

## CHAPTER 2

### SWEET POTATO IN PERSPECTIVE

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#### 2.1 INTRODUCTION

The nutrient and sensory quality of OFSP within the South African context of a population that suffers from both under and over-nutrition has not been investigated before. The study aims to investigate the potential of OFSP as a nutritional food crop within urban communities. The discussion will focus on both the global and local production of sweet potato, followed by the uses from a food industry perspective. Nutritional relevance to rural communities will be indicated. This chapter further explains the sensory and consumer research methods that were applied in order to obtain a better understanding of sweet potatoes.

#### 2.2 ORIGIN AND PRODUCTION OF SWEET POTATO

##### 2.2.1. Global production of sweet potato

Sweet potato found its origin in the New World – either in the Central or South American lowlands and was known as *batatas*. Some remains were also found in the Casma valley of Peru as far back as 2000 B.C. Columbus discovered sweet potatoes in Hispaniola and Cuba in 1492 during his first voyage, and introduced it to Spain where it spread to Europe. It was introduced into Africa by the Portuguese from the Atlantic coast regions of mid-latitude America (Woolfe, 1992: 2).

Today, sweet potato is cultivated in more than a 100 countries in the world and plays an important part in the diet of many nations while ranking seventh in terms of total production as a world food crop. The annual production of sweet potatoes in 2000 was 140.9 million tonnes (Mt) of which Asia produced 91 % (128.8 Mt) that is mostly consumed in China, Africa 7 % (9.1 Mt), Central North America 1 % (1.1 Mt), South America 1 % (1,2Mt), Oceania 0.5 % (0.59 Mt) and Europe 0.35V% (46 000 t) (PPECB Export Directory, 200). In production value (monetary) of food commodities, sweet

potato ranks thirteenth globally and, in developing countries, sweet potato ranks as the fifth most valuable food crop, accounting for one third of the production of root and tuber crops (Woolfe, 1992:1-3).

Nearly all sweet potato production and consumption takes place in developing countries (Woolfe, 1992:5). In African countries such as Uganda, Rwanda and Burundi where starchy crops such as sweet potato are the staple food, the per capita consumption of sweet potato is 75 – 150 kg per person annually. In Malawi, Angola, Mozambique and the Democratic Republic of Congo, where maize is the staple food and sweet potato is an additional crop, the per capita consumption of sweet potato is in the region of 5 – 50 kg per person per annum (Minde, Ewell & Teri, 1999:169-182).

According to the production figures for South Africa, the sweet potato industry is relatively small, with an average annual production in 2005 of 51 000 t – 56 000 t, averaging a gross value of R 30-35 million (National Department of Agriculture 2001). The value and average price of sweet potato sold on the fresh market for 2005 was 26 938t averaging a value of R 30 076 072 which calculates to a price of R 1127/t (National Department of Agriculture, 2006). According to the information extracted from the Food and Agricultural Organisation of the United Nations (FAO) website, the total production of sweet potato in South Africa for 2004 - 2005 was 54 800 t – 64 530 t, (FAO, 2007). However, sweet potato is produced and sold in large quantities by the informal sector, which is not reflected in the official production figures (Laurie in Niederwieser, 2004:2; Domola, 2003:48). An estimated total acreage under sweet potato production is 2000-3000 hectares with an average yield of 5-10 t/ha (commercially the average yield is 40t/ha with a field size of up to 30ha) (Laurie in Niederwieser, 2004:2; Domola, 2003:52).

Most germplasm today comes from Taiwan, Peru, USA, Nigeria and Burundi. The International Potato Centre in Lima, Peru, maintains an international sweet potato germplasm collection consisting of about 900 pathogen tested accessions (Laurie in Niederwieser, 2004:1). The ARC-Roodeplaat Vegetable and Ornamental Plant Institute has a comprehensive sweet potato breeding programme. To date, at least 22 cultivars have been released by the programme and more cultivars will be released in the future. Currently, most South African commercially available cultivars have a white to light creamy-yellow flesh colour. However, beta-carotene rich OFSP is being introduced in

South Africa based on its possible contribution to reducing the prevalence of vitamin A deficiency. Vitamin A deficiency is a serious health problem in Eastern and Southern Africa (De Wagt, 2001:352). In sub-Saharan Africa, this deficiency contributes up to 25.1 % of child mortality due to related diseases such as malaria, diarrhoeal diseases, acute respiratory infections and vaccine preventable diseases (Black, Morris & Bryce, 2003: 2226). The ARC-Roodeplaat is focussing on breeding high beta-carotene cultivars with a good yield, wide adaptability, drought tolerance as well as good storability. Trials are being carried out in various sweet potato producing areas in South Africa such as the Limpopo, North West Province, Free-State, KwaZulu Natal, Eastern Cape, Mpumalanga and Gauteng, in order to establish which cultivars will be released in the future for commercial production (Laurie in Niederwieser, 2004:65).

Sweet potato has the potential to combat increasing food shortages as it provides high yield in terms of edible energy per unit area per unit time. It is one of the most efficient food crops in terms of energy per land area (Van Oirschot, Rees & Aked, 2003:673), while also supplying substantial amounts of vitamins and minerals. The sweet potato crop is widely adapted and provides variety in the diet in terms of taste and texture. OFSP flesh colour varies from light orange to a dark orange colour and the skin from cream to orange to purple (Laurie in Niederwieser, 2004:57). The orange colour is an indication of the beta-carotene content of the sweet potato cultivar. A bright or deep orange colour is an indicative of a high beta-carotene content (Whitney & Rolfes, 2002: 343).

Furthermore, sweet potato is a hardy crop that has relatively low demands on soil nutrients, while also being more drought tolerant than many other vegetables, offering flexibility in planting and harvesting times as it has a shorter growing cycle than other root crops. For example, the average crop growth period for sweet potato is 140 days and, for cassava, 330 days. Rice and maize also have a crop growth period of 120-140 days (Laurie in Niederwieser, 2004:3). Sweet potato is harvested in South Africa during the months of March to June, but is dependent on production area and planting time. For example, in frost-free areas where sweet potato is planted from February to March, harvesting takes place from July to November. In warmer areas, planting takes place in August and harvest is in November or January (Van den Berg, Laurie & Niederwieser in Niederwieser, 2004:39).

In rural communities, farmers often harvest only enough sweet potato to feed their family, leaving the plants in the field to prolong availability (Domola, 2003:52). Sweet potato does not ripen or mature and can be kept in the ground for some time, having a longer keeping time than most root crops (Laurie in Niederwieser, 2004:2, 3). Storage roots can be kept in the soil for up to two months. However, sweet potatoes lose weight during storage as a result of water loss (1-2 % per month) and, therefore, the soil temperature must not be too low (> 10 °C, but not higher than 15 °C) and no rain should be expected during the storage period. Roots stored in the ground run the risk of being attacked by weevils (Laurie & Van den Berg, 2002).

There are different cultivar preferences found among different people in the world. The very dry cultivars, with a dry matter of around 30% are preferred in Africa (Laurie in Niederwieser, 2004: 57). The ARC-Roodeplaat has shown some success with various OFSP cultivars and aims to introduce them to secondary nurseries as well as to sweet potato farmers and subsistence farmers with the aim of becoming a widely utilised crop.

### **2.2.2. Sweet potato production in the informal sector of South Africa**

Sweet potatoes can be produced in all the provinces of South Africa with major production areas in Limpopo (Marble Hall, Burgersfort, Levubu); Mpumalanga (Nelspruit); KwaZulu Natal and Western Cape provinces (Laurie in Niederwieser, 2004:2). The main white-fleshed sweet potato (WFSP) varieties produced in South Africa are Blesbok, Bosbok, Ribbok and Koedoe (Laurie in Niederwieser, 2004:57). The Blesbok and Bosbok are similar in skin colour (purple) and flesh colour (white to light yellow) and both cultivars produce a relatively good yield within 4-5 months after planting. Blesbok, a white-fleshed sweet potato (WFSP) with a purple skin, is the most popular variety with 70% of the sweet potato production (Laurie & Van den Berg, 2002), which is mostly consumed as a vegetable as opposed to a staple food.

The informal sector produces and sells sweet potato in relatively large quantities. The ARC-Roodeplaat conducted a survey in 2001 to 2003 in seven provinces in South Africa that were identified as sweet potato growing areas. These were Limpopo, Mpumalanga, Western Cape, Eastern Cape, Kwa-Zulu Natal, Gauteng and the North West provinces. During this survey, it was found that, although rural farmers did not always own large pieces of land, sweet potatoes were cultivated on any piece of land available in the home garden. Sweet potato is normally produced for home consumption and, up to

95 % of the farmers that participated in the study, were subsistence farmers that depended on agricultural activities for their household supply. Sweet potato plays an important role as a food security crop in resource-poor farming where sweet potato is grown in home gardens for own consumption and to generate income (Domola, 2003:49,50). In rural communities, grain crops such as maize is rated as the most important crop for food supply, followed by vegetables. Root vegetables such as sweet potatoes are rated as the third most important food crop and, according to Domola (2003:49 - 51), sweet potato is sometimes exchanged for maize.

Sweet potato sales in rural areas have been found to be irregular and prices vary depending on quantity, size of the storage root, the place of sale and the people to whom they were selling to. Some farmers harvested only to feed their family but where sufficient sweet potato is available, farmers would sell to their neighbours or to the local market. In 2003, prices ranged from 50c – R 1 / kg to R 3 / kg, in different regions. The average price in all provinces for sweet potatoes sold by rural people is R 1,11 / kg (Domola, 2003:49,52).

While the largest portion of the South African production (26 000t) is sold on the commercial fresh produce market in pockets of 14 – 34 kg, a substantial amount is also sold directly to the large chain stores where it is sold per kg or pre-packed. Approximately 2000t are further processed by freezing and dehydration. Approximately 2000 – 3000 t sweet potato are exported to the United Kingdom (40 %) and Europe (60 %) and 40 t were imported in 2001. Sweet potato has a good keeping quality and is suitable for export by sea – it accounts for about 5 % of the vegetables exported by sea (PPECB, 2004; Laurie in Niederwieser, 2004:2).

### **2.2.3 Uses of sweet potato**

#### ***International food industry***

Sweet potato flour is used in the baking industry as a 20 % supplement to wheat. Mashed sweet potato can also be used to replace more expensive ingredients in products such as ice-cream, tarts and desserts. In its puree form, it lends itself as an ingredient in sauces such as tomato sauce and baby foods, as well as fruit flavoured jams like pineapple, mango, guava and orange. In the USA, sweet potato is canned in various forms. It is frozen as cubed, sliced, fried, mashed, halved and as whole roots.

In China, sweet potato is used for the production of starch which is used for making pasta and as a substrate for alcoholic drinks (Laurie in Niederwieser, 2004:4).

### ***South African food industry***

Industrially, 1000-1500 t of the 2000 t sweet potato that is processed in South Africa, is dehydrated and the powder is then used in instant soups and infant products and the remaining, approximately 650 t that is processed, is frozen (Laurie in Niederwieser, 2004:5). Sweet potato is consumed as a fresh vegetable in many domestic households. The uses of sweet potato can be extended to an ingredient in recipes for baked products such as biscuits, scones, buns and cakes, soups, jams, juices, chutney and pickles (Laurie in Niederwieser, 2004:3).

### ***Rural South African communities and households***

In rural households the sweet potato roots are generally boiled and consumed as fresh roots, while in other regions, roots are sliced and dried to extend their storage life (Van Oirschot *et al.*, 2003: 673). Boiled sweet potatoes are sometimes eaten cold with tea, but, when eaten as part of the main meal, they are first boiled and then mashed (Domola, 2003:49, 53). The tops or leaves of the sweet potato plant may be consumed as a green vegetable (Domola, 2003:49, 53). The tops and leaves are also fed to cattle, goats, pigs, poultry, even fish when green or as hay or silage (Laurie in Niederwieser, 2004:3).

Although the processing of sweet potatoes is still under-utilised, there is a growing interest in the processing of sweet potatoes for human consumption (Laurie in Niederwieser, 2004: 3). Future potential uses of sweet potato include deep-fat frying to make chips (Domola, 2003:49,53).

#### **2.2.4. Constraints in sweet potato production**

Rural farmers do not fully understand the constraints of growing sweet potato crops. In the study conducted by Domola (2003: 50), it was found that nine different viruses occur naturally on sweet potato grown by small scale farmers in South Africa (Domola, 2003: 54). Generally, viruses cause yield and quality loss of the food product and, where proper fencing is not constructed around vegetable gardens, goats and chickens cause

damage by eating the leaves. Irrigation required in areas where there is a low rainfall pattern is another constraint, as well as farming equipment, planting material, production cost, storage places and markets for selling products (Domola, 2003: 57).

In order to improve farming practices among rural and small scale farmers, the ARC-Roodeplaat has started to supply disease-free OFSP cuttings to farmers in targeted rural communities, as well as teaching them how to grow crops correctly and to extend the planting practices in communities not utilising this advantage. To increase yield, small scale farmers need to know that they should select disease-free planting material, use fertilisers before planting and crop rotation to prevent the depletion of nutrients from the soil, making it possible for a crop to survive and still produce in times of poor rainfall (Domola, 2003:58,59).

### **2.3 NUTRITIONAL IMPORTANCE OF ORANGE-FLESHED SWEET POTATO**

The nutritional content of food is recognised as being related to food choice in that it influences diet, health and disease (Shepherd & Sparks in MacFie & Thomson, 1994:202). The South African Vitamin A Consultative Group (SAVACG, 1995), which was formed in 1993 to assess the vitamin A and iron status of South African children, established that one in three children suffered from vitamin A deficiency. Its main findings identified the prevalence of vitamin A deficiency in South Africa as a cause of concern. The SAVACG study (1995) identified iron status as deficient, where one in five children was anaemic. In 1999, the National Food Consumption Survey (NFCS), that was conducted among children between the ages of 1–9 years, observed that one out of two children had an intake of less than half of the recommended level for energy, vitamin A, vitamin C, riboflavin, niacin, vitamin B6, folate, calcium, iron and zinc. The nutrient intake of children living in rural areas was considerably lower than that of children living in urban areas (Labadarios, Steyn, Maunder, Macintyre, Swart, Gericke, Dannhauser, Voster & Nesamvuni, 2000:6). SAVACG recommended vitamin A supplementation for children between the ages of 6 month and 6 years, as well as for lactating mothers to be introduced in high risk areas. The vitamin A status of the people living in rural and urban areas in South Africa requires strategies that are aimed at increasing production, availability, access and subsequently, the consumption of foods rich in vitamin A and provitamin A carotenoids in order to limit the prevalence of vitamin A deficiency..

Generally there are three approaches that assist in combating vitamin A deficiencies. These include:

- the fortification of food products such as maize meal and bread (flour) that are consumed in large quantities. Fortification of maize meal with vitamin A, thiamine, riboflavin, niacin, folic acid, pyridoxine, iron and zinc, became mandatory in October 2004 in South Africa. A logo, identifying fortified maize and wheat has been introduced and appears on all maize-meal packaging as well as on packaging of breads that are fortified (Department of Health, 2002),
- supplementation through the use of vitamin A capsules or drops for children, which is an effective approach. However, not all people in need of vitamin A supplementation are able to visit mobile clinics in order to get the required dose,
- dietary diversification which aims at increasing the consumption of vitamin A rich foods, especially through planting vitamin A rich vegetables such as OFSP, carrots, butternut, pumpkin and spinach in home gardens. Products that could increase the vitamin A intake of South Africans that are cost effective and, simple to grow on small pieces of land, should be actively promoted. Therefore the cultivation of sweet potatoes that have a high nutritional content (especially that of vitamin A), such as OFSP, could be beneficial to South Africans in terms of reducing vitamin A deficiencies (Labadarios *et al.*, 2000:6).

Products that are rich in vitamin A should be readily available in all markets to make it more accessible to all South Africans and for improved dietary diversity. Vitamin A-rich home gardens can increase the availability of fruits and vegetables that are rich in beta-carotene for home consumption.

Small quantities of the high beta-carotene sweet potato added to a family's diet can substantially reduce vitamin A deficiencies in both children and adults (Savage King and Burgess, 2003:261). In a study done by the Medical Research Council (MRC), OFSP was successfully incorporated during a trial period, into the school feeding programme. The children's vitamin A status improved after they consumed a half a cup of OFSP for 53 days as part of the school meal (Van Jaarsveld, Faber, Tanumihardjo, Nestel, Lombard & Benade, 2005:1081). In rural areas, the high beta-carotene sweet potatoes can be produced on small pieces of land in order to produce vegetables that are rich in beta-carotene and readily available. African mothers have been found to be more open to accepting the new varieties of sweet potato once they understood their nutritional value and contribution to alleviating vitamin A deficiency (Mukhala, 2000:9). This was

confirmed in a study by Hagenimana, Low, Anyango, Kurz, Gichuki & Kabira (2001:384) where it was found that nutritional education and counselling activities significantly increase the consumption of vitamin A rich foods.

The Resisto cultivar OFSP is rich in beta-carotene. WFSP has a high energy value but is devoid of beta-carotene and is widely produced and consumed by rural and urban consumers in South Africa (Van Jaarsveld, Marais, Harmse, Laurie, Nestel & Rodrigues-Amaya, 2006:321). Although the absorption and conversion of beta-carotene are less efficient than those of retinoids (derived from animal foods), it still plays an essential role in the diet in that it contributes to the daily requirement of vitamin A (Parker, 1996: 542-551). Sweet potato is a hardy crop and produces a high yield in terms of kiloJoules per unit area per unit time, with low demands on soil nutrients and cultivation input (Laurie in Niederwieser, 2004:3; Woolfe, 1992: 59).

Research has been conducted on OFSP in South Africa for more than ten years in order to select cultivars that would be accepted for their flavour attributes by African consumers, while, at the same time, preserving the beta-carotene content (Mukhala (2000:9). However, the sensory properties of new crop cultivars have generally been ignored in traditional breeding programmes (Van Oirschot *et al.*, 2003: 673). In view of the role that OFSP could play in reducing vitamin A deficiency, it is important to identify its sensory properties, as well as determine the consumer acceptability of OFSP by targeted consumers.

Table 2:1 compares the general performance of Resisto cultivar OFSP and Blesbok cultivar (Laurie in Niederwieser, 2004: 65). It shows that the yield of OFSP is not compatible with that of WFSP. A cost benefit analysis should be performed to justify the production of OFSP as compared to WFSP.

**TABLE 2.1: COMPARISON OF THE PERFORMANCE OF THE RESISTO CULTIVAR OFSP WITH BLESBOK CULTIVAR WFSP IN TRIALS AND ROODEPLAAT (Laurie in Niederwieser, 2004:74)**

Cultivar	Total soluble solids %	Dry matter content %	Keeping ability %	Marketable yield t/ha	Marketable yield %	Total yield t/ha
Resisto OFSP	8.4	23.0	45	44.6	81	55.4
Blesbok WFSP	5.5	14.2	80	64.2	79	81.3

## 2.4 QUANTITATIVE DESCRIPTIVE ANALYSIS

In this study quantitative descriptive analysis (QDA) was applied in order to develop sensory profiles for the different cultivars of sweet potato.

### Application of descriptive analysis

Descriptive analysis is used to obtain a detailed description of the aroma, flavour and oral texture of foods and beverages. The sensory profiles or pictures obtained are used in product development and manufacturing and are of particular value to nutritionists and food scientists who are interested in the development of food and beverage products (Woods, 1998:605). These include activities such as the development of standards for quality control purposes, to document product attributes prior to consumer testing to assist in selecting appropriate attributes for inclusion in the consumer questionnaire, to help explain the results of consumer tests to track sensory changes and to reformulate existing products (Meilgaard, Civille & Carr, 1991:188).

The sensory panel consists of people who are recruited from the immediate area through local media such as the placing of advertisements in the local newspaper. Panel members are screened for their ability to discriminate between different food samples. Selected panel members are then exposed to an introductory sensory course during which they are exposed to the four basic tastes i.e. sweet, salt, sour and bitter. Panel members are also required to complete threshold tests for the basic taste profiles as described by Jellinek (1985:162). Once this has been completed, panellists are able to participate in descriptive sensory evaluation of food products. Further training is applied on the specific product being evaluated. Panellists are then exposed to two-hour training sessions on four consecutive days in order to develop a clear definition of each

attribute. Panellists each receive a representative sample of the sweet potatoes and are trained to increase sensitivity and ability to discriminate between the sensory attributes of the different cultivars.

### **Language development in descriptive analysis**

During the training phase of descriptive analysis, the panellists describe the characteristics of a product by creating their own scientific language for the product or product category of interest – this is also referred to as the lexicon. A set of terms that describe differences among products is developed and a definition plus a reference standard are agreed upon by the panel members in order to anchor the descriptive term. This is then used by the trained panel throughout the evaluation of the products. Concepts are formed and labelled and panellists are trained to use the same concepts so that they are able to communicate precisely with one another. Consumer language is often imprecise and non-specific and does not allow sensory specialists to measure and understand underlying concepts in a way that will provide meaningful data. Often concept formation requires exposure to many similar products in order for it to be meaningful. However, when the boundaries are clear, for example sweetness, a single standard may be adequate (Lawless & Heymann, 1998:342-4). The panel further determines the sequence of evaluating each attribute (Lawless & Heymann, 1998:351), i.e. attributes that are more prominent in a product would be analysed first.

Data generated using descriptive analysis by a trained panel can be used to interpret consumers' hedonic responses to the same samples (like / dislike), allowing concepts developed during descriptive analysis to be related to concepts that lead consumers to accept or reject a product (Lawless & Heymann, 1998:354).

### **Scaling and score sheet**

In descriptive sensory analysis, samples are evaluated for a number of attributes by a trained panel (Lea, Næs & Rødbotten, 1998:4). Scaling involves the allocation of numbers by sensory panellists to quantify sensory experiences (Lawless & Heymann, 1998:209). The intensities of the attributes are quantified on a scale of any length possible e.g. 1-7, 1-9, 0-100 (Lea *et al.*, 1998:4). Category scales are commonly used in descriptive analysis, which is a limited set of words or numbers with equal intervals between categories. Scales should allow panellists to respond in varying degrees. A guideline to help decide how long a scale should be is to evaluate how many steps a

panellist can meaningfully employ and then adopt a scale twice as long, which is not recommended for panellists with limited skills. Other scales used in descriptive analysis are line scales and magnitude estimation, which were not used in this study (Meilgaard *et al.*, 1991: 191).

An eight-point category scale was used to measure the intensity of each sensory attribute (aroma, texture, flavour and aftertaste) for each treatment. One (1) on the category scale denoted the least intense condition (e.g. no sweet potato aroma) and eight (8) denoted the most intense condition (e.g. extremely intense sweet potato aroma).

## **2.5 CONSUMER EVALUATION OF FOOD PRODUCTS**

Consumer sensory evaluation is conducted with coded, unbranded samples, whereas in marketing research, branded products are used. In consumer sensory testing, the researcher is interested in finding out whether the consumer likes the product and prefers it above another product in order to determine the acceptability of the product, based on its sensory characteristics (Lawless & Heymann, 1998:430).

An important function of the introduction of new products into the market place, such as OFSP, is the ability to understand the needs of the present and future consumer in order to identify products with attributes that are desired by the target consumers. Specific cultivars OFSP have been selected to potentially meet nutrient and energy requirements of sub-Saharan African people as part of a food-based approach (Faber, Laurie & Venter, 2006: 14). In most sub-Saharan African countries, only WFSP is available, which contains very little or no beta-carotene.

### **2.5.1. Influences and understanding food choice**

According to Shepherd (in McBride & MacFie, 1990:3), a better understanding of the factors that influence food choice is required to improve the diet of people in general. Food choice and food consumption is also closely related as both refer to the behavioural act involving the acquisition of food. Food acceptance, on the other hand, denotes the pleasure derived from the consumption of food and comprises both a behavioural and attitudinal component (Randall & Sanjur, 1981:151), including the

palatability or taste of food. Sensory perception is one of the most important determinants of consumer food choice behaviour (Van Trijp & Schifferstein, 1994:128).

In order to understand the determinants of food choice as a human behaviour, one has to look at research done on the psychological process and individual attitudes for making food choices. Attitudes have been defined as learned dispositions or mannerisms of an individual to act in a consistently favourable or unfavourable way towards some objects and consist of three distinguishable components:

- firstly it is either our emotional or affective reactions to objects – a natural preference (like or dislike) for a particular food;
- secondly our behaviour tendencies (cognitive) towards objects – therefore our need or wish to consume or avoid certain foods;
- and thirdly our thoughts or cognitive ability – the information we have about the food, including what we believe the benefits or consequences are of a particular food (Conner, 1993: 27, 28).

This approach was developed by Fishbein and Ajzen (1975), as published in Shepherd, (1990:4) and offers a coherent framework within which these three components of attitude could be related (Shepherd, 1990:4). Preferences are also based on the belief that, by consuming a particular food, the outcome will be positive (Conner, 1993: 27). The positive outcomes include beliefs about foods that are healthy or unhealthy; foods that are appropriate for certain occasions or people and those that are not (Conner, 1993: 28). This relationship between attitudes and beliefs has been widely studied, although the relationship has remained somewhat unclear. However, within this framework, attempts have been made to relate attitudes to food consumption, which have led to the development of the framework of knowledge-attitude-practice (behaviour), which means that changes in behaviour can be brought about by increasing knowledge about a particular food (Shepherd, 1990: 3).

Thus, a closer look at the theory of planned behaviour shows that an individual's attitude towards the behaviour is based on his or her belief of salient outcomes of the behaviour. These outcomes include behavioural outcomes (e.g. price of a food item), emotional outcomes (pleasantness of taste) and potential risks (will the food increase the chances of heart disease) (Conner, 1993: 28). According to this theory, individuals are likely to choose and consume a particular food if they believe that the consumption will lead to

specific positive outcomes and therefore, by changing the beliefs about the outcomes, changes in food choices can be influenced (Conner, 1993:29).

When considering the food itself, food choice consists of three aspects i.e. the food, the consumer and the context or situation in which it is consumed or the interaction with the food (Gains in MacFie & Thompson, 1994:51). Conner (1993:28) states that, when comparing diverse influences on food choices with the reasons people provide for consumption, the flavour or 'taste' of the food is a strong predictive positive factor, followed by satiety as a physiological factor and lastly benefits such as price and convenience have little or no effect. Men (husbands) have been found to value the taste of food as the most important determinant of food choice, while the nutritional contribution and the safety (safe for consumption) of the food are more important determinants of food choice by mothers of a household (Shepherd in McBride & MacFie, 1990:141).

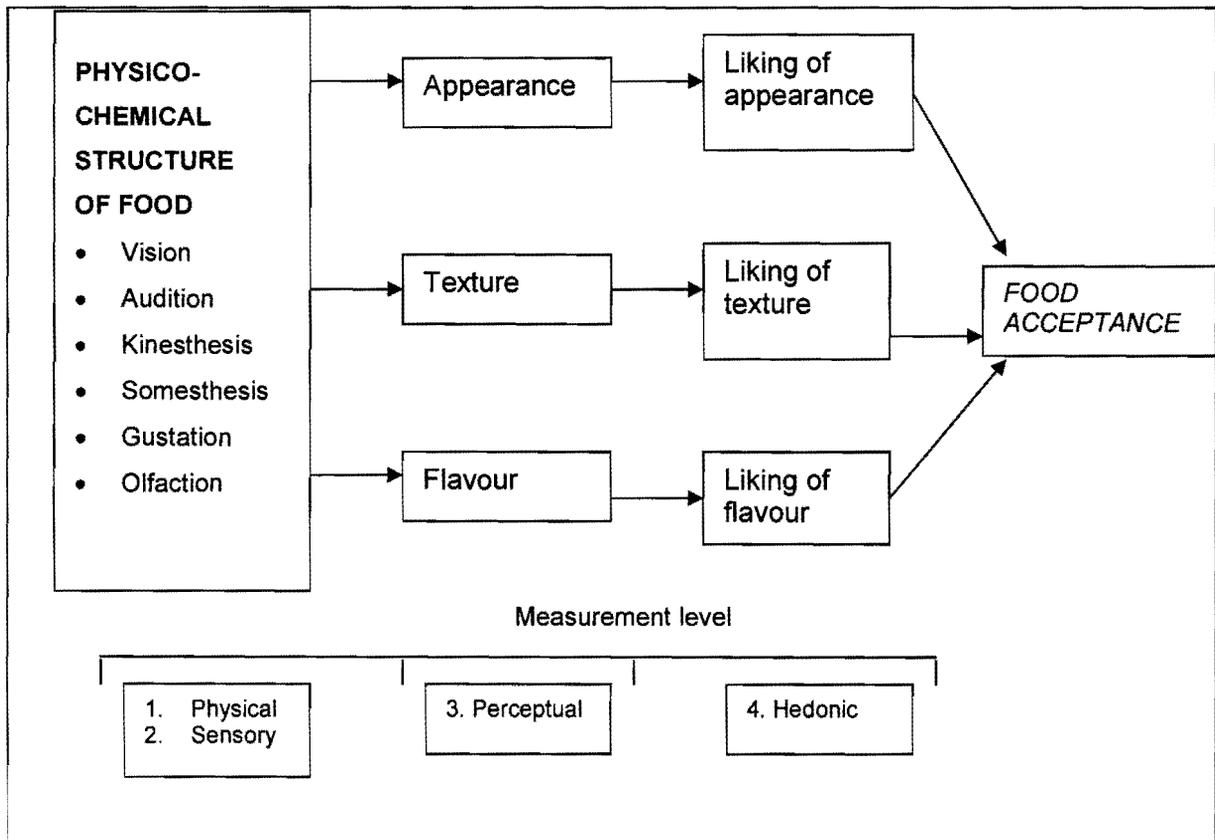
All these theories relate to the purpose of this study which is to establish consumer taste preference for OFSP in order to meet the nutritional requirements of the consumers that are most in need of vitamin A in their diet (therefore a health benefit). It can, therefore, be predicted that, if the taste of OFSP surpasses that of WFSP, it could successfully be introduced into any community, in particular low income. Measuring the sensory properties of OFSP and determining the importance of these properties as a basis for predicting consumer acceptance is an essential component in the promotion of OFSP to South African consumers.

### **2.5.2. Food acceptance**

Food acceptance refers to the palatability, hedonic tone, liking or disliking, food taste preference and pleasantness accompanied by the consumption of the foods (Meiselmann & MacFie, 1996:2). Food acceptance comprises a behavioural and attitudinal component (Randall & Sanjur, 1981: 151). Taste preferences in food often reflect a consumer's social and cultural origins, social ambitions as well as cultural capital acquired (Wright, Nancarrow & Kwok, 2001:355). From ancient days to the modern world of today, food and taste preferences have been closely linked to cultural development. Often, with affluence, consumers move from satisfying basic physiological needs to fulfilling social and psychological needs, shaped by the sub-cultures to which they belong (Wright *et al.*, 2001: 348-350). Meiselmann and Macfie (1996:3) show a

schematic model of the sensory basis of food acceptance, the stages, interactions and levels involved in the processing of sensory and perceptual information about food. Figure 2.1 is a simplified version of this model, and is included as it bears relevance to this study and the acceptability of OFSP.

Food preference refers to an expressed choice between two or more food items. Food preference techniques are used when the researcher wishes to look at the preference for one product directly against another product (Lawless & Heymann, 1998:430) and can also be defined as the degree of liking for a food product (Randall & Sanjur, 1981:151).



**FIGURE 2.1: Schematic diagramme showing basic sensory, perceptual and hedonic stages involved in the processing of the structure of food, resulting in food acceptance (Meiselman & MacFie, 1996:3)**

### **2.5.3. Focus group discussions - a brief overview**

A focus group interview is a carefully planned session with 6-15 individuals and is designed to obtain perceptions in a defined area of interest in a permissive, non-threatening environment (Casey & Krueger in MacFie & Thompson, 1994: 77). It makes a valuable contribution towards understanding the attitudes and behaviour of consumers (Jenkins & Harrison, 1992:33). A skilled moderator conducts the interview and the discussions are relaxed and enjoyable for the participants. Focus group discussions are aimed at providing insights into how a product, service or opportunity is perceived. The moderator should be skilled to encourage participation by all the participants (Casey and Krueger in MacFie & Thompson, 1994: 77; Jenkins & Harrison, 1992:34). Caution should be taken to generalise the findings to the population at large as, even though respondents are recruited based on regular use of the product, it is not possible to ensure a representative sample of the public on all relevant demographic variables (Jenkins & Harrison, 1992:34). Limitations include the influence of dominant participants, limited exposure to the product, or it may not be used by all the participants (Lawless & Heymann, 1998: 521). Data is often complex to analyse and, although the group may provide rich dynamics, these may be difficult to interpret and therefore analysis takes time and thought. At least three groups should be conducted to balance idiosyncrasies amongst groups. Groups are often difficult to assemble and recruitment is time consuming (Casey and Krueger in MacFie & Thompson, 1994: 77). However, as markets become more complex and segmentation more important for success in the marketplace, focus group interviews will continue to dominate qualitative research (Jenkins & Harrison, 1992:36).

## **2.6 MOTIVATION FOR THE STUDY**

Main thrusts were identified from the literature research and are discussed as separate bullet points:

- As consumption of OFSP improves the vitamin A status of children under the age of 10 years (Van Jaarsveld et al., 2005: 1080), role-players in food-based programmes in South Africa can promote the cultivation and use of OFSP in rural and urban communities in an effort to reduce malnutrition by increasing vitamin A intake. By

establishing the taste acceptability of beta-carotene rich OFSP in terms of its sensory properties amongst consumers of sweet potato and by determining the nutrient content of OFSP compared to that of WFSP, role-players in health and nutrition education could use such data to more effectively plan and implement food-based programmes.

- Consumer acceptability of OFSP among different socio-economic groups has not yet been established. Data reflecting its acceptability and preference based on taste, could be used by the ARC-Roodeplaat and similar organisations to motivate the production of OFSP for home consumption and also for the introduction of OFSP to the local fresh produce market, making it readily available to all consumers.
- Generally food composition data and specifically commodity data such as that which will be generated for OFSP is essential in nutritional research, for planning and assessing nutrition intervention studies, planning national food and nutrition policies and prescribing normal therapeutic and individual or institutional diets. Dietary intake is usually analyzed and recommendations are made by utilizing this information. Therefore the data will contribute to the South African food data base.

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