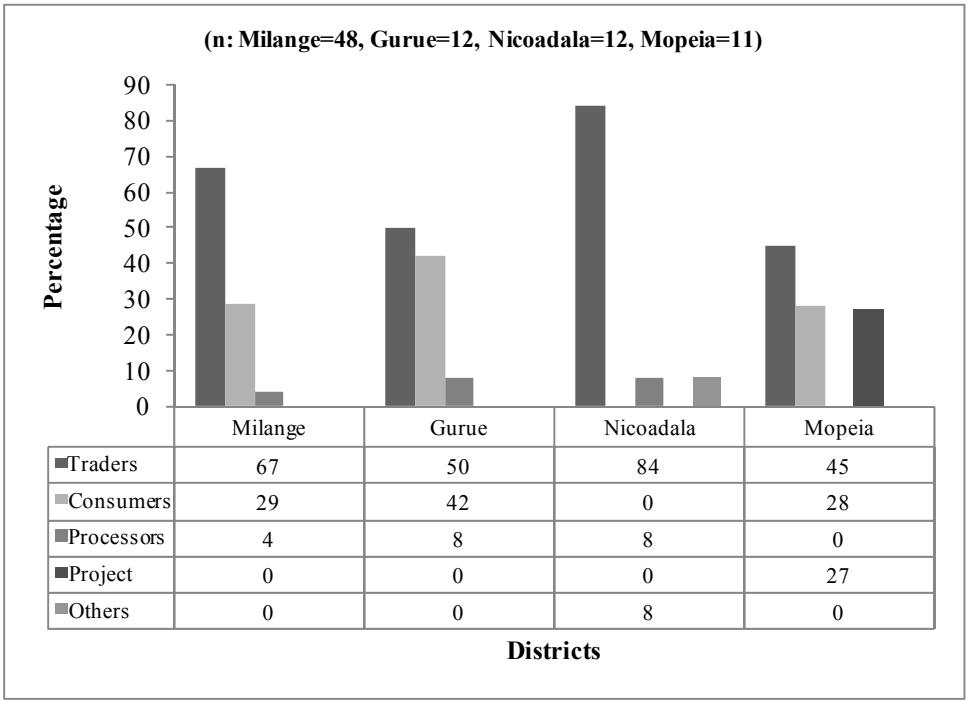
Figure 13 and 14 show the most frequent type of sweet potato buyers reported by MSP. The major buyers of OFSP from the MSP are traders and specifically retail traders. Among traders, retailers are the major group of buyers followed by consumers.

Figure 13 OFSP medium scale producers' most frequent buyers in Zambézia



Source: MSP survey, 2010.

Figure 14 OFSP medium scale producers' most frequent buyers by district



	Milange	Gurue	Nicoadala	Mopeia
Traders	67	50	84	45
Consumers	29	42	0	28
Processors	4	8	8	0
Project	0	0	0	27
Others	0	0	8	0

Source: MSP survey, 2010.

7.3.3 Sweet Potato Prices at Producer Level

The REU project taught producers that OFSP was a superior product compared to non-OFSP varieties given its high vitamin A content. Because of that, producers should sell it separately and expect higher prices for OFSP compared to other varieties. There were interviewed medium scale producers with OFSP and non-OFSP in same districts and project sites (see section 4.2.5)

The results of the Medium Scale Producers (MSP) survey showed that at producers' level the overall mean price for OFSP is higher compared to the mean price for non-OFSP varieties (white and yellow). Table 23 shows the comparison of farm gate mean and maximum price of 50Kg sacks of OFSP against non-OFSP in the four project districts (Milange, Gurué, Nicoadala and Mopeia). Nicoadala and Gurué are the districts where OFSP price was higher than non-OFSP varieties, particularly in Nicoadala where OFSP price is nearly 250 percent higher. This is not the scenario in Milange and Mopeia, however, where OFSP is sold at a lower price than non-OFSP varieties. The results are consistent with the time series price data collected in 2009 and the spot prices collected in 2007 and 2008. Analysis at retail market level found that there was a statistically significant difference between the high OFSP price and the non-OFSP price in Licuari, Nicoadala. Similar differences were observed in Gurué and Quelimane. In Milange, although few observations of OFSP retail spot prices are significantly higher, prices between the two varieties are almost the same. It has been referred earlier that most of production in Milange was traded across the border with Malawi; therefore, OFSP demand from Malawian consumers is key to stimulate price increase at producer level. This was done with one promotion activity carried out in Malawi and some radio commercials. However, this may not be enough to have a same impact such as in Mozambique where continuous campaigns, commercials, road signs, traders and farmers' training, market boards were used to raise consumers' awareness to buy OFSP. The equal price between OFSP and non-OFSP varieties at retailing level and the low OFSP price at producer level may be the evidence of more OFSP demand from Mozambican consumers at retail level and relatively low OFSP demand from Malawian traders at producer level. Other factors linked to the acceptability of OFSP by Malawian consumers against the local ADMARC sweet potato variety have to be considered and researched as important issues, which may contribute to lower OFSP price.

Table 23 OFSP and non-OFSP farm gate mean prices (Mt/50 kilograms sack) in Zambézia

	Overall		Milange		Gurué		Nicoadala		Mopeia	
	OFSP	Non OFSP	OFSP	Non OFSP	OFSP	Non OFSP	OFSP	Non OFSP	OFSP	Non OFSP
N	83	24	49	18	12	1	11	4	11	1
Mean price	143	128	117	133	155	125	236	93	154	175
SE	(7.75)	(11.11)	(6.45)	(13.97)	(22.62)	(--)	(17.95)	(7.50)	(27.08)	(--)
Maximum price	350	278	300	278	250	125	350	100	250	175

Source: MSP survey, 2010.
SE: Standard error.

7.3.4 Impact of Facilitative Marketing Activities on Market Access for MSP

In the context of introducing OFSP and recognizing the key role that could be played by marketing system on giving incentives to farmers for sustainably take up the crop, the REU project included a marketing component implementation. This component worked on implementing the facilitative marketing strategy designed jointly with the marketing operation research, which consisted mainly on: a) training traders about OFSP business and basic knowledge about vitamin A; b) training farmers on marketing issues and create marketing committees to commercialize as a group and c) training extensionists about marketing issues and facilitative approach. Apart from trainings other marketing activities were carried out to create a demand for OFSP, including small boards indicating OFSP in the retail markets, linkages of traders to farmers, mural paintings, road signs and directions indicating zones of concentration of OFSP producers and markets, respectively, radio commercial spots and programmes. Some MSP received training on marketing but there were no focus groups for marketing committees (these were only held with targeted small-scale producers in areas with limited access to market).

MSP were asked whether the marketing activities implemented by the REU project had any impact on their market access in 2009. Table 24 shows the results of the producers' perceptions by district. Almost two-thirds of MSP (62 percent) stated that road signs indicating the location of OFSP producers had positive impact on their sales. The signs guided traders to locate the zones of OFSP production. Some 46 percent of producers reported that radio spot messages were more important in creating demand for their produce. Marketing committees had less impact on MSP in part due to their focus on small-scale producers and lack of coverage of some project implementation areas where many MSP are located. Of 128 MSP 103 had not marketing committees in their zones and of

those 25 who had 24 were part of the committees. About 8 MSP mentioned marketing committees as one of the project activities which allowed them to sell their produce.

Other factors that contributed to improve market access according to MSP recall are the activities carried out by nutrition promoters and agricultural extensionists. In all the sample about two thirds of MSP (57 percent) believe that they could sell OFSP due to public awareness raised by promoters' activities. This was particularly reported in Milange. The work carried out by the agricultural extensionists was also particularly mentioned by few producers in Gurué and Mopeia.

Table 24 MSP perceptions about the impact of REU project activities on OFSP market access.

	Overall	Milange	Gurué	Nicoadala	Mopeia
n=	72	39	12	11	11
Marketing linkages (%)	31	31	36	36	18
Radio commercials (%)	46	49	64	36	27
Road signs (%)	63	67	55	73	46
Marketing committees (%)	11	8	36	9	0
Nutritional education for general public (%)	56	56	75	46	36
Others:					
n=	28	17	5	3	3
Nutrition promoters' activities (%)	57	94	0	67	0
Agricultural extension activities (%)	39	6	100	0	100
Promotional materials (caps, T-shirts) (%)	4	0	0	33	0

Source: MSP survey, 2010.

7.3.5 Medium-Scale Producers' Profile

The profile of the medium scale producers is dominated by men; this is similar to the production of all cash crops, according to some African and Mozambican studies (Simione, 2009, Sender *et al.*, 2006). The production of OFSP in relatively large areas to supply the market was taken up by adult men, of which 50 percent were project promoters (Table 25). The fact that such a large proportion of MSP were promoters was related to the selection criteria for recruiting promoters. The selection criteria were based on producers' reputation, standing in the community and capacity to mobilize other farmers. The promoters were the first contact point between the project and the communities, which may have contributed greatly to their participation as MSP. Moreover, most OFSP producers

(82 percent) growing the crop as MSP were over the age of 35. The participation of women in medium-scale production was limited. Men accounted for 91 percent of MSP and in each of the four districts the percentage of men was equal or above 90 percent.

At the end of the fourth year of intervention in 2010 a significant number of MSP have accumulated experience on producing and selling OFSP. Overall, 91 percent of MSP have been producing the crop for two or more years, only nine percent were producing for the first time. Some 47 percent of the MSP had grown the crop for three years while 20 percent had grown it for four years in all the two seasons since the intervention started in 2006. The districts of Mopeia (57 percent), Nicoadala (54 percent) and Gurué (54 percent) had the higher percentages of producers with three years of experience. Conversely, Milange had the lowest percentage of experienced producers but the district had a higher number of MSP in absolute terms than each of the three districts. Since the engagement in production of MSP as was voluntary and most producers continued for more than two years it seemed that the conditions of production and marketing were attractive for producers.

MSP were involved in production of other crops for home consumption or for sell. In average MSP had more than two crops for sale and the main crops were maize, rice, pigeon pea, beans and cassava. However, a significant number of producers, 64 percent in Gurué and 23 percent in Nicoadala produced soya bean and tobacco for sale. Vegetables were also grown especially in Nicoadala district. The diversified cropping system challenged the adoption of OFSP to be competitive; otherwise producers would shift to other crops. A significant number of MSP had experience of participating in agricultural marketing selling other crops. Overall, about 70 percent of MSP had more than five years of experience selling staple food crops and 59 percent selling cash crops.

Table 25 Characteristics of OFSP medium scale producers, cropping system and marketing in four districts in Zambézia

		Overall	Milange	Gurué	Nicoadala	Mopeia
	n=	128	87	14	13	14
Age (%):						
	<18	2	2	0	0	0
	18-25	3	2	7	0	7
	26-35	13	12	7	23	21
	>35	82	84	86	77	72
Gender (%):						
	Male	91	90	93	92	93
	Female	9	10	7	8	7
Promoter (%)		50	44	71	62	51
Years producing OFSP by MSP (%)	1	9	9	0	7	14
	2	24	28	31	8	14
	3	47	44	54	54	57
	4	20	19	15	31	15
Number of other crops growing for sale :	Mean	2.3	2.2	3.4	2.8	1.9
	STD	(1.3)	(1.2)	(1.3)	(1.2)	(1.5)
Other crops for sale by MSP (%):	Maize:	78	77	86	85	71
	Rice:	33	30	36	46	43
	Pigeon peas:	27	31	36		21
	Beans:	27	31	43		14
	Cassava:	14	9	7	31	36
	Soya:	7		64		
	Tobacco:	7	8	7	23	7
	Paprika:	6	8			
	Tomato:	5			31	
	Vegetables:	4			15	
	Pineapples:	2			15	
Years selling staple food crops vs. % of MSP:	<2 years	5	4	0	0	21
	2-5 years	25	27	14	31	22
	>5 years	70	69	86	69	57
Years selling cash crops vs. % of MSP:	<2years	37	19	60	46	58
	2-5 years	4	3	10	8	42
	>5 years	59	78	30	46	0

Source: MSP survey, 2010.

7.4 Conclusion: MSP: Answers to Research Questions

MSP continued growing and selling more OFSP than non-OFSP despite reported limited access to markets in some production sites. The following factors contributed to that, a) a significant number of MSP (50 percent) were promoters, responsible of linking the project and small-scale producers; b) existing demand for OFSP in some places especially in those exposed to nutrition and health

promotion messages and with good linkage to markets; c) the positive experience MSP had producing the crop for sale during more than two years and, d) higher OFSP price compared to non-OFSP.

OFSP production and farmers' participation in the market was not homogeneous among districts in Zambézia province. Higher production of OFSP is found in districts of Milange and Gurué in the north compared to Nicoadala and Mopeia in the south, given the relative good agro ecological conditions in the former. In terms of marketing, generally, market access for all project sites evolved considering that about 76 percent of MSP has sold a proportion of their produce. The larger proportion of MSP selling part of their production is observed in the south, namely Nicoadala district than in the north (e.g. Milange). This result is similar to that of small-scale farmers. The demand was a result of higher level of consumers' awareness about the health and nutrition benefits of OFSP in southern Zambézia, given the earlier projects, compared to the north and the proximity to the densely populated urban city of Quelimane. The comparative low awareness about OFSP in the north led the project to promote the produce in the neighbouring Malawi, broadcasting messages in two radio stations, organizing promotion days and linking traders to farmers. The role of information and consumers' awareness in demand creation was observed by Cranage *et al*. (2004), and Conklin *et al*. (2005). These authors underline the power of nutrition information on influencing consumers to buy new products, increasing demand and their intention to purchase in the future. Nevertheless, the marketing constraints associated with low development of support institutions and infrastructures are considered very important by Dorward *et al*. (2002). The increased demand for OFSP not only provided new market access opportunities to new MSP entrepreneurs but also pushed up the price and attracted MSP to continue growing and selling the produce where linkages to market existed.

CHAPTER VIII: RESULTS – SWEET POTATO SUBSECTOR ANALYSIS AND PRICES

This chapter presents the results of sweet potato marketing research, focusing on the organisation of the subsector and the produce flow from the production sites to consumers, including the prevailing and arising support institutions. It also analyses the vertical and horizontal structure of the value chain regarding production, processing and marketing decisions. Finally, it includes the analysis of geographical and price differences that can explain the produce flow and consumer decision-making.

The main research question relates to the identification and analysis of drivers of marketing of high-nutrient crops in an African context. The specific research questions are:

- Which sweet potato subsector structure and institutions support and drive OFSP marketing for increasing its uptake by consumers and sustainable production by farmers in Zambézia?
- How do existing sweet potato subsector structure and institutions (markets, relationships, information, rules and prices) and project-facilitated interventions influence OFSP marketing in Zambézia?
- What factors influence OFSP price formation and how the prices affect OFSP marketing share and demand?

8.1 Results from the Sweet Potato Subsector Analysis

Although the sweet potato marketing chain in Zambézia involves a limited number of functions and actors, it can still be quite complex as noted earlier by others who studied marketing of agricultural produce in that province (Bowen, 1998; Whiteside, 1998). This study confirmed this observation and identified the following functions of the sweet potato subsector as shown in the subsector map (Figure 15): a) production of different varieties of sweet potatoes; b) distribution (wholesaling and retailing); and c) processing at very small scale. The introduction of OFSP was the main change in the production system. Given the particularities of OFSP in terms of drought resistance, farmers had to adjust their common production practices, namely the use of lowland and humid places at home in the homestead to store the vines.

The production of sweet potatoes

Farmers in the four districts studied used to grow their local white and yellow varieties of sweet potatoes as secondary staple food using their planting materials before the implementation of the OFSP project. After the introduction of the project this study identified two groups of farmers: some were small-scale farmers producing no more than 0.5 hectares while a reduced number were encouraged to produce 2 hectares as medium-scale producers to supply both local and urban markets, spreading the benefits of vitamin A intake among non-producers consumers (see section 3.2 on project implementation). Both groups received vines of OFSP varieties and extension assistance on husbandry, how to keep the vines from season to season and how to store the roots. This assistance on production, marketing (linkages) and nutrition constituted incentives for producers to devote some of their time and resources to OFSP production and marketing as shown in chapter VII about sweet potato producers. The results showed that 93% of producers were involved in OFSP production primarily for home consumption and a minor proportion for sale (7%). This finding supports the commonly mentioned low participation of producers in marketing (Bias and Donovan, 2003), which constituted a challenge to use marketing as key drive of sustainable production adoption. The lack of local institutions, such as producers associations or organizations, to link them to the distribution system disappointed some farmers who thought that the intervention was responsible to guarantee a market for their produce. This misunderstanding was found out during the follow up investigation with medium-scale producers about their experience selling OFSP, and influenced the change of marketing strategy which included the formation of marketing committees. The detailed participation and experiences of producers in sweet potato marketing is included in chapter VII, on sweet potato producers.

The distribution system (marketing)

After harvesting, the sweet potatoes are distributed mainly through the market to small-scale processors and directly to consumers. Free market rules allow the produce to be sold without restrictions and following supply and demand forces of the market. Two main traders' categories were identified: wholesalers and retailers. The former category sells sweet potatoes in sacks to retailers or intermediaries and the latter sells the produce directly to consumers. Some retailers sell boiled sweet potato, as well, which is commonly eaten as snack or during breakfast. Thus, sweet potato is mostly sold early in the mornings or in the afternoons. Regarding spatial distribution, the presence of wholesalers was only noticed in the south of Zambézia, where traders transport large

quantities from the districts of Nicoadala and Maganja da Costa to Quelimane city. In the north the sweet potato is only retailed. In the south the main transport for distribution are trucks and there are storage facilities in reasonable conditions, while in the north most traders use bicycles for transportation and the storage facilities are relatively poor. Although sweet potato is a perishable product it can be stored up to twelve weeks (Tomlins *et al.*, 2007) improving its durability in marketing chain. The intervention stimulated and trained producers using underground storage (a pit) to improve OFSP shelf life at least when the produce still in hands of producers. However, the number of producers using this storage is stills low and the period of scarcity of the produce in the market still long and inducing the fluctuation of prices showed in the graphs displayed in this chapter. This observation suggests the need to intensify and spread the knowledge about storage to more famers, taking consideration of the studies undertaken in this area of knowledge and cited by Tomlins *et al.*, (2007) in 2007.

Processing

The main processing activity of sweet potato in Zambézia is boiling [see Appendix 6, figure A6]. People eat boiled sweet potatoes either for breakfast or as a snack (see consumer survey results). A couple of bakers in Quelimane, Milange and Gurué were involved in producing bread ("golden bread") in which a portion of OFSP pulp is mixed with the dough flour, though this activity was not sustained. The bread was well accepted by consumers because of its taste and appearance (Tomlins *et al.*, 2010) but the main challenge was the irregular supply of the produce during the season as that was not compatible with the industrial production of the bakeries. Furthermore, farmers were encouraged and taught by the project staff to process orange varieties making porridge and cakes for home consumption and to feed children and sell cakes in the market expecting that its demand rises with increasing consumers' awareness stimulated by the project campaigns programmes. Farmers participating in the REU project and a couple of café owners in Gurué and Milange districts were trained in making juice from OFSP. Preservation of the juice was the main challenge for this activity given that only a limited number of farmers had refrigerators, and cafes with refrigerators faced an irregular supply of sweet potato due to seasonality in production and lack of storage facilities.

Coordinating mechanism

In Zambézia, the main coordinating mechanism between functions through which sweet potato moves and is transformed from production to consumption is the market, although with some hierarchical integrated functions such as wholesale and retail being sometimes run by the same traders. The intervention was responsible for producing and distributing the first OFSP vines and farmers were responsible for keeping them for the next seasons. Wholesalers and retailers were responsible for buying the produce from farmers, and transporting it through bicycles and trucks to the market. With the project intervention, some farmers growing OFSP were linked by the project to makers of sweet potato juice and bakers of the golden bread, which is made using a proportion of OFSP [Appendix 6 figures A5 and A7]. An important tool for coordination is information sharing. Although the intervention helped to share information about the production sites and potential markets, usually traders walk around villages and production sites looking for information about supplies.

Actors/participants

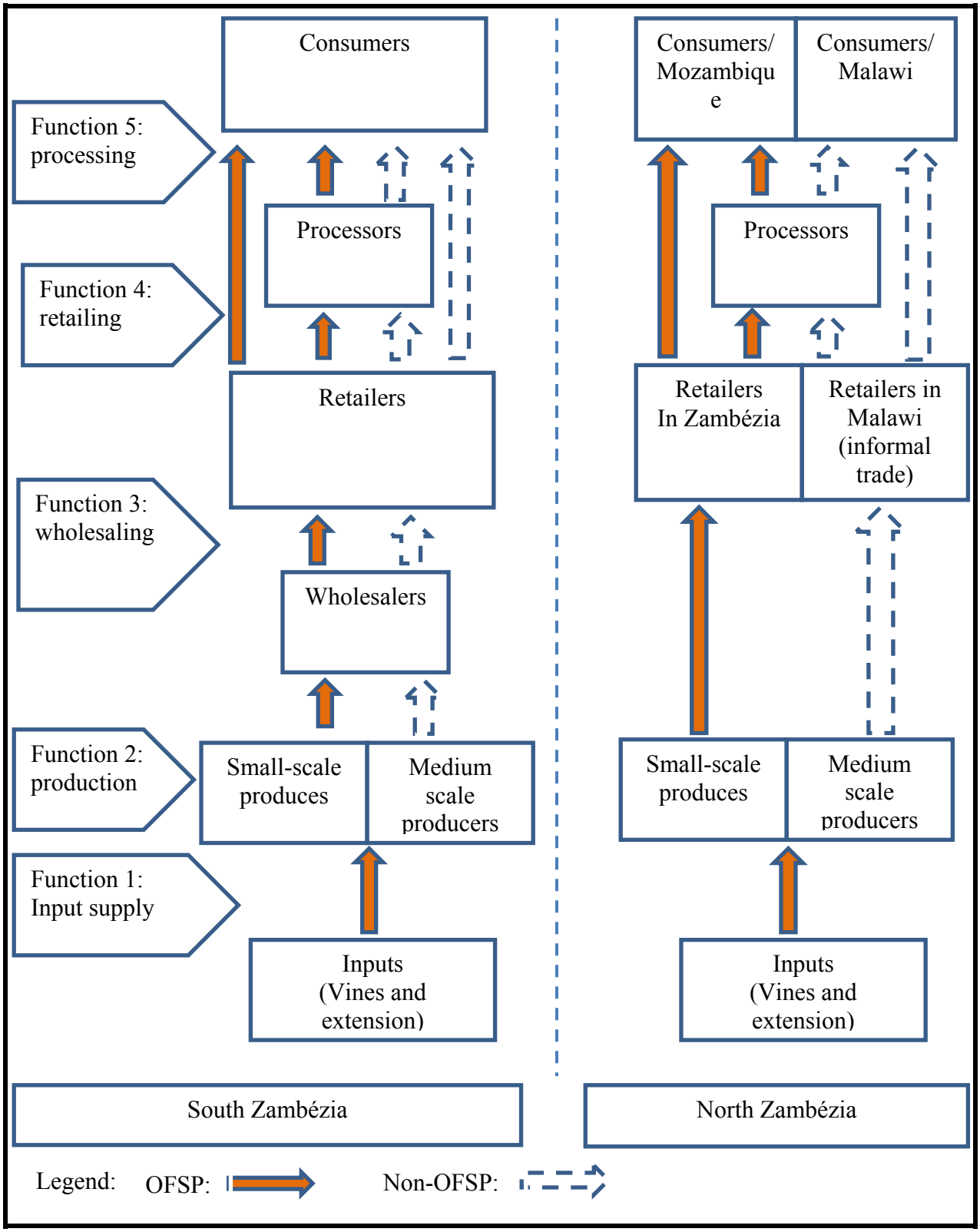
The subsector actors include small scale farmers, medium scale farmers, wholesalers, retailers, transporters, store house owners, processors (cake makers, juice makers, bakers) and consumers. Generally, each actor performs its activity but there are few cases of vertical integration. Some producers act as producers and traders when they take their raw produce or boiled sweet potato to sell in the market. Also, some wholesalers retail their produce when waiting for large buyers. Traders, especially retailers, use bicycles to travel around the villages where supply sites are, however in some cases farmers take their produce to the market, particularly in the beginning of marketing season when produce availability is high, but the categories of traders is fewer than the ten categories found in a previous study of marketing of agricultural produce in Zambézia (Bowen, 1998). Although sweet potato is an important secondary staple food its marketing still in low proportions compared to crops like maize and cassava. In the sweet potato subsector, transporters using trucks are found in the south of the province where some traders are wholesalers, who supply sweet potato to the big city of Quelimane from Nicoadala and Maganja da Costa districts. Both districts, Nicoadala and Maganja da Costa, have storage facilitators to keep large quantities of sweet potato before selling or during bulking before taking the produce to the market in Quelimane.

Environment

A subsector as a set of economic activities happening in a particular slice of sector or system it is influenced by the context or environment surrounding it. The important components of environment of subsector analysis according to Boomgard *et al*. (1986) are: a) the rules which guide the activities; b) the information flow among different actors within the subsector and; c) the service institutions which support the activities. First, the sweet potato subsector is within the whole agriculture sector that is ruled by open economy in which the market forces of supply and demand guide the allocation of resources. The participants are free to sell the quantities they want to and where they want. However, in the marketplace there is reserved a place to sell sweet potato and other tuber produce. Second, since farmers already grow white varieties of sweet potato they developed communications mechanisms to share information about demand, supplies and prices. Information is shared during physical contact between farmers, farmers and traders, and traders and consumers. Nevertheless, the introduction of OFSP was accompanied by additional information campaigns about the nutrition and health through various means such as paintings, pamphlets, orange cars, radio spots and programs, theatre and training meetings. Project extensionists provided production technology to farmers and information about the benefits of OFSP to farmers and supply sites to traders and consumers. In the third component, the service institutions, is highlighted the role of agriculture organizations giving assistance to agricultural production as a whole, including non-OFSP varieties and the REU project providing inputs and assistance for OFSP production. Yet, the intervention had to keep vines and provide extension services to farmers and the challenge was to train few medium-scale producers as vines' producers to source the communities after phasing out the intervention.

Summing up, the intervention privileged a theoretical subsector and market map, plus observations and key informants interviews rather than a participatory mapping which could minimize intervention limitations such as observed mismatching of huge production sites in southern Zambézia (Maganja da Costa district) and Milange with huge markets of Quelimane and Malawi respectively. However, opting to use a participatory approach for the intervention would involve spending more time and resources to gather and interact with participants in the chain than using observations and key informants to map the subsector, design and adjust the marketing strategy.

Figure 15 Sweet potato subsector map, Zambézia



Source: Author.

8.1.1 Marketing Infrastructures and Communications

In Zambézia sweet potato is commonly sold on the ground by heaps even in formal markets equipped with stalls [Appendix 6 figure A8]. Few traders use stalls built from local material compared to those who sell higher value produce. Usually, in marketplaces the roots section is outside, uncovered and in a comparatively unclean place [Appendix 6 figure A9]. Traders sell their produce on the ground because it is not washed before displaying to costumers to show its freshness and as a conservation strategy. However, it is common that some traders selling vegetables put sweet potatoes on stalls as well.

Orange painted brick-built sales kiosks, called *bancas*, were introduced by the TSNI project as an outlet for farmers' surplus production to consumers and processors [Appendix 6 figure A10]. Two kiosks were located on main roads near the existing markets and close to the project production sites. They were operated by traders who signed a contract with the TSNI project and later on with the successor Eat Orange project. The strategy for stimulating market was to select a local experienced trader who would buy and sell OFSP in the kiosk. Experienced traders would be linked to project farmers and travel to those areas to purchase sweet potato or farmers could bring the produce to the kiosk. The trader was trained to sort OFSP into three grades and sell the higher two quality grades at a higher price, as means of creating a market for OFSP based on its visible traits. In Gurué, the trader was linked to a bakery and tea shop which were producing OFSP products.

The TSNI project helped to raise awareness about vitamin A rich-sweet potato varieties and their benefits, and was a starting point to create a demand in the markets through the focal point of the kiosks (Low *et al*., 2005). The same approach was adopted by the Eat Orange project and four additional kiosks were constructed. Several of those could not be built in the best areas, closer to existing sweet potato selling areas and this was a contributory factor in why few, if any, of the new kiosks inherited by the REU project functioned as originally intended. In addition, the kiosks were equipped with scales to measure the produce brought by farmers and retailed to consumers. This was different to the way used in the informal local sweet potato markets.

Few of these kiosks were working for most of the time during the 2007 season. The only one in the north that operated, albeit with some difficulties, was in Lioma, where there are fewer marketing opportunities. Most kiosks stopped selling sweet potatoes, and others got turned over to trading of higher-value products such as onions. Some traders mentioned a problem of lack of working capital

to buy sufficient quantities of OFSP from farmers. In the south, the situation was slightly different as the two kiosks in Licuari and Lualua were open when product was available, but there were some problems in the latter where the operator was replaced.

Some research into the operation of the Lualua kiosk in May 2008 highlighted typical difficulties. The new kiosk operator alleged lack of liquidity as the reason for closing the kiosk for several weeks during the harvesting season. He asked the project for credit arguing that many farmers were coming to sell OFSP to the kiosk. When visited in mid-May the kiosk was closed and the trader not there, although he appeared later. When asked about why the kiosk was closed, he referred to his lack of money to buy OFSP. But, he also said that during the whole week only one farmer came twice, with two sacks the first time and one sack the second time, so it seemed he did not receive so many farmers at that time. When asked about other economic activities he is involved in he mentioned his timber business in which he had been involved for the last five years. He supplies logs to both Chinese and Mozambican operators. In this case it seemed that other strategies were needed to make the kiosks respond to supply of produce from farmers and explore ways in which more OFSP could be sold. These strategies include allowing producer groups to operate the kiosks and to sell processed OFSP products.

Another constraint mentioned by kiosk operators was the location of the kiosk. Kiosk traders argued that when customers go to the market their intention normally is to buy several products. If they see OFSP in the market, they buy it instead of going to the kiosk which was located away from the centre of the market. As a result of these difficulties, the proportion of OFSP sold in the kiosks decreased from 2006 to 2007 (see table 26 overleaf).

It was due to such problems with the *banca* model that a more inclusive marketing approach was proposed for the REU project. In 2007, more emphasis was placed on working with lots of sweet potato traders, and the demand increased in local markets where OFSP prices were lower than at the kiosks. Added to this, some farmers managed to find linkages with buyers, who offered better prices than the kiosks (Zano, 2007).

Table 26 Number of kiosks and sales in and out of kiosks

		Gurué			Milange			Nicoadala			Mopeia		
Item	Unit	2006	2007	change (%)	2006	2007	change (%)	2006	2007	change (%)	2006	2007	change (%)
Use of bancas													
	# bancas	2	1	-50	2	2	0	1	1	0	1	1	0
	# of bancas working	1	0	-100	2	1	-50	1	1	0	1	1	0
OFSP sales in the banca	Quantity (ton)	8.70	5.10	-41	0.54	0.00	-100	2.80	0.86	-69	1.20	1.17	-3
Sales out of bancas	Quantity (ton)	0.00	12.90		0.00	60.00		0.00	14.14		0.00	1.83	
Total sales including bancas[1]	Quantity (ton)	8.70	18	107	0.50	60	11900	2.80	15	436	1.20	3	150

Source: Compiled from Zano, Lenine and Barroso's 2006 and 2007 REU annual reports for south and north Zambézia.
1. Marketing annual report, Barroso 2007. Calculated based on information given by farmers to agricultural extensionists.
Note: n.a.: data not available.

The recorded sales data in the southern sites are given in table 27 and they show high farm gate sales compared to the *bancas*. REU agricultural extensionists reported the difficulty of obtaining records of farmers' sales, so they believe that much more OFSP had been traded and not reported to them. The medium scale producers' survey showed that many farmers are selling OFSP in the field for traders and neighbours. This is expected since farmers can easily sell their produce without additional marketing costs of taking the produce to the market or *banca* and spend their time looking for buyers and bargaining. Selling at farm gate, if traders come, is attractive to farmers given the reduction of their transaction costs (Williamson, 1975). Thus, even recognizing the role of the *bancas* as assembling point of OFSP, where urban buyers and retailers could find the produce, and more information about it, experiences showed that facilitating the contact of traders and farmers closer to production field was much effective in creating market access for OFSP producers given the large distance from farm to market as showed in Chapter VIII about producers. This was facilitated by the capacity of traders, especially intermediaries to seek for information and supply sites.

Table 27 Recorded sales of OFSP in southern Zambézia, 2007

Market place	Quantity (kg)	Percentage (%)	Purchaser
Licuari Banca/Nicoadala	861	8	Kiosk trader
Lualua Banca /Mopeia	1,169	11	Kiosk trader
Nassorela (farm gate)	1,365	13	N.A.
Licuari Market/Nicoadala	501	5	Several traders
Quelimane	200	2	Chuabo Bakery
Brandão Market/Quelimane	2,646	25	N.A.
Dugudiwa/Nicoadala (farm gate) one MSP	1,596	15	N.A.
Posto Campo/Mopeia (farm gate)	2,360	22	N.A.
Total	**10,698**	**100**	

Source: REU annual report for southern region in Zambézia, 2007.
N.A.: Not Available.

The roads are poor in Zambézia and most of the ones linking production sites to the nearby markets are not tarred. Some roads crossing rivers do not have bridges or they are weak and made by local material such as sticks and timber, making the circulation of people and goods hard, especially by bicycles that are the main mean of transport for traders and producers. The situation worsens during the raining season, particularly in Milange and Gurué districts characterized by clay soils. The recognition by the research work that some production areas were facing market access constraints because of their isolation as result of poor infrastructures and consequently lack of transport was not easily accepted by the project implementation team. They wanted the product in the market anyway even if it meant to use project vehicles to take it from the production sites to the market, which mean the distortion of the market and unsustainability of intervention. It was from such discussion that in the second year of project implementation the marketing committees were suggested by this research and formed to facilitate the marketing process.

Regarding communication connections, all the four districts capital towns are covered by the main Mozambican cell phone companies, Mcel and Vodacom. However, the coverage is weak or non-existent in some production areas far from the towns, especially in the northern districts of Milange and Gurué. In some areas of Milange, the proximity to Malawi is an advantage to the people far from the town who use the Malawian Celtel cell phone company connection to communicate. This problem constrains the connection between traders and producers increasing transaction costs as traders spend time travelling around looking for supplies. Conversely, where infrastructure and

communications are available in good conditions some marketing channels are stimulated as shown in the section 8.1.2 about spatial marketing of sweet potato.

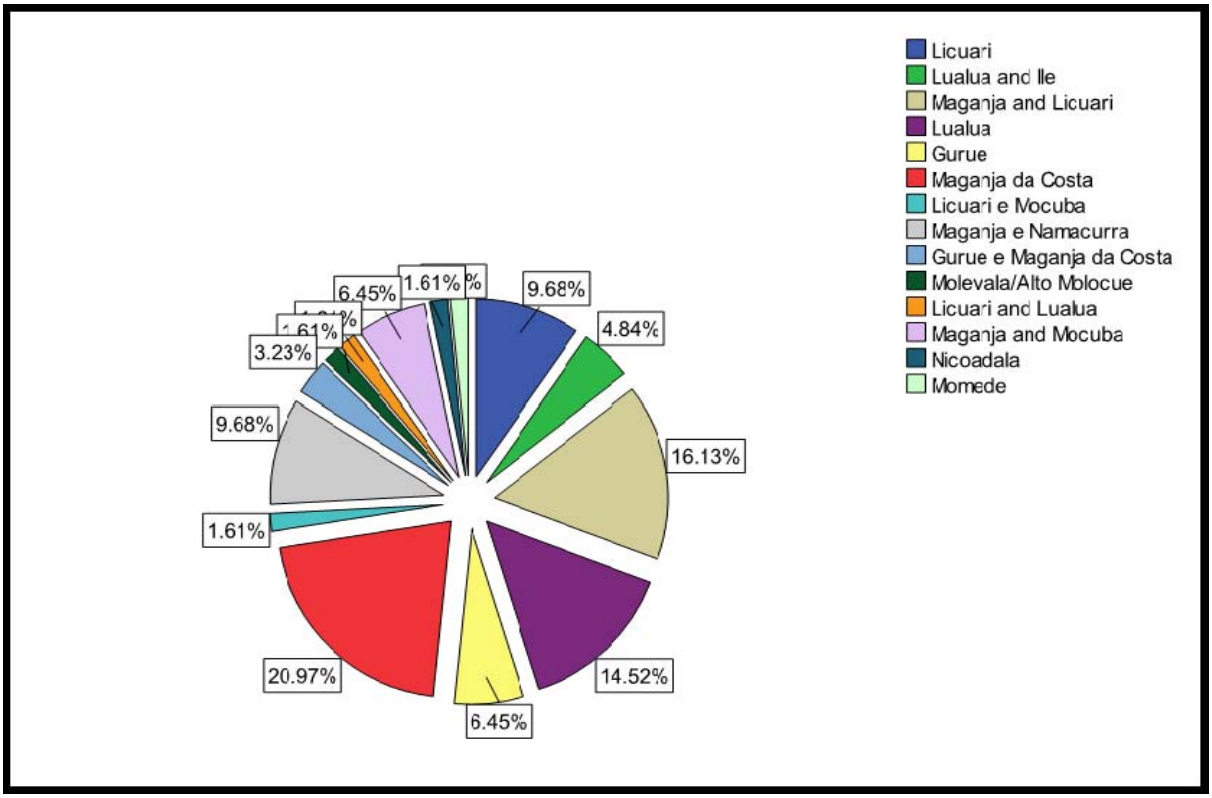
8.1.2 Spatial Marketing Flow of Sweet Potato

In terms of spatial produce flow, in the south, urban markets and roadside markets along the main roads, such as at Licuari, constitute the principal outlets; however, some local markets in remote areas are becoming more important for sweet potato trading. This was observed in Posto Campo village in Mopeia district, 40 km away from the main N1 road and with no reliable transportation system, with small-scale farmers being able to sell their orange-fleshed sweet potatoes to meet the increasing demand from public workers such as teachers and local administration staff. The previous OFSP projects, TSNI and Eat Orange, in this area raised public awareness, resulting in more people being informed about OFSP and leading to high demand.

The Reaching End Users (REU) with OFSP project was designed to increase both production and consumption of OFSP varieties in rural areas where vitamin A deficiency is critical. In this context, there was expectation that OFSP producers in Nicoadala and Mopeia (Posto Campo) would supply local markets and the principal market of Quelimane city due to existing marketing links between these regions for some agricultural produce, particularly rice. Quelimane is densely populated and to feed this population depends on the supply from the surrounding districts. However, this research found that the sweet potato marketing flow follows a different pathway. Quelimane is mainly supplied with sweet potatoes from Maganja da Costa district, about 150 km away to the east, which was not part of the OFSP project area, instead of Nicoadala which is closer at only 40 km away. This may be due to higher sweet potato production in Maganja da Costa which made it worth traders' time to source from there.

For example, the traders' survey showed that 57 percent of 62 traders in Brandão/Quelimane market reported to be supplied sweet potatoes from Maganja da Costa whilst approximately 26 percent were supplied from Licuari/Nicoadala and Lualua/Mopeia (20.9 percent). The exhaustive list of supply sites to Brandão is shown in figure 16. It illustrates weak marketing linkages between Brandão with Gurué (9.7 percent) in northern Zambézia. Other linkages with Brandão market include Molevala/Namacurra (11.3 percent), Mocuba (8.1 percent) and Ile (4.8 percent).

Figure 16 Sources (%) of sweet potato sold in Brandão urban market in Quelimane, 2007-2009 (n=62 traders)



Source: Traders' survey, 2009

Figure 17 indicates in yellow colour the four districts where OFSP intervention occurred and the main routes of sweet potato trading in southern and northern Zambézia, beyond the local commercialization. Farmers in Nicoadala and Mopeia are likely to sell their sweet potatoes to local traders who sell in local markets and this produce does not reach Quelimane (a considerably larger market) in significant quantities. Smallholder farmers interviewed for the qualitative component of the study in Nhanguo, Nicoadala district, said they sold all the OFSP they wanted to in their preferred local market of Licuari, where they could sell in heaps to final customers or in bags to intermediary traders. Of the eight traders interviewed during the survey (see the traders' section 6.1) in Brandão market in Quelimane in July 2008, four explained that they had been supplied sweet potatoes from Maganja da Costa district and only one from Nicoadala district. This is consistent with what was found during the visit to two urban markets in Quelimane (Aquima and Lixo markets) where traders mentioned Maganja da Costa as their principal source of produce.

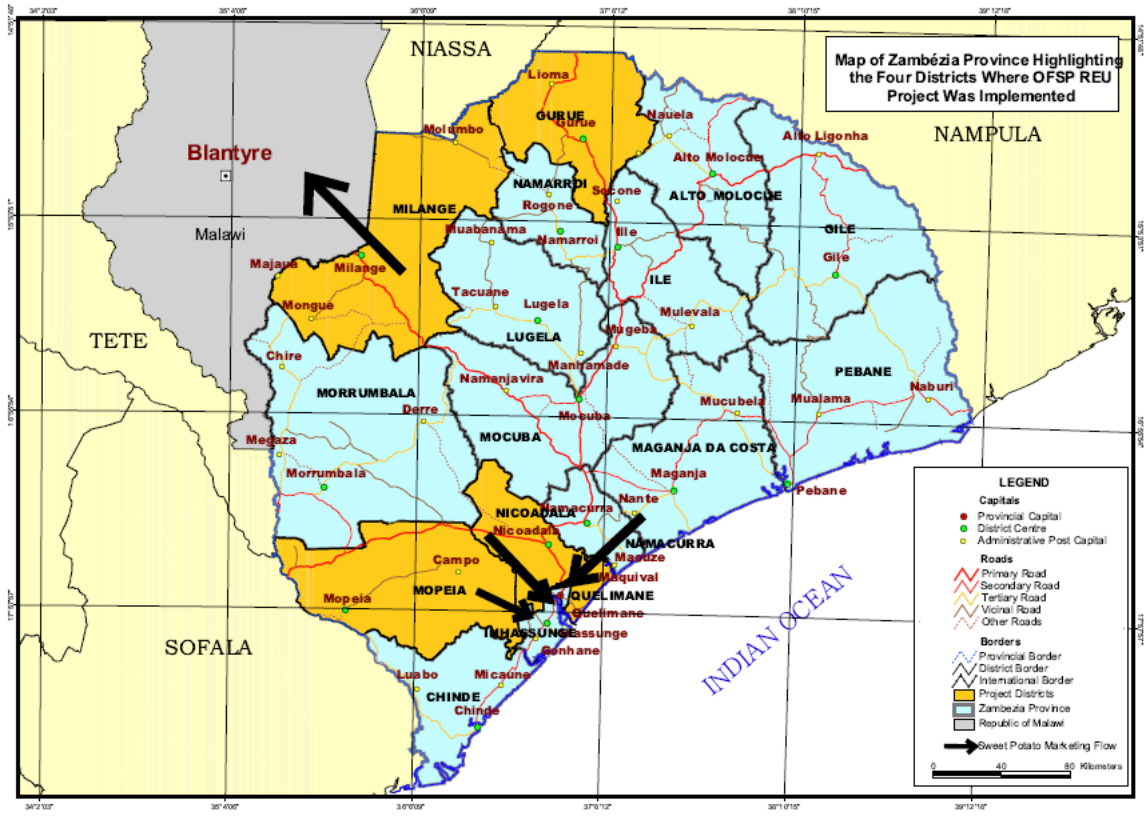
Maganja da Costa is the main and old supplier of sweet potato to Quelimane for several reasons. The district is a large producer of sweet potato in the region, thus contributing to lower prices.

Despite the longer distance from Maganja to Quelimane compared to the other supply districts, the scale of marketed produce that is bulked in an assembly market [Appendix 6 figure A11] and the good transportation link plays a decisive role. The road to Maganja is paved and the town has a sweet potato wholesale market where the produce is assembled and sold. Appropriate trucks are available in this market to transport people and the produce to Quelimane [Appendix 6 figure A12]. All this contributes to relatively lower transaction costs. While Maganja is away from the main N1 road, Nicoadala and Mopeia districts are crossed by this road which contributes to high demand and prices in markets there. For this reason, some producers and traders prefer to retail their produce to road travellers than to sell to wholesalers coming from Quelimane.

The current marketing flow of local sweet potato varieties suggests that to target Quelimane urban consumers with new OFSP varieties, Maganja da Costa and Madal, the nearby area of Quelimane, should be selected as OFSP project production sites. Although Madal was not referred to in the traders' survey, follow up interviews with traders in Quelimane markets found that supplying sweet potatoes to that city is especially important during the second planting season when supply from other regions is limited. The main research finding about the existing and well established marketing flow of sweet potato was not used by the implementation team since one of the purposes was the production of OFSP in areas with vitamin A deficiency which in some cases were not overlapping with the large suppliers of sweet potatoes to the main demanding towns. Even though this finding was not taken in account, it was documented to be considered in future interventions where similar experience can be replicated.

In order to quantitatively evaluate the linkages between supply sites and markets four markets in three districts (Milange, Gurué and Nicoadala) where the REU OFSP project was implemented and one in Quelimane, the biggest urban market in Zambézia, which is closer to the Nicoadala market (40 kilometres) were included in the traders survey. According to 786 interviews with traders in the principal markets of these districts from 2007 to 2009, three markets (Milange, Gurué and Nicoadala) are not commercially connected in terms of sweet potato trade flow. It means that little movement of traders and sweet potatoes were seen between them. Thus, during the traders' interview they were requested to report all their produce supply, which generated some combination of supply sites in the villages around the District towns.

Figure 17 Map of Zambézia and main flow of sweet potato



Source: Matusse, 2015.

There is a difference in market structure between southern and northern Zambézia. While southern markets are mostly urban and are active all days of the week, northern Zambézia (Milange and Gurué districts) has urban markets that operate actively all week around, as well as village markets that operate on a pre-set day (known as periodic markets). The urban markets are usually supplied with sweet potatoes from the nearby production villages. For example, in Milange, sweet potato is supplied from nearby villages of Nhazombe, Simbe, Tengua and Chitambo. In Gurué, district sweet potato arrives mainly from Mangone and Invinha. In rural areas in Milange, a key role is played by the local periodic bi-weekly markets where most farmers bring and sell their produce. These markets are concentrated close to the border with Malawi serving as bulking point for Malawians and Mozambican traders buying produce to sell in Malawi. Many of these traders buy sweet potatoes in Milange district (Mangassanja, Mbessa, Vulalo, Chitambo and Coromana) and take it across the border to Malawi via informal crossing points using canoes [Appendix 6 figure A13]. In these bulking places and markets along the border there could be seen as well a number of tea rooms selling boiled sweet potato, including OFSP, with tea.

8.1.3 Rural Periodic Markets

Research carried out by Bowen (1998) and Tickner (1998) found out that rural periodic markets are widespread in Zambézia, and especially in Milange district, where sweet potato is commonly sold [Appendix 6 figure A14]. This research confirmed that these markets serve as assembly points where bicycle traders buy produce to sell in Malawi. Commonly, rural periodic markets open twice a week allowing traders to circulate between them to buy and sell sweet potatoes. In rural areas, close to the periodic markets, women producers can be seen selling their production directly to consumers or traders. In areas without periodic markets, women have to wait for the buyers to come, especially if the distances are large and they are unable to carry heavy sweet potato bags for these distances. In this situation, men can transport the produce to the market by bicycle - the major transportation system used in rural areas in Zambézia, particularly in the north [Appendix 6 figure A15]. The appendix 5 shows the list of rural periodic markets in Milange district with the respective market days.

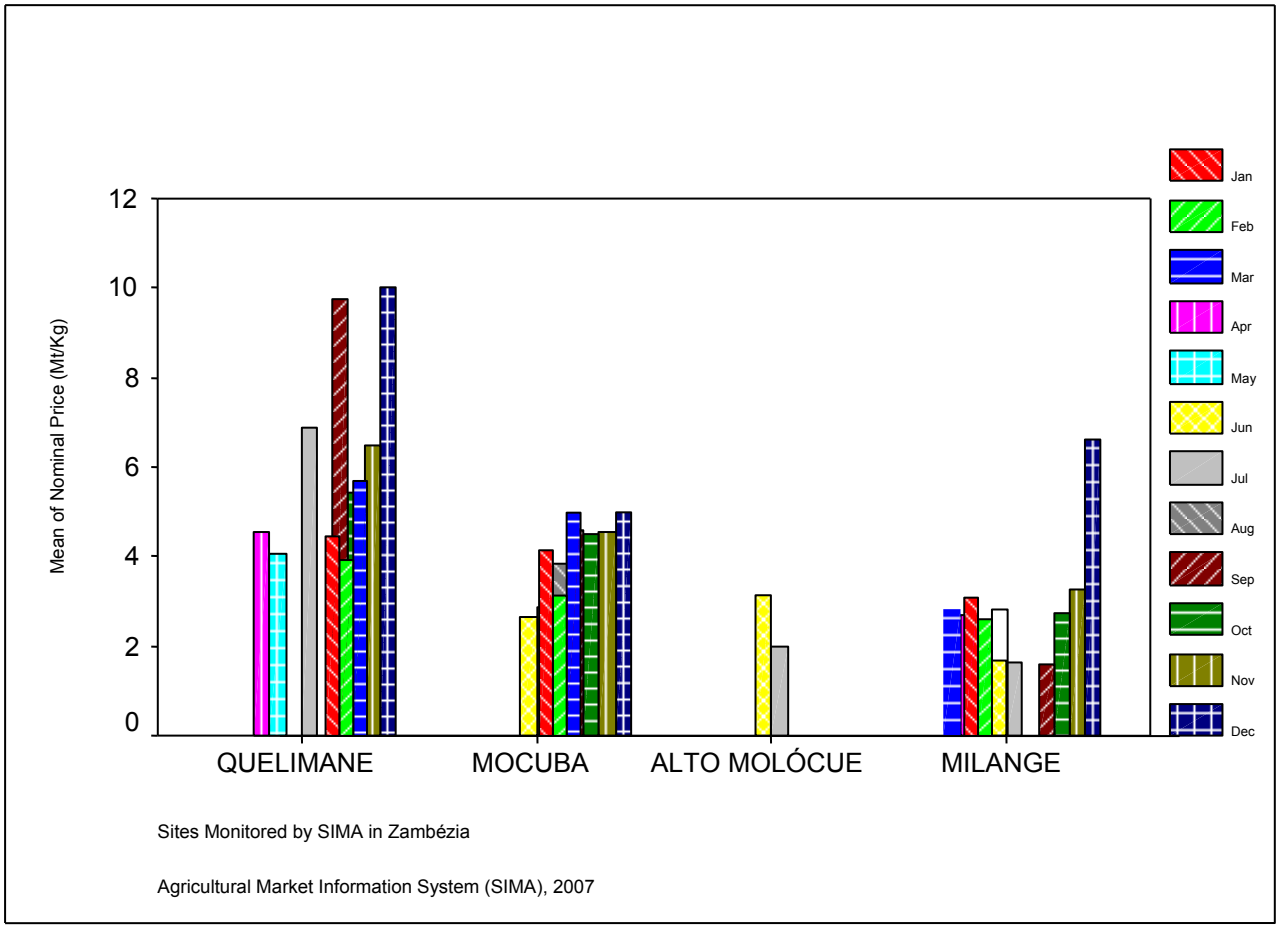
8.2 OFSP and Non-OFSP Prices

According to Smith (1776) and Fetter (1912) prices guide the market and indicate the seasonality, spatial availability, scarcity and consumers' preferences of a produce. To understand these elements the study analysed the earlier situation of non-OFSP[12] prices in Zambézia before the implementation of the project using SIMA price data as a secondary source. The prices shown below in Figure 18 were collected in 2007 and illustrate the variations in four markets monitored by SIMA. Although markets in the three districts (Gurué, Nicoadala and Mopeia) covered by the REU OFSP project are not included in SIMA, the data represent the patterns in the south (Quelimane), centre (Mocuba) and north (Milange) of the province. Sweet potato prices were highest in Quelimane, reflecting the high sweet potato demand by people living in the capital and the costs of getting the produce there as it is not a major production area. Sweet potato prices are lowest in Milange where production is high. In the south (Quelimane), the prices fall in May when harvest starts and begin to rise in July but due to the second production season prices fall again in October and November. In the centre and north of Zambézia, where there is only one season, sweet potato prices are lower only in one period, during the harvesting season from May to September.

[12] Non-OFSP include white and yellow sweet potato. This mix of varieties is more common in Milange district. In other districts, non-OFSP price is equal to white fleshed sweet potato.

The price differential between regions within the province is a potential marketing opportunity to be explored by traders. Even the variation of sweet potato prices during the season in the same districts can be explored by farmers that afford or have all conditions to grow it in two seasons.

Figure 18 SIMA sweet potato prices in four markets in Zambézia, 2007



During the research period, in 2008 and 2009, two sets of both OFSP and non-OFSP prices data were collected and analysed. These are: a) spot market prices that were collected sporadically during field visits to the markets, and b) a time series data set based on prices collected by reference traders previously trained and equipped with scales and paper forms. The spot market prices collected in 2008, the second year of project implementation, showed differences between OFSP and non-OFSP prices in all markets. OFSP prices were higher than non-OFSP in all markets

but the huge market of Quelimane/Brandão. The Mann–Whitney U-Test[13] showed that this differences were statistically significant in Nicoadala/Licuari (P value=0.01) and nearly significant in Milange/Central (P value=0.11), where the price of OFSP was higher than the price of non-OFSP (Table 28). Conversely, in Quelimane/Brandão the price of OFSP was significantly (P value=0.05) lower that of non-OFSP. This is understandable looking at the consumers' survey in chapter VI which indicates that Quelimane/Brandão market has one of the lowest percentage of awareness about OFSP (74%) among the 4 towns covered by this research (Quelimane, Nicoadala, Gurué and Milange) that has influence on demand. The difference of prices verified in Nicoadala/Licuari is also explained by the relative high consumers' awareness about the produce since this district was covered by previous TSNI OFSP projects apart from the current intervention. The results of the survey of consumers show that Nicoadala is ranked second in consumers' awareness (91%) after Gurué (97%). Furthermore, the traders understood the differences between the varieties because they have been trained by the intervention or received information from farmers. Then traders passed this information to consumers during trade. In Quelimane/Brandão the price of non-OFSP was significantly higher because it is sourced from out of project implementation, without same public awareness and exposure to previous OFSP projects and traders training like other districts.

The results of time series price data collected in the following year of 2009 showed changes to be highlighted. Differently to 2008, in 2009, the OFSP prices were higher than non-OFSP in all four markets. In three markets (Quelimane/Brandão, Nicoadala/Licuari and Gurué/Central) the difference of prices is statistically significant (P value=0.00). Interestingly, in Quelimane OFSP price went from low in 2008 to high in 2009 compared to non-OFSP. OFSP from nearer district of Nicoadala and seldom from the far district of Gurué penetrated in this market, which experienced increased demand due to the intensification of promotions using mural paintings, road signs and radio programmes. The consumers' survey show that 50% of consumers learned about OFSP through radio. However, turning to Milange district, the prices of OFSP and non-OFSP and its seasonality were very similar. Some factors might have contributed to that. Milange had its first experience with OFSP in this intervention and consumers' awareness was slightly lower (88%)

[13] The Mann-Whitney U-Test, also known as rank-sum test, is a nonparametric test that does not assume any condition related to the distribution of the samples, as t-test does, and compares two unpaired samples… If the P value is minor the null hypothesis that the difference between means is due to the random sampling is rejected concluding that the means of the two populations are different. If the P value is large there is no reason to reject the null hypothesis although there is no evidence that the means of the two populations are equal.

compared to Nicoadala (91%) and Gurué (97%). Here, OFSP is competing with yellow varieties, such as the Admarc variety, extensively promoted and distributed in the post-war resettlement period, which are also widely sought after by traders from Malawi.

Table 28 OFSP and non-OFSP retail prices (Mt/Kg) in different markets, 2008 and 2009

Districts/Markets	OFSP		Non-OFSP		Dif. of medians	P value
	n	Median	n	Median		
			2008			
Milange/Central	9	5.26	12	4.88	0.38	0.11
Gurué/Central	5	4.00	5	3.33	0.67	0.29
Nicoadala/Licuari	5	12.09	9	6.15	6.75	0.01**
Quelimane/Brandão	9	7.09	9	8.16	(-1.07)	0.05*
			2009			
Milange/Central	12	2.87	7	2.78	0.09	0.12
Gurué/Central	31	5.00	32	3.78	1.22	0.00**
Nicoadala/Licuari	35	6.06	27	3.57	2.49	0.00**
Quelimane/Brandão	177	6.67	300	4.26	2.41	0.00**

Source: Author data collected in 2008 and 2009.

* Statistically significant (5 percent) using Mann–Whitney U-Test.

**Statistically significant (1 percent) using Mann–Whitney U-Test.

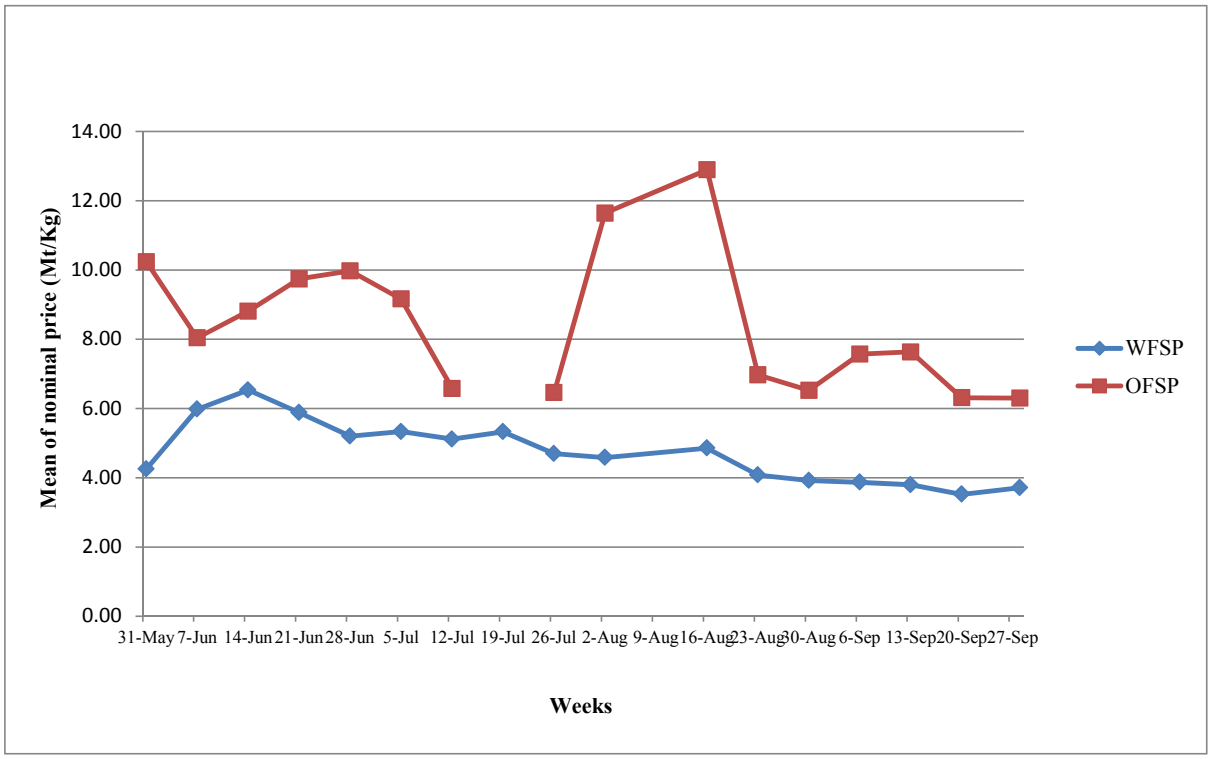
In order to understand the distribution and seasonality of the prices of sweet potato the research uses graphs to display the time series data collected in 2009 (Figures 19, 20, 21, 22 and 23). The seasonality pattern of price fluctuation found by this research is very similar to that shown by time series price data of the Agricultural Marketing System Information (SIMA) of the Ministry of Agriculture in 2007 (Figure 18). In the south the low prices were verified from April to June and from October to November following the pick of harvesting season which has two periods in the south and one in the north. Comparing the two varieties it was found that, generally, OFSP prices in all four districts with markets included in this analysis were not lower than non-OFSP varieties during all the marketing season and in large period, for some markets, the differences were statistically significant. For example, in Quelimane/Brandão market (Figure 19) the price of OFSP

was greater than the non-OFSP price during all the marketing season, contrary to the pattern showed in 2008 dominated by non-OFSP varieties. The reasons for that were already mentioned above in this chapter. OFSP from Nicoadala and seldom from Gurué district penetrated this market with high price as result of increasing demand from increasing number of informed consumers. The high fluctuation of OFSP price in Quelimane is an opportunity for traders to engage in this business since the fluctuation reflects the scarcity of the produce in some periods of the year. It is important also to note that Quelimane receives OFSP from Nicoadala which also supplies the demand of passing passengers in the main N1 road linking the south and the north of the country and many districts in Zambézia. The alternative source of OFSP for Quelimane is the far district of Gurué (350 Km) from where occasionally some traders arrive.

In different scenario is the non-OFSP variety that presents stable prices as result of regular supply from Maganja da Costa, a huge producer of sweet potato within the province but which is non-intervention area. This district is linked by good tarred road and a transport system which favour the transportation of sacks of sweet potato. In Nicoadala/Licuari market the prices are lower in June following the pattern of the southern region, while in Gurué; in the northern region of the province, the prices show low fluctuation but fall slightly in July. Figure 22 shows the comparison of prices in Milange. The price of both OFSP a non-OFSP varieties have similar pattern and they are almost equal during all the marketing season. Prices are higher in April and fall down in May staying steady up to September. This can be explained in two ways. First, among the four districts, Milange was unique where OFSP was introduced without previous experience from other projects. Second, the yellow ADMARC varieties distributed during the settlement period after the end of war in 1992 was very popular and compete with OFSP. However, the increasing demand from nearby villages of Malawi is expected to result in increasing the price of OFSP in the future.

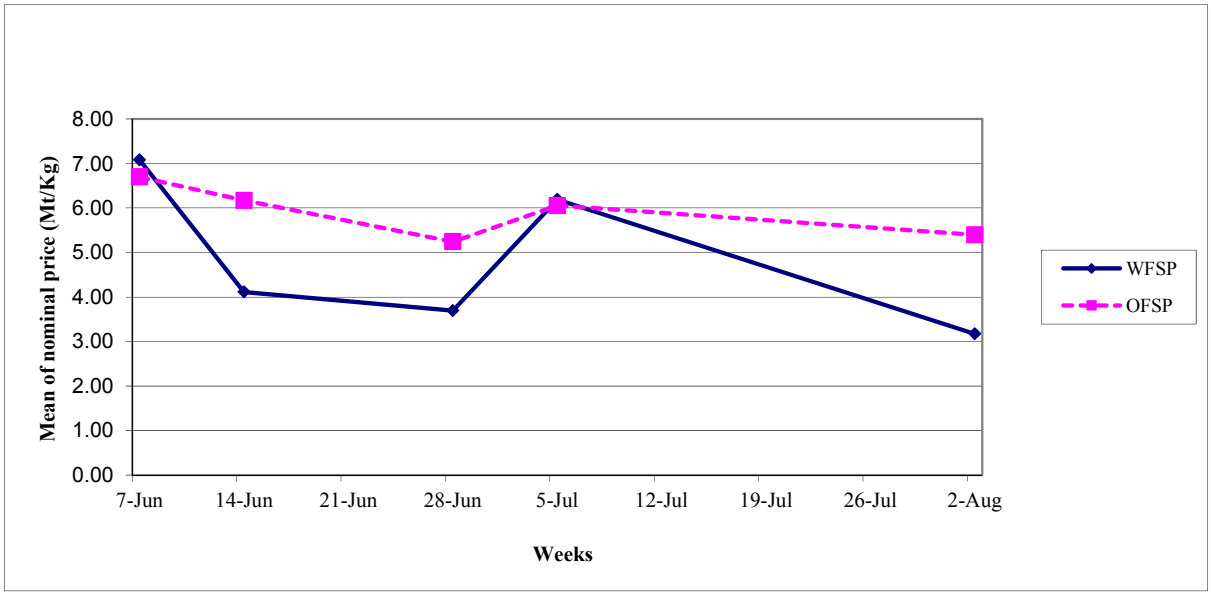
These different price patterns of different markets show business opportunities for traders and demand for production if some marketing factors can be controlled. When the produce is being harvested in the north of the province, from July to August, it starts to be scarce in the in the south. Few traders explore this opportunities given the long distance to supply sites (between 324 and 350 Km) but mainly because of poor transport system characterized by poor roads, mainly that link Quelimane to Milange. As a recommendation, there is a need to investing in infrastructure such as roads and bridges (the road linking Quelimane and Milange is under rehabilitation), and to consider in project design the inclusion of production areas which are closer to the main markets with potential high demand to support sustainable production and consumers satisfaction.

Figure 19 Sweet potato retail prices in Brandão, Quelimane, Zambézia, 2009



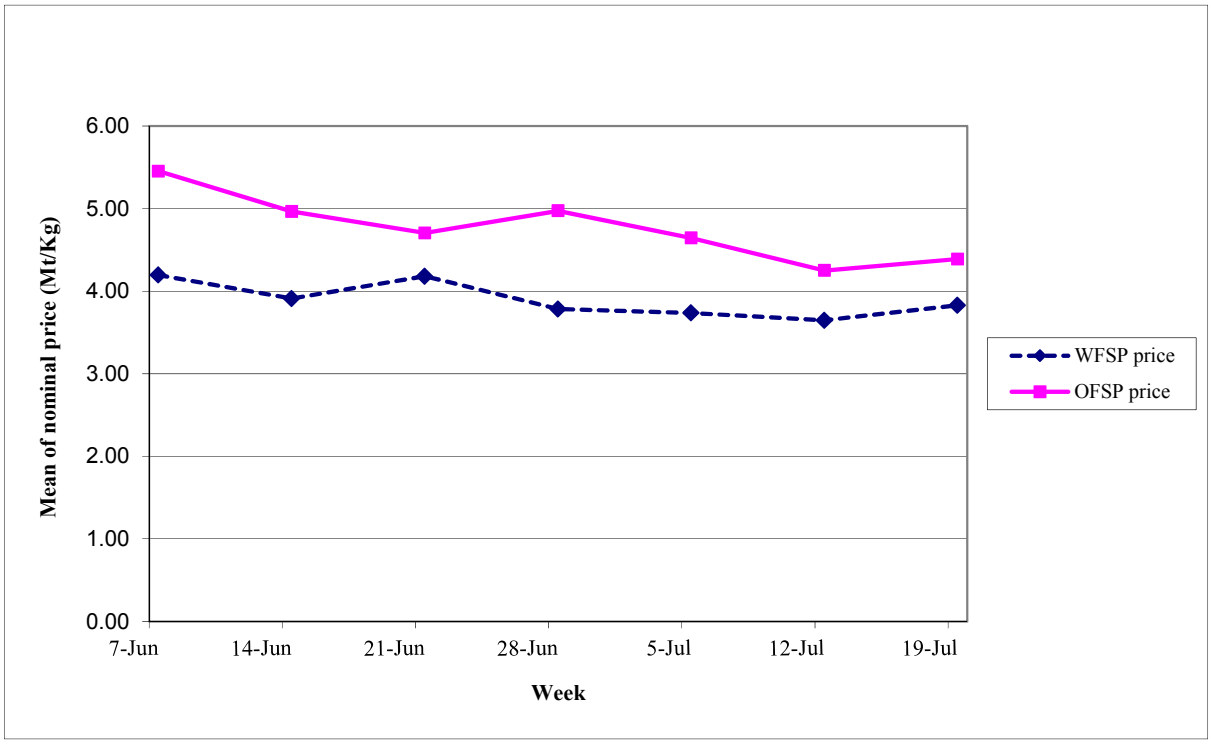
Source: Author time series prices.

Figure 20 Sweet potato retail prices in Nicoadala, Zambézia, 2009



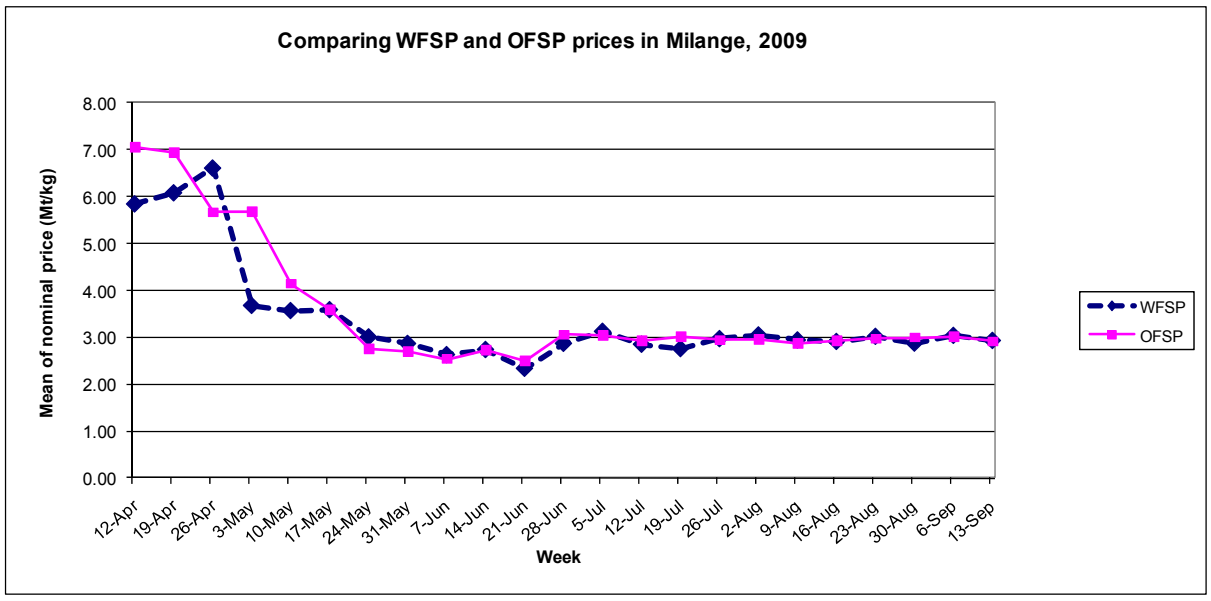
Source: Author time series prices.

Figure 21 Sweet potato retail prices in Gurué, Zambézia, 2009



Source: Author time series prices.

Figure 22 Sweet potato retail prices in Milange, Zambézia



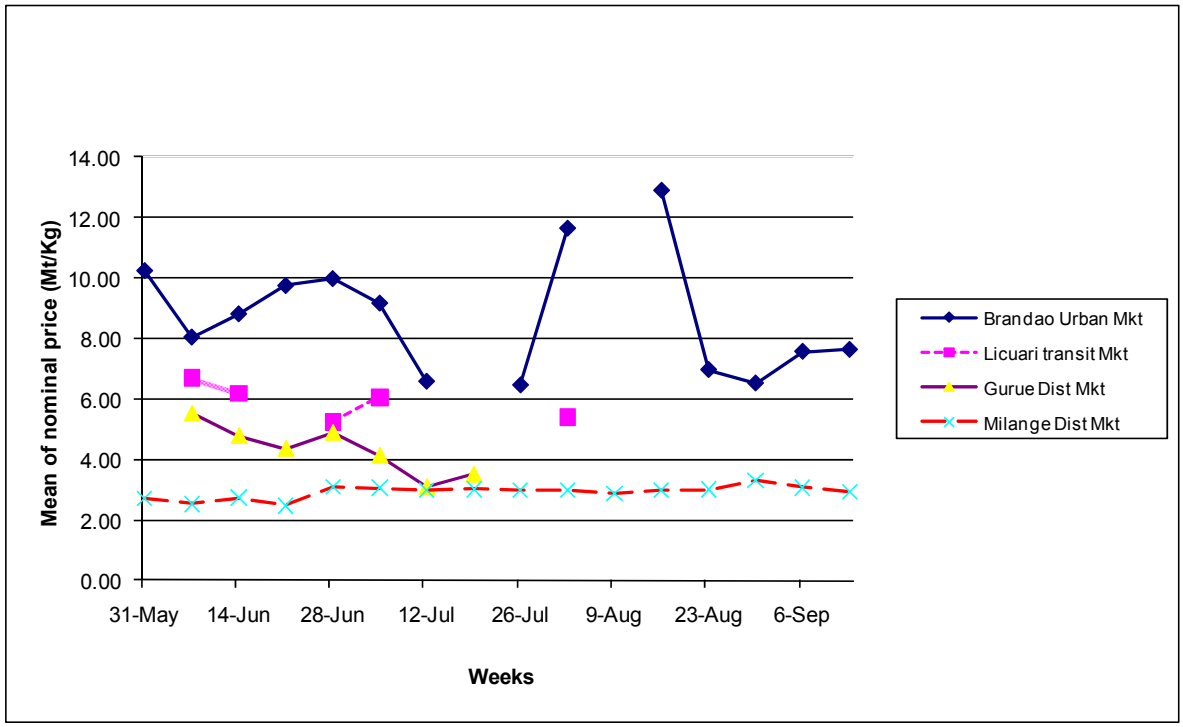
Source: Author time series prices.

The OFSP price differential was also explored between markets. This is shown in Figure 12. In the southern markets, Licuari market in Nicoadala district and Brandão market in Quelimane city, OFSP prices are higher compared to the prices in the north (Milange and Gurué). These prices

attracted traders to purchase the produce around Nicoadala district to sell in Licuari market or purchase in other nearby districts to supply Licuari and Quelimane. Few traders had started to bring OFSP from the far district of Gurué to Quelimane (350 km). Although OFSP was available in Milange, the flow of produce from there to Quelimane (350 km) was not observed given the problem of lack of direct transport links. Passengers traveling in this rout first stop in Mocuba to change transport, making it difficult to transport heavy products such sweet potatoes.

OFSP prices in Licuari were higher than in Gurué and Milange but surprisingly lower than Brandão in Quelimane. Previous observation in 2008 had shown that most often OFSP prices were higher in Nicoadala than Brandão. A possible explanation of that is the delay in harvesting of produce in Maganja da Costa district, the main supplier of sweet potato to Brandão, as result of different production seasons.

Figure 23 Orange-fleshed sweet potato retail prices in Milange, Gurué, Nicoadala (Licuari) and Quelimane (Brandão), Zambézia, 2009



Source: Author time series prices.

8.3 Price incentives for the marketing chain actors

Sweet potato price data from 2008 to 2009 in intervention areas, presented in this chapter, highlight the increase of OFSP retail price over non-OFSP in some markets due to increasing demand by

consumers. More consumers were informed and aware of the benefits of OFSP and knew where to find it (see chapter VI). However, this increasing of OFSP price may concern consumers, who look for lower prices, but it is as well an incentive for traders and producers who sell their produce looking for good prices and margins, as noted by Reley (2012). Table 29 summarizes the farm gate prices, retail prices and gross margins received by producers and traders producing and selling OFSP and/or non-OFSP. The calculation of prices is explained in chapter four about methodology and the full explanation of trader gross margins calculation can be found in chapter seven about traders and their activities. Producer gross margins were calculated multiplying the farm gate price and the average quantity produced by each medium-scale producer, in case of OFSP. Given the limited data on the quantities of non-OFSP produced in implementation areas, the calculation of gross margins for this variety was based on the quantities and prices recorded in the World Vision Mozambique study (Fote *et al*., 2009) undertaken in the same districts. An additional limitation is that the study did not collected production costs. Thus, the gross margins are based only on the prices and quantities sold.

The results show that producers and traders can get higher prices and margins selling OFSP in some areas and markets, although in few places this is not true. OFSP farm gate prices are higher in Gurué and Nicoadala districts which experienced previous OFSP projects and some people are familiar with the produce. Non-OFSP prices continued above OFSP prices in northern Milange district where OFSP was introduced later compared to the southern districts. Beyond that, OFSP in Milange faced the competition of a massive distribution of non-OFSP varieties (Admarc), highly demanded by Malawian consumers and traders, during the resettlement period following the civil war in 90s. In terms of producers' gross margins, this research did not collect data of non-OFSP quantities and prices from the producers not covered by the intervention, which limits the study regarding comparability between the intervention and control. Nevertheless, using additional data from the World Vision study cited above, it is noted that the producer gross margins for OFSP are higher than for non-OFSP. In regard to retail prices, the results show that OFSP prices are not lower than non-OFSP in all the five markets analysed and this could be a great incentive to traders maintain or even increase the business. Furthermore, the OFSP traders' gross margins, which were calculated (subtracting some costs such as transport and loading, market taxes, plastics bags, gifts, and losses), are higher in some markets like Gurué, Mopeia and Quelimane. Surprisingly, the margins were not higher in Nicoadala, a district with previous large experience with OFSP. Although this market was covered by previous interventions, making consumers here more familiar with the produce, increasing demand and earnings for traders, the fact that this market was working

as retail and wholesale transit market might have contributed to lower trader margins. In this market, sweet potato is not only demanded by final consumers or passengers of the main N1 road but it is also bought by intermediaries to sell in the nearer densely populated market of Quelimane city. For example, the *banca* trader in nearer market of Lualua stated that occasionally he takes his produce to sell directly in Quelimane where he can obtain good prices.

Table 29 Farm gate and Retail Prices and Gross Margins at Producer and Trader Levels, Zambézia, 2009

Markets	Sweet potato variety	Farm gate price (Mt/kg)	Producer gross margin (Mt/sack)	Retail price (Mt/Kg)	Trader gross margin (Mt/sack)
Milange	OFSP	2.79	597	3.24	n.a.
	Non-OFSP	3.01	124*	3.16	235
Gurué	OFSP	3.69	542	5.95	547
	Non-OFSP	2.98	124*	4.00	434
Nicoadala	OFSP	5.49	1,086	5.95	15
	Non-OFSP	2.16	407*	5.15	36
Mopeia	OFSP	3.58	708	10[a]	1,235
	Non-OFSP	4.07	407*	1.68[a]	102
Quelimane	OFSP			8.10	524
	Non-OFSP			5.91	257

Source: Author calculations using MSP and Traders surveys, 2009.

*Calculated using World Vision Mozambique Ocluvela project baseline study (Fote *et al*., 2009), since the medium-scale producers' surveyed were mainly OFSP producers. The World Vision study covered 1644 families in 9 districts of Zambézia including those covered by the REU project analysed in this study except the district of Milange which was left out but has similarities with the covered Gurué district.

[a]Data not recoded during the traders' survey but during fieldwork visit in the same period and year.

n.a.: No traders selling exclusively OFSP in Milange during the traders survey, but 7 traders selling simultaneously both OFSP and non-OFSP varieties had average gross margin of 866 meticais.

8.4 Conclusion: Answers to Research Questions

The sweet potato subsector in Zambézia is complex. The principal actors/participants are input suppliers, producers, traders, processors and consumers. The input suppliers are limited to the

OFSP vines suppliers from the REU project and non-OFSP local suppliers which usually grow the crop. Traders are mixed in different categories from wholesalers, retailers and intermediaries, in some cases of vertical integration some individuals act as producers and traders at same time, especially in rural periodic markets spread out in the north of Zambézia. This overlap of functions increases the flexibility of subsector actors to maintain activities along the chain. The processors are very few and processing is reduced to boiling sweet potatoes, however, the intervention introduced the processing of OFSP to make cakes, porridge, juice and golden bread which contributed to expand the quantity of produce demanded. However, the sustainability of processing juice and golden bread need further investigation and investment to be continued.

The introduction of OFSP was embedded in the existing local varieties subsector and additionally raised up some functions specificities such as the supply of vines by the REU project and additional processing steps apart from boiling. Common functions linked to non-OFSP include production using own vines kept from the previous season, trading (wholesaling and retailing) and processing (boiling).

Regarding produce flow along the market chain, there are a mismatch between some OFSP production sites chosen by the REU project, according to vitamin A deficiency, and the principal consumption markets of Quelimane in the south and of Malawi in the north in Milange. This fact required project additional effort to link producers and traders after research findings. Thus, it is suggested that a quick and successful introduction of a new bio-fortified crop variety has to consider existing marketing chains for the varieties being substituted. From a marketing perspective, areas of high production of white sweet potato varieties and with identified marketing links should be also prioritised during production site selection. For example, to target the huge and demanding Quelimane market with high production of OFSP, and raise consumers' awareness of the high nutritional profile of the new variety, Maganja da Costa district would be the main production site choice in southern Zambézia. The results show that informal cross border marketing, between Malawi and the district of Milange, was not considered from the beginning but the marketing strategy had to be changed to take into account the existing marketing channels and take advantage of present sweet potato demand from nearby urban areas and tea estates on the other side of the Malawian border. From these results it is learned that beyond the incidence of micronutrient deficiency, potential production sites, established marketplaces and market chains with potential demand for the new variety have to be considered when choosing areas and marketing strategies for sustainable introduction of high-nutrient crops in a production system.

The painted kiosks built as the first market outlets for buying OFSP from farmers and selling it to consumers were important to raise awareness of all marketing actors but as the project progressed they lost their role to a less costly and more inclusive trading mechanisms available locally. Traders preferred selling by heaps closer to the place where many products were sold and customers concentrate instead of at isolated kiosks.

Price formation depends on some of the following factors: a) Demand: this research found out that increasing demand of OFSP as result of public awareness about the health and nutrition benefits influence retail and farm gate prices. The demand increased also in area exposed to this produce before through previous interventions; b) Availability: the fluctuation of price is linked to availability or scarcity of the produce in the field. Price time series showed lower prices from May to July, during the pick of production; c) Market links: markets located in densely populated towns and linked to main roads observed higher prices.

Looking specifically at retail prices, it was found that OFSP was selling at a higher price than non-OFSP varieties in most of the markets studied, as a result of consumers', traders' and producers' awareness of the value of the crop promoted by the REU project, as expected by Avermaetea *et al*. (2004). Assuming similar trading costs for non-OFSP and OFSP varieties, the higher retail price for OFSP compared to non-OFSP varieties is contributing to higher OFSP attractiveness for traders. These opportunities could be realized if constraints related to the production of OFSP could be overcome by extending the supply period outside of the peak season. This means the use of low lands for a second season, the use of new drought resistant varieties as well as the use of improved storage technologies. Furthermore, improved infrastructure and communications would allow better linkages between markets.

CHAPTER IX: SUMMARY OF FINDINGS, GENERAL DISCUSSION AND RECOMMENDATIONS

9.1 Summary of Findings

The present chapter summarizes the findings and the discussion around the major research questions and provides some recommendations for enhanced high-nutritious crop consumers' demand, traders' uptake and sustainable adoption by farmers. The chapter firstly summarizes and discusses findings relating to consumers, trader, producers, the sweet potato subsector and the incentives for increasing adoption and uptake of OFSP, considering the hypothesis and relevant research questions. Then, it draws some recommendations for future implementation and research related to the introduction of high-nutritious crop supported by a marketing component.

Given the problem statement and the objectives of the research, the following two hypotheses are considered while responding to the research questions:
Ho1: The existing sweet potato subsector structure and marketing institutions in Mozambique were not favourable to promote the sustained marketing of OFSP.
Ho2: The marketing strategy and facilitation provided by the REU project intervention were not favourable to promote the sustained marketing of OFSP.

Consumers

Research questions:

a. *How sweet potato consumers' perception of nutrition, health information, included in an OFSP demand creation programme, contributes to product demand and future intention to purchase OFSP?*
b. *Which marketing intervention components of the REU project had the greatest impact on consumers and demand creation?*

In Zambézia, access to information about health and nutrition benefits of OFSP consumption was important to increase OFSP demand among consumers who buy sweet potato mainly to cook and consume as a breakfast food or as snack, commonly three times per week. Consumers play a key role in creating value and demand (Cova and Dalli, 2009). This research found that 54% of

consumers stated that knowledge about the health benefits and vitamin A content of OFSP after having been exposed to information and promotion campaigns was the main reason to buy OFSP. This contributed to the increase of demand and price in some markets. Radio spot messages and programmes on health, nutrition and vitamin A were the most effective way of raising awareness among consumers. These tools were ranked first in the means of communication and were pointed out by 61% of consumers as the first source of information about OFSP.

Traders

Research question:

a. *What factors affect traders' uptake to adopt OFSP marketing and why?*
b. *What kind of relationships between farmers, traders, and consumers are necessary to strengthen OFSP marketing?*

OFSP demand attracted intermediaries and retail traders to sell the new produce. As result of increased OFSP demand by consumers, responding to a large campaign about health benefits of consuming OFSP, the price and margins also increased, and more traders started selling OFSP than in previous years of introduction of the new varieties in the intervention area. The entry of new entrepreneurs is expected with new business opportunities. Foss and Klain (2005), analysing the theory of the firm and the role of entrepreneurs and transaction costs, noted that new business opportunities were explored by alerted traders, which have or develop entrepreneurial skills, who are willing to innovate and take risk and advantage of new market opportunities. There was a segmentation of traders and a significant number of them could move to OFSP business and relatively few of them continued selling exclusively non-OFSP varieties. Overall, in the four town markets studied in the intervention districts, the number of OFSP traders increased significantly from 14 in 2008 to 24 in 2009. However, few of these continued selling simultaneously non-OFSP varieties, which is not surprising in an adoption process which occurs gradually over time.

In general, sweet potato traders are involved in more than one marketing function. Retailers can also be intermediaries (assembly traders) and producers can retail their production in local markets, especially in more remote areas. Commonly, retailers sell more than one product, mainly vegetables and other agricultural products. Most traders sell this type of produce for two years and then move on to sell other higher value products. During the introduction of a new variety, such as OFSP, due attention should be paid to the fact that traders sell products other than sweet potato and

they change products over time. This has implications for interventions. A strategy based on training traders to be aware of the new variety and its economic advantages would have to be implemented in more than one year to cover a large number of participants including those shifting, coming back and new entrants to product trading.

Traders in the markets studied were able to sell more OFSP than non-OFSP varieties. Furthermore, traders made more money selling OFSP than non-OFSP in some of the markets. Overall, traders selling exclusively OFSP made a gross margin 287 percent more than that made by those selling exclusively non-OFSP. This was due to consumer demand in response to public awareness campaigns about nutritional and health benefits of the produce. It was also noted that in places with a previous experience of OFSP the demand and gross margins were higher, suggesting that the length of project implementation play a key role on uptake. From this result we can infer that produce introduction lasting longer than two years can result in more actors adopting OFSP. The market barriers to new product entry are important constraints to highlight in such processes of introducing a new product. Generally, the percentage of failures when new product is introduced in the market can reach 80-90 percent (Bogue and Delahunty, 1999). Thus, harnessing the views of experienced traders could help to overcome initial barriers to introducing a produce in the market. It was found in this research that more experienced traders achieved higher marketing margins. A positive and significant correlation was also found between the experience of the trader and marketing margins. Traders with more years selling agricultural produce had achieved higher margins than those with fewer years.

In addition, there are a couple of further reasons why traders sell sweet potato and OFSP. Apart from generating income, this subsector has low barriers to entry. The amount of capital needed to start sweet potato trading is lower than other crops such as maize and cassava, which are much traded in Zambézia. People wanting to start trading can easily borrow a small amount of money from other traders or from other small business partners to start sweet potato trading.

Producers

Research question:

a. *Will farmers shift from growing and selling local sweet potato varieties to OFSP?*
b. *What are the major factors contributing or not to such a shift?*
c. *How can these factors be explained, qualified, or quantified?*

The general research question sought the drives of orange fleshed sweet potato (OFSP) marketing. The investigation found that new marketing opportunities of orange fleshed sweet potato (OFSP) are contributing to a shift of farmers from producing traditional non-OFSP varieties to OFSP. This is true not only for market oriented MSP but, including those small scale farmers who grow sweet potato primarily for home consumption demonstrated willingness to increase acreage of OFSP production to respond to the emerging local and regional market demand. This supports findings from work done by Mazuze (2004) in Gaza province in which marketing was important for famers' adoption of OFSP. The current increase on OFSP demand is a response to nutritional education campaigns and the existing institutional facilitation plus linkages to the markets promoted by the implementation REU project. In general, access to markets for farmers growing OFSP improved from 2007 to 2009 in areas where the REU project was implemented in Zambézia. The consumers' public awareness and the earlier experience with the crop in certain regions had an impact on demand for OFSP. However, some villages or farmers in the same village experienced constraints in finding markets for their production. Different entrepreneurship experiences in selling agricultural produce, distance to the markets increased transaction costs (Coase, 1937) and constrained market access for some farmers. OFSP producers in the same village differently accessed market according to their marketing experience and entrepreneurship capacity. Some producers, which failed to sell their produce, did not show sufficient entrepreneurial skills for identifying opportunities and responding to them as highlighted in the literature (Elkan, 1988). Therefore, during the intervention period the operation research identified this problem and suggested changing the marketing strategy introducing the formation of marketing committees which served as platform for training in marketing activities and the supporting linkages between the producers and the buyers.

Sweet potato subsector and marketing chain

Research question:

Which sweet potato subsector structure and institutions support and drive OFSP marketing for increasing its uptake by consumers and sustainable production by farmers in Zambézia?

Subsector analysis was chosen to analyse the sweet potato marketing as the mostly used tool to study the structure and performance of a subsector by identifying the organization of activities, strengths and constrains. The three main elements in these analyses are the marketing functions, coordination mechanisms and the actors or participants. Related to the first element, the main

functions performed in the sweet potato marketing were production, wholesale, retail and processing, in small-scale. OFSP production was facilitated by the intervention by providing vines and technical assistance but, constrains related to low production and losses of vines because of sensitivity of the crop to drought were reported. Wholesaling is common in southern Zambézia and retail in the north and south. Wholesaling in the south is facilitated by existence of trucks for transportation that is also eased by relatively good roads. Retailing is common in all markets and it is frequently done on the ground of the marketplaces. Few traders, depending on the markets, used stalls to sell their produce and three traders, in Mopeia, Nicoadala and Milange, used project painted kiosk to sell OFSP. Traders opted to sell OFSP and other produce in these painted kiosk built or leave and join other traders in the place reserved to roots in the marketplace where the flow of customers buying a range of produces was high. So, the strategy of using painted kiosk (*bancas*) worked as first entry point to stimulate OFSP marketing but as long as the market was developing and consumers got used to the product the relevance of *bancas* for traders and consumers dropped. Thus, the placement of them away from the centre of vegetables place and consequent decreasing consumers visiting it suggests the revision of the strategy changing the location of the *banca* moving it closer to the vegetable section.

> Research question:
> *How do existing sweet potato subsector structure and institutions (markets, relationships, information, rules and prices) and project-facilitated interventions influence OFSP marketing in Zambézia?*

The coordination mechanism between marketing actors (producers, traders and consumers) and the marketing flow of local sweet potato varieties was facilitated and constrained by geographic location of supply sites and the demanding markets. In northern Zambézia (Milange and Gurué districts), sweet potato is traded locally in district and rural periodic markets. However, informal roadside markets exist. In Milange, the informal cross-border marketing is a very important market opportunity for producers particularly those closer to the border with Malawi. Malawi is a great consumer of sweet potato but has low local production. In some villages of Milange, this marketing chain is linked to the local periodic biweekly markets that are interconnected with the Malawian markets. This allows traders to move from one market to another in different days buying and selling agricultural and non-agricultural products. OFSP is also traded in these markets when closer to the production sites and in cross border marketing to Malawi, but consumers and traders' awareness about the benefits of OFSP was also important to increase demand. The messages

broadcasted by the REU project in Radio 1 and 2 in Blantyre, Malawi, contributed to increased demand of OFSP in the Malawian side.

In Gurué district, which is far from the Malawian border, the town markets are the principal outlets of sweet potato and OFSP grown within the district. The distance and poor and not tarred roads between this district and other possible demanding towns such as the neighbouring provinces of Niassa and Nampula in the north of the country is constraining the flow of sweet potato and other products from Gurué. Bicycle traders and other intermediaries play a key role to move the produce from the field to the marketplaces, although this is difficult in some routes where bicycle cannot be used due to high elevation. The problem of market access in Gurué is exacerbated by lack of market information system to stimulate trade between districts. There is no a formal market information system for sweet potato, despite that the Agricultural Market Information System (SIMA), through agriculture office (SDAE) collects prices and quantities for other agricultural products to broadcast later province and nation-wide using radio and printed bulletins. The challenge is to include the growing market of OFSP in this marketing information system.

In southern Zambézia, one of the key findings is that the two districts covered by the REU project are not the major suppliers of sweet potato to the major sweet potato market – Quelimane town. Quelimane town markets are supplied with non-OFSP varieties mainly from Maganja da Costa (150 km), a district out of the REU Project implementation. Nicoadala is one of the two districts where the REU project was implemented and is a second supplier of sweet potato to Quelimane through the transit market of Licuari. This market is also important bulking point of sweet potato from the neighbour district of Mopeia. This shows that selecting site production with nutritional objectives only may not respond to existing marketing facilities and normal production flow. Doing so, the programme missed the production potential of Maganja da Costa district and its good marketing linkage to Quelimane, which would increase OFSP marketing and reach more urban consumers. Here, one of the drivers of new product development, which is the existing market flow of substituted product, was missed.

Regarding the types of participants, the sweet potato marketing chain in Zambézia is short and involves few actors. In the chain, producers, informal traders (retailers and wholesalers), a few processors and the consumers were identified. However, it is dynamic and producers can be involved in retail of their produce and wholesalers can retail their produce as well depending on the demand and location. In these cases, when the same actors are involved in different functions, the

transaction costs are reduced since the actor will not spend time and resources to interact with another actor. It happens frequently in periodic rural markets where some producers double as retailers and wholesalers and in some town markets where some retailers act also are wholesalers.

Prices

Research question:

What factors influence OFSP price formation and OFSP marketing share?

Premium price is one of the incentives and drivers of OFSP marketing in Zambézia. The results of this study show that across the four sweet potatoes urban retail markets studied OFSP is selling at higher price than non-OFSP varieties in urban markets of Nicoadala and Gurué districts, and Quelimane town. However, retail prices between the two types of varieties are similar in Milange district. The difference of prices was statistically significant in some periods of the marketing season in Nicoadala and Milange. The premium price is extended to OFSP producers who sell OFSP at higher price than non-OFSP varieties, and this represents an incentive to increasing their acreage.

Price formation depends on some of the following factors: a) Demand: this research found that increasing demand of OFSP as result of public awareness about the health and nutrition benefits influenced retail and farm gate prices. The demand also increased in areas already exposed to this produce through previous interventions; b) Availability: the fluctuation of price is linked to the seasonality of availability of the produce in the field, with. lower prices from May to July, during the peak of production; c) Market links: markets located in densely populated towns and linked to main roads observed higher prices.

9.2 General Discussion of Findings and Answers to the Research Questions

Consumers' awareness of the health benefits of OFSP was key in generating demand and as a driver to support the marketability of this produce. The power of radio commercials in raising awareness of consumers and the importance of nutritional and health information to consumers' decision making is underlined in the literature (Harris *et al.*, 2009, Sousa *et al.*, 2006). Although radio messages and programmes were effective in informing consumers, the costs associated with

them are high. Thus, combined alternative ways such as murals and road signs may help to lower the cost. No less important for consumers' decision making to purchase the produce is the taste (Sousa *et al*., 2006). Despite that, this research did not assess the varieties' acceptability although a research by Tomlins (2007) highlights the importance of produce texture for acceptability. It was based on this result that high dry matter varieties of OFSP were selected and propagated to minimize the texture constraint. The increasing demand by consumers stimulated production and market share of the produce as shown in the results about the quantities of OFSP traded in the market compared to non-OFSP varieties. The demand also stimulated the premium price paid for OFSP as shown in producers and traders' surveys, and contributed to farmers and traders shift to produce and trade OFSP.

The experience farmers and traders have of producing and trading local sweet potato varieties were one of the drivers of OFSP marketing in Zambézia province. The experience in non-OFSP varieties production and marketing served as platform to introduce OFSP varieties making slight changes in the production system, traders' practices and consumers habits. Existing institutions such as formal marketplaces which were already selling sweet potato, trade policy allowing a free circulation of produce, infrastructure and informal rules and procedures which guide the interaction between marketing actors enabled the adoption of production and marketing of OFSP. Marketing of old varieties of sweet potato was observed in previous study done by World Vision (Fote *et al*., 2009). However, the formalization of marketplaces using the orange painted kiosks did not achieved the expected results of being the principal point of OFSP marketing, although they were useful in raising awareness of the crop among producers, traders and consumers. This decreasing role of kiosks was due to some factors such as the location of the kiosks away from the centre of the marketplaces where other vegetables and products are sold, and the selling by kilograms instead of the heaps normally used in the marketplace. It came up in the surveys that sweet potato retailers sell more than one product in the market place. Thus, selling one produce in an isolated kiosk was seen by kiosk traders as disadvantageous. Moreover, it is not realistic to expect that all production sites will be well linked to markets, given that distances, market infrastructures and entrepreneurship of producers and traders vary across the districts, villages and even within the same village. All these aspects contributed to the formation and differentiation of prices of OFSP and that of non-OFSP varieties. Looking specifically at retail prices, it was found that OFSP was selling at a higher price than non-OFSP varieties in most of the markets studied, as a result of consumers, traders and producers' awareness of the value of the crop promoted by the REU project, as expected by Avermaetea *et al*. (2004). Assuming similar transaction costs for non-OFSP and OFSP varieties,

the higher retail price for OFSP compared to non-OFSP varieties is contributing to OFSP attractiveness for traders. These opportunities could be realized if constraints related to the production of OFSP could be overcome by extending the supply period outside of the peak season. This means the use of low lands for second season, the use of new drought resistant varieties as well as the use of improved storage technologies. Furthermore, improved infrastructure and communications would allow better linkages between markets.

In terms of participation of actors in the chain, the main result indicates that the marketing chain was short, with lack of processing initiatives and limited to producers, traders and consumers. In rural periodic markets in northern Zambézia, this chain is much shorter with overlapping of producers with traders, and many of them are women selling their production. As said earlier, processing still in its early stage and is limited to isolated initiatives introduced by the project based on making juice, porridge and bread from OFSP. In regard to golden bread the major constraint was the shortage of produce during some periods of the year, following the seasonality of production and lack of storage capabilities. This is limitation in terms of marketing opportunities for producers and traders, but it means a potential for development of the sector with possible appearance of new processors depending on continuity of OFSP production, technical and technological assistance.

Sweet potato marketing flows naturally from the sites of major production to the major urban centres. In southern Zambézia, the capital Quelimane is sourced sweet potato from Maganja da Costa, while in northern Zambézia the district of Milange supplies the neighbouring country of Malawi. Both Maganja da Costa and Malawi are outside the project areas because production sites were chosen according to vitamin A deficiency and not marketing purposes. This means that additional effort had to be made to link the production areas in the south to Quelimane and raise consumers' awareness in Malawi to absorb the increasing production of OFSP in northern Zambézia. From this, it is shown that the existing marketing links for products meant to be substituted play an important role on introducing new varieties. These links represent established production, demand, transport and marketing actors' relationships that contribute to relative low transaction costs and motivation for traders. As highlighted by Williamson (1979), low transactions costs stimulates trade activities. In this case, low transaction costs in some sweet potatoes marketing chains are in favour of existing non-OFSP marketing linkages and are incentives to the involvement of traders. The lesson learned from this experience is that an effective marketing component for facilitating overall uptake of high-nutritious food crop chain needs to consider not only the local incidence of micronutrient deficiency but also the existing marketing linkages. The

major production sites and markets of traditional varieties of sweet potato have to be viewed in a broad value chain which will play a role in boosting production and marketing of OFSP.

9.3 Recommendations for Future Implementation and Research

Related to consumers, it is necessary to understand household dynamics as buyer and consumer on market participation in order to design effective public awareness programmes. It was found during the study that most sweet potato purchasers were youngsters mandated by their parents to purchase certain kind of sweet potato. If the public awareness programmes do not reach household decision makers, and concentrate only in the marketplace, they may fail to increase demand. Yet, consumers seem to be sensitive to health and nutrition information when explained. In similar future interventions is suggested to emphasize this component of consumers and produce demand creation analysing how the purchasing and consumption decision making is made, particularly in developing countries such Mozambique where the literacy is low and information is scarce.

This research used mixed approaches, including subsector analysis, price analysis, drawn on transaction costs theory and theories of consumers' research as a framework to conduct the work to learn about the structure and dynamic of the sweet potato sector to respond to the main research question about the main drivers of high-nutritious crop adoption and marketing. This purpose was achieved with some limitations. In subsector analysis, the subsector mapping which is the key of this approach, was done based on literature review, field observations and key informant interviews instead of participatory approach with focus group discussion recommended by some authors (Albu and Griffith, 2005). It was done so in in order to improve and in a timely matter manner respond and contribute to the intervention which was already being implemented. In this case the option of using a participatory approach would have been constrained by the limitation of time and resources. So, it is recommended that the operation research starts earlier preparing the participatory interviews in parallel with baseline or diagnosis study. Other recommendations for future intervention and research are following.

Based on the key findings of this study, it is also recommended that future implementation of similar programmes should pay attention to the existing marketing flows, practices, institutions, constraints and strengths of the product o be substituted. It is recommended that the introduction of OFSP varieties follow similar marketing channels to reach sweet potato producers.

The model followed by the REU project was to select medium-scale producers to grow OFSP on a minimum area of 0.5 hectares for sale. This criteria left out women who are also involved in sweet potato production. Almost all MSP were men. The selection procedures were mainly based on previous experience of selling agricultural produce in the marketplace, leaving out many small-scale farmers, especially women, who are able to sell some amount of their produce when the market opportunity exists. This research indicates the need for an in-depth investigation of the markets, considering gender participation, in order to select farmers who can be trained to produce and participate in various nodes of marketing chain. For example, it was found that women dominate the sweet potato market in periodic rural markets selling their own production.

The results showed also high fluctuation of sweet potato prices. One of the key issues is the limited availability of OFSP in the markets due to short growing season and limited production due to bad weather conditions. This limited the period of sweet potato consumption and supply for bread processing in bakeries. Future work should focus on cost-effective ways to extend the sweet potato production season considering the use of low lands and irrigation system where it is possible. The storage possibilities are still to be investigated and explored as well.

Further analysis should look at the entrepreneurship of producers in their production system. It was clear during the study that some farmers proactively sought a market for their production but others expected the project to buy. Entrepreneurship of producers needs to be understood in order to address correctly the limitations of market access in rural areas.

Regarding traders, the training sessions they were given were important but they would be more effective if continued beyond two years in order to cover more traders, recognizing their high mobility and the short period they normally remain selling the produce before shifting to another produce. The research also found that most traders are seasonal and sale a range of different products. Therefore, future work should pay attention at understanding their decision-making process and marketing system to better encourage their participation in trading a new high-nutrient produce.

The evidence observed and recorded in this study about the intervention using combined activities of extension, production, public awareness, demand creation, marketing facilitation and linkages show a potential to increase OFSP demand by rural and urban consumers, marketing uptake by traders and adoption by producers and, hence, reduce vitamin A deficiency in rural and urban areas.

Thus, it is suggested that the successful experiences are carefully examined for replication in similar conditions or carefully adapted to different socio-economic contexts, always considering all the challenges that this study has identified particularly in terms of creating demand and linking the producers to the main consumption centers.

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APPENDIXES

Appendix 1 Trader Survey Questionnaire

CONFIDENTIALITY

Inform person that with this survey the NRI as partner of REU Project is interested in understanding the sweet potato marketing chain and specifically OFSP and would like to ask then some questions. The project is funded by HarvestPlus which is international funded and seeks to introduce crops that offer improved nutrition and health. The questionnaire is in confidence and participation is entirely voluntary and they can opt out any time and do not have to give a reason for do.

Natural Resources Institute

ID

SWEET POTATO TRADERS SURVEY 2009

A. Identification, profile of the trader and information about the interview

A01.	District		A17.	For non-OFSP traders: Have you ever traded OFSP? 1- Yes 0- No	
A02.	Market		A18.	For non-OFSP traders: Have you heard about OFSP? 1- Yes 0- No	
A03.	Trader number in the selection list		A19.	(Only traders/farmers)-Proportion of SP from his/her field (1=less than 0.5; 2=0.5 and 3=more than 0.5):	
A04.	Name of trader:				
A05.	Place of residence of the trader				
A06.	Gender (1-Male or 2-Female)				
A07.	Age:				
A08.	Educational attainment (0-illiterate; 1-12:1rst to 12 grade) 99=knows how to read and write				
A09	Head of household? 1-yes 2-no				
A10.	Number of members in trader's household:		A20.	Date of interview (dd/mm/yyyy) __ __ / __ __ / 2009	
A11.	Type of trader (1-Retailer, 2-Wholesaler, 3-retailer/wholesaler, 4-Itinerant)		A21.	Time of the interview __ __ : __ __ to __ __ : __ __	
A12.	Number of products trading		A22.	Was the interview completed? 1- Yes 0- No If no, why?_____	
A13.	Products trading in descending order of value:1-..... 2-.....3.....		A23.	Enumerator:	
A14.	Number of years in business				
A15.	Number of years trading sweet potato				
A16.	Number of years trading OFSP				

B. Questions about traders' livelihood and business activities ID

B1. Why are you in tradind activity
1.
2.
3.

B2. Reasons to trade:

B21. Vegetables, cassava and other roots	B22. Sweet potato	B23. Orange fleshed sweet potato
1	1	1
2	2	2
3	3	3

B3. If trader is only trading sweet potato why?_____

B4. What were your previous activities (if any)	B5. Apart from trading what are your other activities (list in descending order of importance)	B6. Sweet potato profits compared to other activities are:
1	1	1. Higher ☐
2	2	2. Equal ☐
3	3	3. Lower ☐
4	4	

B9. Are you member of any traders association or group? 1 (yes)____ 0 (no)_____ B91. Name of group_____

B10. How many traders in this market can sell your product or look after it when you are out?____ B11. How many traders from whom you can borrow or lend them money ☐

B12. With which amount you started selling sweet potato?_____ B13. What is your current capital?_____

B14.When you need money for your activities where you ask for it?_____ B15.Are you saving your money?1-yes 2-no ☐

B16. If no, why_____

B17. Do you have access to credit? 1-yes 0-no ☐ B171. From whom_____

B18. Which of the following contact are you using for your business?
1 Cell phone ☐
2 Land phone ☐
3 Home contact ☐
4 Other ☐ Specify_____

B19. Do you own a bicycle? **1- Yes 0- No** ☐ B191. Do you own a radio? 1-yes 0-no ☐

B17. Which transport are you using currentely for your trading activities?_____

C. Sweet potato knowladge, knowladge retention and market information ID

C1.In which months do you sell sweet potato: Jan___Feb___Mar___Apr___May___Jun___Jul___Aug___Sep___Oct___Nov___Dec___

C2. Which is more purchased (1-first, 2-second, 3-third) WFSP ☐ YFSP ☐ OFSP ☐

C3. Compared to last year OFSP is: More purchased_____Equaly purchased_____Less purchased_____

C3a. Why?_____

C4. Have you participated in the WV sweet potato training course? 1-yes ☐ 0-no ☐

If not go to C8

C5. What do you remember about the course
1_____
2_____
3_____

C6. Have you talked to your customers about OFSP benefits 1-yes ☐ 0-no ☐

C6.1. If not, Why_____

C7. Evaluate your customers' knowledge about orange fleshed sweet potato:
1 - Fewer than 30% of customers buy OFSP because know its benefits ☐
2 - 30% and less than 60% of the customers buy OFSP because know its benefits ☐
3 - More than 60% of customers buy OFSP because they know about its benefits ☐

C8. How you get information about:

	C81. Supply		C82. Demand		C83. Price	
	OFSP	Other prod	OFSP	Other prod	OFSP	Other prod
Personal observation	☐	☐	☐	☐	☐	☐
Speaking with regular customers	☐	☐	☐	☐	☐	☐
Speaking with regular suppliers	☐	☐	☐	☐	☐	☐
Speaking with intermediaries	☐	☐	☐	☐	☐	☐
Speaking with other traders like him/her self	☐	☐	☐	☐	☐	☐
World Vision project	☐	☐	☐	☐	☐	☐
Newspapers	☐	☐	☐	☐	☐	☐
Radio	☐	☐	☐	☐	☐	☐
Other (specify)_____	☐	☐	☐	☐	☐	☐

D. Sweet potato Quantities, Prices, Costs and Margins ID

D1. Type of location where the trader is selling:

☐ On the ground ☐ On a table ☐ stall ☐ From a bicycle ☐ From baskets

☐ Others (Specify)_____

D2. Which amount of sweet potato do you sell per week during the season?

	Qt purchased	Unit	Price/unit	Qt sold	Unit	Mode of selling: 1-sack, 2-heaps, 3-other (specify)	N of units/Unit purchased	Price/unit	Total revenew/ week	Currency: 1-MT; 2-MK
WFSP										
YFSP										
OFSP										

D3.Costs per week

Acommodation	Transport of person and product (if using your own, what others pay)	Loading and unloading	Bags (sacks or plastics)	Markets tax	Storage	Other costs (specify)		

D4. Losses (small, rotten and roots without market value) and gifts per unit purchased

Losses	Unit	Gifts	Unit

E. Relationships between market stakholders (Farmers, Traders and Consumers)

Who is your preferred supplier and customer (farmer, itinerant trader, wholesaler, intermediary, retailer, consumer/institution, etc.)

E1. Supplier_____ E2. Customer_____

Whith the next exercice we would like you to evaluate your relatioship with your preferred suppleirs or customers marketing process. Where:

1-I agree a lot; 2- I agree slightly; 3-Neither agree nor disagree 4-I disagree slightly 5-I disagree a lot

	Suppleir or Customer					
Satisfaction	**Farmers**	**Traders**	**Wholesalers**	**Retailer**	**Collector**	**Consumer**
Trading with preferred suppleir or customer is less risky						
Good cooperation with preferred suppleir or customer						
Treats me fairly and equitably						
Adequately rewarded						
Quick to handle complaints						
Much conflict with preferred suppleir or customer						
Trust						
Confidance in preferred suppleir or customer						
Always keeps promisses						
Always honest						
Good reputation						
Trust in preferred suppleir or customer						
I have been knowing my suppleir or customer for several times						
Believe information provided						
Suppleir or customer always consider best interests						
Power/dependance						
Free to choose another suppleir or customer at any time						
Suppleir or customer set the price						
Suppleir grade the product						
Suppleir or customer provides financial assistance						
Willing to share risk						
Suppleir or customer controls all the information						
Suppleir or customer often acts opportunistically						
More dependent on certain suppleir or customer						

Appendix 2 Questionnaire for Medium Scale Producers' Survey

REACHING END USERS - MOZAMBIQUE ID
OFSP MEDIUM-SCALE PRODUCERS FINAL SURVEY
JANUARY/FEBRUARY 2010: ZAMBÉZIA

A. HH IDENTIFICATION

A01 DISTRICT
A02 VILLAGE
A03 PRODUCER'S NAME
A04 WAS PROMOTOR FOR HIS ORGANIZATION? 0- NO 1- YES
A04A GENDER 1- Male 2- Female Age Years Head of HH?

INTERVIEW INFORMATION DAY MONTH YEAR
A05 DATE OF INTERVIEW / /
A06 TIME OF INTERVIEW START: :
A07 END :
A08 NAME OF THE ENUMERATOR:

A14 WHAY THIS AREA IS LARGER, LESSER OR EQUAL TO THAT OF LAST SEASON (2008/2009)?
A14A AREA FOR WHITE SWEET POTATO
A14B AREA FOR YELLOW SWEET POTATO
A14C AREA FOR ORANGE-FLESHED SWEET POTATO
A14D AREA FOR MIXED SWEET POTATO

AREA FOR VINES IN THE CURRENT SEASON: FROM OCTOBER 2009 TO SEPTEMBER 2010
(Measure the existing areas and estimate planed area) A16
A15 TOTAL AREA OF OFSP VINES: **GPS** , m2
PRODUCER ESTIMATION , m2
A17 WHY THIS AREA FOR OFSP VINES IS LARGER, LESSER OR EQUAL TO THAT OF LAST SEASON?

AREA OF SWEET POTATO LAST SEASON: FROM OCTOBER 2009 TO SEPTEMBER 2010
(Measure of current areas and estimation of planned area)

	GPS		**PRODUCER ESTIMATION**		A13
A09 AREA FOR WHITE SWEET POTATO	,	m2	,	m2	
A10 AREA FOR YELLOW SWEET POTATO	,	m2	,	m2	
A11 AREA FOR ORANGE-FLESHED SWEET POTATO	,	m2	,	m2	
A12 AREA FOR MIXED SWEET POTATO	,	m2	,	m2	

CODES FPR A13 AND A16:
1- THIS AREA IS GREATER THAN LAST SEASON,
2- THIS AREA IS LESSER THAN LAST YEAR,
3- THIS AREA IS EQUAL TO THAT OF LAST YEAR.

A13 THIS AREA IS LARGER, LESSER OR EQUAL TO THAT OF THE LAST YEAR? WHY? (Use A13 codes):

The producer estimations have to consider normal and good agroecological conditions.

PAG. 1
ID

B. EVOLVIMENT AS OFSP PRODUCER

B01 HAVE YOU ACCESS TO BAIXAS 1- YEAS 0- NO
B02 HOW MANY YEARS HAVE BEEN PRODUCING OFSP?
B03 WHEN WAS THE FIRST TIME TO GROW OFSP? MONTH YEAR
B04 CAN YOU EXPLAIN HOW YOU ESTABLISHED YOUR OFSP PLOTS?

SEASON	HOW MANY TIMES IN EACH YEAR HAVE RECEIVED VINES FROM THE PROJECT	QTY OF VINES PLANTED	QTDD OF VINES PURCHASED	TOTAL COST OF VINES	QTY OF OWN VINES	OFFERED VINES	PLOT AREA	HOW MANY SEASONS?
2005/2006								
2006/2007								
2007/2008								
2008/2009								
2009/2010								

B05 IF DIDN'T PRODUCE IN ANY YEAR LIST THE REASONS:
YEAR 1
YEAR 2
YEAR 3

B06 FACED PROBLEMS TO KEEP THE VINES IN ANY YEAR? WHICH PROBLEMS? 1- YES 0- NO

B06A PROBLEMS TO KEEP OFSP VINES
ANO 1
ANO 2
ANO 3

B06B PROBLEMS TO KEEP OTHER VARIETIES (WHITE/YELLOW) VINES
ANO 1
ANO 2
ANO 3

PAG. 2

C. OFSP VARIETIES

C01 WHICH OFSP VARIETIES HAVE YOU TRIED TO GROW? 1- YES 0- NO

1. RESISTO ☐ 2.JONATHAN ☐ 3. LO 323 ☐ 4. MGCL01 ☐ 5. CORDENER ☐

6. GABAGABA ☐ 7. CN ☐ 8. 62.1 ☐ 8. OUTRAS ☐ _____

C02 FROM THOSE VARIETIES YOU HAVE TRIED, WHICH: (Choose up to 2 varieties)

C02A	PRODUCED MORE ROOTS?	☐	☐
C02B	PRODUCED MORE VINES?	☐	☐
C02C	IS EASIER TO KEEP VINES?	☐	☐
C02D	IS DROUGHT RESISTANT	☐	☐
C02E	IS MORE DEMANDED IN THE MARKET?	☐	☐
C02F	HAD GOOD PRICE?	☐	☐
C02G	YOUR HOUSEHOLD LIKE MORE TO EAT?	☐	☐

C03 ON THE OTHER SIDE OF THE VARIETIES YOU HAVE TRIED, WHICH: (Select 2 varieties)

C03A	PRODUCES LESS POTATOES	☐	☐
C03B	IS EASIER TO KEEP VINES	☐	☐
C03C	IS LESS RESISTANT TO DROUGHT	☐	☐
C03D	IS LESS DEMANDED IN THE MARKET	☐	☐

C04 FROM LOCAL NON-ORANGE VARIETIES, WHICH IS BETTER THAN ORANGE VARIETIES IN:

C04A	ROOTS PRODUCTION	1	_____	2	_____
C04B	VINES CONSERVATION	1	_____	2	_____
C04C	DROUGHT RESISTENCE	1	_____	2	_____
C04D	DEMANDED IN THE MARKET	1	_____	2	_____
C04E	PRICE	1	_____	2	_____

D. MULTIPLICATION AND OFSP VINES SALES (FOR D01, D02 E D04: 1-YES 2-NO)

D01 HAVE YOU PRODUCED ENOUGH VINES FOR YOUR FIELDS?

a. 2006 ☐ b. 2007 ☐ c. 2008 ☐ d. 2009 ☐

D02 HAVE YOU SOLD YOUR VINES FOR OTHER PRODUCERS ?

a. 2006 ☐ b. 2007 ☐ c. 2008 ☐ d. 2009 ☐ e. 2010 ☐

D03

	To whom you sold?	Which quantities?	Total value of sales	Currency
a. 2006				
b. 2007				
c. 2008				
d. 2009				
e. 2010				

D04 HAVE YOU OFFERED YOUR VINES TO OTHER PRODUCERS ?

a. 2006 ☐ b. 2007 ☐ c. 2008 ☐ d. 2009 ☐ e. 2010 ☐

D05

	How many people?	Which quantities?	Which varieties?
a. 2006			
b. 2007			
c. 2008			
d. 2009			
e. 2010			

CODES FOR D06 E D07: 1- Increased 2- Dicreased 3- Equal

D06 GENERALLY, HOW WAS THE VINES MULTIPLICATION AFTER THE PLROJECT CLOSE? ☐

WHY? _____

D07 GENERALLY, HOW WAS THE VINES SALES AFTER THE PROJECT CLOISE? ☐

WHY? _____

E. OFSP PRODUCTION

E01 TOTAL OF OFSP HARVESTED

(List the varieties in descending order of qty harvested)

		UNT	VARIETY 1	VARIETY 2	VARIETY 3
a. 2006	☐☐☐,☐	☐☐			
b. 2007	☐☐☐,☐	☐☐			
c. 2008	☐☐☐,☐	☐☐			
d. 2009	☐☐☐,☐	☐☐			

E02 MOST OF OFSP PRODUCED IN YEAR... THE SECOND PART.....AND THE THIRD PART.?

CODES 1- Sold 2- Consumed 3- Offered 4- Lost/rotten in the field

	a. 2006	b. 2007	c. 2008	d. 2009
1. MAJOR PART	☐	☐	☐	☐
2. SECOND MAJOR PART	☐	☐	☐	☐
3. THIRD MAJOR PART	☐	☐	☐	☐

THE QUANTITY YOU HAVE SOLD	1- YES 0- NO			
WAS THAT THE PRODUCER	a. 2006	b. 2007	c. 2008	d. 2009
WANTED TO SELL? IF NO, WHY?	☐	☐	☐	☐

E03 WHO WAS RESPONSIBLE OF PRODUCING OFSP WITHIN THE HOUSEHOLD?

CODES: 1. MAN 2. WOMAN 3. CHILDREN 4. MAN AND WOMAN

a. 2006 ☐ b. 2007 ☐ c. 2008 ☐ d. 2009 ☐ e. 2010 ☐

F23 DO YOU INTEND TO PRODUCE OFSP NEXT SEASON?

1- YES 0- NO ☐ WHY? _____

MEASUREMENT UNIT:

01-KG	04- 20L CAN	07-1L CAN	10- 70KG BAG
02- UNIT	05- 10L CAN	08- 100KG BAG	11- 50KG BAG
03- 25L CAN	06- 5L CAN	09-90KG BAG	12- 25KG BAG

F. OFSP MARKETING

F01 TOTAL OF OFSP SOLD, PRICE AND WHERE SOLD — COMMON UNIT AND PRICE

	QTY SOLD		UNIT	TOTAL VALUE	CURREN	LOCATION1	LOCATION2	UNIT	PRICE
a. 2006	☐☐☐	,☐	☐☐	☐☐☐☐	☐	☐☐	☐☐	☐☐	☐☐☐☐
b. 2007	☐☐☐	,☐	☐☐	☐☐☐☐	☐	☐☐	☐☐	☐☐	☐☐☐☐
c. 2008	☐☐☐	,☐	☐☐	☐☐☐☐	☐	☐☐	☐☐	☐☐	☐☐☐☐
d. 2009	☐☐☐	,☐	☐☐	☐☐☐☐	☐	☐☐	☐☐	☐☐	☐☐☐☐

1- Meticais 2- Kwacha

F02 TO WHOM SOLD?: 1. CONSUMER 2. WHOLESALERS 3. RETAILERS 4.ITINERANT TRADERS 5. PROCESSORS 6. TRADER 7. OTHER (SPECIFY) 8. DON'T KNOW

F03 FROM WHERE WAS COMING THE BUYER? 1. SAME VILLAGE 2. OTHER DISTRICT 3. OTHER PROVINCE 4. MALAWI 5. OTHER (SPECIFY)

	F02	F03	F02	F03	F02	F03	F02	F03
a. 2006	☐	☐						
b. 2007			☐	☐				
c. 2008					☐	☐		
d. 2009							☐	☐

F04 WERE YOU HAPPY WITH THE PRICE RECEIVED FOR OFSP LAST SEASON? 1- YES 0- NO ☐

F05 WHO IS RESPONSIBLE OF SELLING OFSP WITHIN YOUR HOUSE 1. MAN 2. WOMAN 3. BOTH

F06 WHO AUTHORIZES THE USE OF MONEY FROM OFSP SALES? ☐ 1. MAN 2. WOMAN 3. BOTH

F07 WHAT ARE YOU DOING TO HELP YOURSELF TO SELL OFSP?

1 _____

2 _____

3 _____

FO8 WHICH PROJECT ACTIVITIES CONTRIBUTED TO CREATE THE MARKET FOR YOUR PRODUCE?

1. LINKAGES WITH BUYERS	☐
2. RADIO COMMERCIALS	☐
3. IDENTIFICATION SIGNS IN THE STREET	☐
4. MARKETING COMMITEES	☐
5. CONSUMERS' EDUCATION ABOUT OFSP CONSUMPTION ADVANTAGES	☐
6. OTHERS (SPECIFY)_____	☐

SELLING LOCATION			
01- IN THE FIELD	03-ON THE ROADSIDE	04 IN THE LOCAL MARKET	06-OTHER PROVINCE
02-AT HOME	05- IN THE DISTRICT MARKET	08- OTHER (SPECIFY)	07- OTHER COUNTRY (MALAWI)

F. OFSP MARKETING, CONT.

F09 1- YES 0- NO

	HAVE YOU SOLD OFSP FREQUENTLY TO THE SAME BUYER	HOW YOU ESTABLISHED THIS LINKAGE?
A. 2006		
B. 2007		
C. 2008		
D. 2009		

MARKETING NON-ORANGE SWEET POTATO (WHITE AND YELLOW VARIETIES)

F10 TOTAL OF NON-ORANGE SWEET POTATO SOLD, PRICE AND LOCATION — COMMON UNIT AND PRICE

	QTY SOLD	UNIT	TOTAL VALUE	CURREN	LOCATION1	LOCATION2	UNIT	PRICE
a. 2006	,							
b. 2007	,							
c. 2008	,							
d. 2009	,							

1- Meticais 2- Kwacha

F11 TO WHOM YOU S: 1. CONSUMER 2. WHOLESALERS 3. RETAILERS 4.ITINERANT TRADERS 5. PROCESSORS 6. OTHERS (SPECIFY)

F12 FROM WHERE WAS COMING THE I: 1. SAME VILLAGE 2. OTHER DISTRICT 3. OTHER PROVINCE 4. MALAWI

	F11	F12		F11	F12		F11	F12		F11	F12
a. 2006			b. 2007			c. 2008			d. 2009		

F13 WERE YOU HAPPY WITH THE PRICE OF SWEET POTATO LAST SEASON? 1- YES 0- NO

F14 WHO IS RESPONSIBLE OF SELLING THIS SP VARIETIES WITHIN THE HOUSEHO 1. MAN 2. WOMAN

F15 WHO AUTHORIZES THE USE OF MONEY FROM NON-OFSP SALES??

1. MAN 2. WOMAN

F16 WHAT ARE YOU DOING TO HELP YOURSELF TO SELL NON-OFSP??

1 _____

2 _____

3 _____

F. OFSP MARKETING, CONT.

F17 HAVE YOU CHANGED OFSP WITH OTHER PRODUCTS OR USED IT TO PAY SERVICES LAST SEASON? 1- YES 0- NO ☐

QUANTITIES OF OFSP CHANGED	PRODUCT (QTY) RECEIVED/SERVICE
a.	
b.	
c.	

F18 IS THERE ANY MARKETING COMMITTEE IN YOUR COMMUNITY? 1- YES 0- NO 8- DON'T KNOW ☐

F19 HAVE YOU JOINED THE MARKETING COMMITEE? 1- YES 0- NO ☐

F20 HAVE BENEFITED FROM LINKAGES WITH BUYERS PROMOTED BY WV PROJECT? 1- YES 0- NO ☐

F21 HAVE YOU RECEIVED TRAINING ON MARKETING? 1- YES 0- NO ☐

F22 IF YES, WHO ORGANIZED THE TRAINING?

1. WORLD VISION OFSP PROJECT ☐
2. ANOTHER WORLD VISION PROJECT ☐
3. OTHER PROJECT (SPECIFY)_____

G. MARKETING EXPERIENCE AND ENTERPRENEURSHIP

G01 FOR HOW LONG HAVE YOU BEEN SELLING STAPLE CROPS? ☐ YEARS

G02 FOR HOW LONG HAVE YOU BEEN SELLING AGRICULTURAL PRODUCTS COMMERCIALLY? ☐ YEARS

G03 QUAIS SAO AS CULTURAS DE RENDIMENTO QUE JA PRODUZIU E VENDEU?

G04 OFSP HAD MORE PROFITS THAN THESE CROPS

PRODUCTS	,	A. 2007	B. 2008	C. 2009	A. 2007	B. 2008	C. 2009
1. TOBACCO	,						
2. SOYA	,						
3. COTTON	,						
4. MAIZE	,						
5. RICE	,						
6. OTHER (SPECIFY)_____	,						
7. OTHER (SPECIFY)_____	,						

G05 TO WHON YOU SOLD THESE CROPS AND WHERE?

PRODUCTS	,	2007		2008		2009	
		BUYER	LOCATION	BUYER	LOCATION	BUYER	LOCATION
1. TOBACCO	,						
2. SOYA	,						
3. COTTON	,						
4. MAIZE	,						
5. RICE	,						
6. OTHER_____	,						

BUYER

01 -COMPANY 02-WHOLESALER 03-RETAILER 04-CONSUMER
05-PROJECT 06-GOVERNMENT 7-OTHER (SPECIFY)

LOCATION 01- IN THE FIELD 02-AT HOME 03-ON THE ROADSIDE
04 LOCAL MARKET 05- DISTRICT MARKET 06-OTHER PLROVINCE
07- MALAWI 8- USING ASSOCIATION 9- OTHER (SPECIFY)

Appendix 3 Questionnaire for Consumers' Survey

Sweet potato Consumers' Survey, NRI

CONFIDENTIALITY: Inform person that with this survey the NRI as partner of REU Project is interested in understanding the sweet potato marketing chain and specifically OFSP and would like to ask then some questions. The project is funded by HarvestPlus, which is international funded, and seeks to introduce crops that offer improved nutrition and health. The questionnaire is in confidence, participation is voluntary, and they can opt out any time and do not have to give a reason for do.

Objective: To analyse SP and OFSP demand in terms of ascertain amounts purchased, frequency of purchase, consumption and preferences, the number and characteristics of people buying OFSP at markets, knowledge of the product and behaviour change derived from the REU-HarvestPlus project marketing/demand creation activities.

1. Respondent no:_____2. Market/location (GPS coordinates):_____
3. Date of interview (DD/MM/YY):___/____/____4. Time of interview:____5. Enumerator name:_____
6. Consumer SP purchase

Type purchased:	No of heaps/kg	Heap value	price per kg
i) WFSP			
ii) OFSP			
iii) Mixed			
(iv) YFSP			

7. Meals you are purchasing SP for:_____
8. Who are you buying this sweet potato for? _____8a. Who decided which SP variety to purchase?_____
9. How many people are in this family those will eat this sweet potato: _____
10. How many children in your household are under 5? _____
11. How often do you eat SP per day? _____; 11a. Per week?_____
12. Have you purchased OFSP before? [0] = No, [1] = Yes; 12a. How often the last seven days?_____
14. Have you eaten OFSP before?: [0] = No, [1] = Yes
15. Had/Have you heard about orange-fleshed sweet potatoes before: [0] = No, [1] = Yes (if no, go to Q 21)
16. How did you hear about orange-fleshed sweet potato?: [1]=People; [2] = Radio; [3] = signs; [4] = Project promotions; [5]=Other sources (specify)_____
17. Which type of SP (White or Orange) are you buying more now?_____
18. Is OFSP as regularly available in the market as non-OFSP (White/Yellow)?: [0] = No, [1] = Yes
19. Have you eaten other OFSP products? [0] = No, [1] = Yes; 19a. Which?:_____
20. What do you know about orange-fleshed sweet potatoes? [up to 2 responses]

a. _____
b. _____

21. Would you consider purchasing orange-fleshed sweet potato in the future?
[0] = No [1] =Yes [2] = Possibly

22. Please give [up to 2] reasons for purchasing (eating) orange-fleshed sweet potato
a. _____
b._____

23. Please give [up to 2] reasons for not purchasing orange-fleshed sweet potato
a. _____
b. _____

24. Do you grow your own sweet potato? [0] = No [1] =Yes; 25. Do you grow OFSP? [0] = No [1] = Yes

26. What do you think (observation) about OFSP?_____
_____
_____
_____

27. Age. In years:_____28. Sex: [1] Male [2] Female; 29. Write and read? [0] = No [1] = Yes.
30. Formal education: _____; 24. What is your main occupation?
_____
25. Where do you live? _____

Appendix 4 Sweet Potato Data Collection Forms

Appendix 4a Sweet potato availability and supply zones form

Market:_____

Name of enumerator:_____ Date:__/__/_____

Date	Variety of SP: a=OFSP; b=non-OFSP	Quantity	Unit	Additional Quantity arrived today	Unit	Supply area	Distance to supply area	Transport
	a							
	b							
	a							
	b							
	a							
	b							
	a							
	b							
	a							
	b							
	a							
	b							
	a							
	b							
	a							
	b							
	a							
	b							
	a							
	b							

Appendix 4b Sweet potato price form

Date	Weight of heaps (kgs)					
	Non-OFSP			OFSP		
	5 Mt Heap	10 Mt Heap	20 Mt Heap	5 Mt Heap	10 Mt Heap	20 Mt Heap

Appendix 5 Periodic markets in northern Zambézia and southern Malawi

District/Zone	Market/Feira	Days of the Week						
		Mon	Tue	Wed	Thu	Fri	Sat	Sun
Milange/North								
	Lipale	X			X			
	Coromana			X			X	
	Mocuco		X			X		
	Namaio		X			X		
	Murangala		X			X		
	Bediwa		X			X		
	Namucumua	X			X			
	Cadote			X				X
	Mucori	X			X			
	Mbirima							
	Carioco			X			X	
	Mombusha			X			X	
	Muguliwa		X			X		
	Messasse		X				X	
	Mukuna			X			X	
	Mucurumba	X			X			
	Sambene	X			X			
Chitambo								
	Malicana	X			X			
	Mutalani		X				X	
	Chingoma	X				X		
Thamanda								
	Chalomwe				X		X	
	Namulombwa				X		X	
Milange/South								
	Vulalo			X			X	
	Simbe			X			X	
	Dabarwa				X			X
	Chissulo				X			X
	Samaria	X			X			
	Mangassanja	X			X			
	Dachudwa	X	X			X		
	Dulanhe		X			X		
	Ngirenje		X			X		
	Sagauwa			X			X	
	Masala		X			X		
	Mwanhanje	X			X			
	Cacaria		X			X		
	Mbessa		X			X		
	Ngema		X			X		
	Zalimba Lojas			X			X	
	Mutariga		X				X	
	Solidgia		X			X		

District/Zone	Market/Feira	Days of the Week						
		Mon	Tue	Wed	Thu	Fri	Sat	Sun
Tengua								
	Cobuiri-Marega				X			X
	Mutho				X		X	
Milange Town								
	Sombwa		X			X		
	Tito Nhazombe		X			X		
	Chamando-Cholomwe			X			X	
	Tito Mareco		X			X		
Mongoe	Mongoe	X			X			
	Roupa							
	Sabelua		X		X			
Gurue District								
Gurue Town	Municipal Market	X	X	X	X	X	X	X
	Paroquia	X	X	X	X	X	X	X
	Moneia	X	X	X	X	X	X	X
	Junta	X	X	X	X	X	X	X
Nepuagiua	Vehiwa		X		X		X	X
	Namanyota							X
	Morapacha							X
	Nachalé							X
Magige							X	
	Sevene							X
	Melosa							X
	Covela							X
	Ewarelo					X		
	Murimo							X
Lioma	Mugunua							X
	Namonde							X
	Npisa		X		X		X	X
	Ruace							X
Malawi								
Muloza	Limbi/Muloza border							X
	Chinakanaka			X		X		
	Tchicuci		X			X		
	Mathambe							
	Ruo/Mangongo	X	X				X	
Phalombe								

Appendix 6 Field Work Photographs

Plate 1 Weighing retail heaps of sweet potatoes

Plate 2 Weighing wholesale sacks of sweet potatoes

Plate 3 Enumerator interviewing sweet potato customer

Plate 4 Enumerators interviewing sweet potato traders

Plate 5 OFSP products – golden bread

Plate 6 OFSP products – boiled sweet potato

Plate 7 OFSP products – juice and fritters

Plate 8 OFSP sold by heaps on the ground

Plate 9 Market place area for sweet potatoes

Plate 10 Kiosk (*banca*) built by project and used for selling OFSP

Plate 11 Sweet potato transit market. Maganja da Costa, Zambézia

Plate 12 Trucks linking Maganja da Costa to Quelimane city, Zambézia

Plate 13 Informal border crossing (Ruo River) between Mozambique and Malawi

Plate 14 Sweet potato traders, rural periodic market in Mbessa, Milange, and Zambézia

Plate 15 Bicycle traders in Milange, Zambézia