Designing a food based strategy for the introduction of an unfamiliar food crop as a community based approach

INNIKE RAJPUT (neé Taljaard)

Essay

M Cons Sc. (Food Management)

Study leader: Prof HC Schönfeldt
Co-study leader: Dr R Kruger

May 2012

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Essay (VBR 892 Mini-dissertation, 60 credits of 240) submitted in partial fulfillment of the requirements for the degree

Master in Consumer Science (Food Management)

in the

Faculty of Natural and Agricultural Sciences

Department of Consumer Science

University of Pretoria

Study leader: Prof HC Schönfeldt
Co-study leader: Dr R Kruger

May 2012

*Referencing as per Department of Consumer Science, University of Pretoria.
Referencing of Chapter 4 and 5 as per specific journal requirements.

I dedicate this thesis to my supervisor, Hettie, and co-supervisor, Rozanne. They challenged me, taught me the true meaning of perseverance, and always stood by me. Without their encouragement when this thesis seemed interminable, I would not have been able to complete it. I also dedicate it to my husband, who loves me unconditionally and believes in me more than I believe in myself.

DECLARATION

I, **Innike Rajput**, hereby declare that this essay for the **Master in Consumer Science** degree at the University of Pretoria, hereby submitted by me, has not previously been submitted for a degree at this or any other university and that it is my own work in design and execution and that all reference material contained herein has been duly acknowledged.

INNIKE RAJPUT

January 2013

ACKNOWLEDGEMENTS

My sincerest gratitude and appreciation to the following persons and institutions for their valuable contributions to the successful completion of this study:

My study leader, Professor Hettie Schönfeldt for her guidance in the design and execution of the research as well as her support in the writing up of the project;

Dr Rozanne Kruger, co-supervisor of the study, for her patience and endless assistance, and for always being available despite challenging time-zone differences, and who arranged the funding needed for this study;

Dr. Ciska Green (decd.), Hope Matla and Irene Moopa who conducted parts of the study;

All the community members who willingly participated in the study;

Makena and Mona Scheepers for approval to work on their farm;

My field worker and translator, Irene Moopa, for her enthusiasm, willingness and hard work;

Sunette Laurie from the Agricultural Research Council for her assistance with the establishment of and community training in the gardens;

Agricultural officers from the Agricultural Research Council for their willingness to assist in the refinement of the strategy;

Dr. Ingrid van Heerden for the language editing, and Trudie Erasmus for the technical editing of this thesis;

May and Stanley Smith Charitable Trust for funding this research;

All my family and friends for their support;

My husband and best friend for all the patience I could ask for.

ABSTRACT

Designing a food-based strategy for the introduction of an unfamiliar food crop as a community-based approach

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Department: Consumer Science
Degree: Masters in Consumer Science (Food Management)

Household food security has been described with a three-factor definition: 1) the availability of food, 2) the access thereto, and lastly 3) the food utilization patterns and practices. In previous research, both the availability and access to food were studied in a farming community in the Free State Province to understand how these factors contribute to household food security. However food utilization was not investigated at the time. Food consumption patterns of households deserve attention, particularly in relation to food gardens and nutrition, including the cultivation cycle, dietary norms and practices, and methods of food preparation and preservation. By studying utilization patterns of foods, the context of food insecurity and the resultant malnutrition can be better understood.

The purpose of this study was to investigate whether the food utilization strategies of a known food crop (spinach) can be used to establish efficient utilization of a new, unfamiliar crop (orange-fleshed sweet potato) in a farm worker community.

Three focus group interviews were conducted with a total of 21 participants to determine current food utilization patterns of spinach and orange-fleshed sweet potato (OFSP). The women were asked to describe how they currently utilize these crops in the same focus

group discussion (although the focus was on the known crop (spinach)) to understand what actions they take during the process of utilization, from access to disposal. They were asked to describe which tools and methods they apply, and who participates in all these various activities. Subsequently, the respondents were asked to perform all these steps while being observed to record current practices. Data from the focus group interviews and the observations were transcribed and categorized under themes. It was found that in addition to a lack of dietary diversity and subsequent malnutrition found discovered in another study of this community, that they are also not optimally utilizing their food. This is as a direct result of lack of access to a variety of food due to monetary constraints, lack of nearby shops, a lack of cultivation and production education about crops that can be home-produced, and a lack of knowledge about nutrition and the importance of a varied diet. A food-based approach to improve the lack of knowledge of home-produced crops and nutrition was, consequently, the focus of this utilization strategy. This information was used to design a food-based strategy to improve the utilization of an unfamiliar crop (OFSP), in areas where the food crop was not being utilized optimally. Although the strategy was developed based on observations and lessons from one specific community, the principal findings were used to develop a strategy that is generic to the implementation of an unfamiliar food crop, and can then be refined for a specific community before implementation. A complete training manual was developed to complement the food-based strategy. The researcher then tested the strategy with agricultural extension officers who are active in communities where food insecurity and malnutrition exist during a training programme hosted by the Agricultural Research Council - Roodeplaat. The agricultural extension officers provided input on the strategy and identified areas for improvement. These recommendations were adapted in a manual to ensure that the developed strategy could be broadly implemented in other communities.

The overall conclusion of the study is that it is necessary to investigate and understand all elements of the food utilization system to truly understand the reasons for observed behaviour, habits and practices. Planning and developing a nutrition education programme requires systematic analysis of nutrition and health-related problems in a given community. It is evident that each step of the utilization cycle is equally critical and should enjoy comparable attention to facilitate delivery of nutrient-rich foodstuffs to the end user.

Key words: Orange-fleshed sweet potato, food utilization, food access, food security, dietary diversity, malnutrition, food gardens, farming community

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LIST OF ABBREVIATIONS

ARC	Agricultural Research Council
BCC	Behaviour change communication
FAO	Food and Agriculture Organization
FBDGs	Food-based dietary guidelines
FCS	Food coping strategies
GDP	Gross Domestic Product
HIV	Human Immunodeficiency Virus
IFSS	Integrated Food Security Strategy
LSM	Living Standards Measurement
MRC	Medical Research Council
NFCS	National Food Consumption Survey
NGOs	Non-governmental organizations
OFSP	Orange fleshed sweet potato
RDA	Recommended Daily Allowance
RE	Retinol Equivalents
SADC	Southern African Development Community
UNICEF	United Nations International Children's Emergency Fund
VAD	Vitamin A Deficiency
WSSD	World Summit on Sustainable Development

CHAPTER 1
THE STUDY IN PERSPECTIVE

1.1 BACKGROUND AND INTRODUCTION

During 2011, 77% of households in the Southern African Development Community (SADC) were experiencing severe food insecurity, and food security in South Africa is becoming a growing issue (Mdluli, 2011). In South Africa, a study conducted in 2000 by Statistics South Africa to measure poverty (poverty at the time defined as a person living below R211 food expenditure per month), revealed that 35 percent of our total population was classified as being food insecure, and that the poverty rates of South Africa's nine provinces differ significantly, as do those of the urban and rural areas of the country. Poverty was more prevalent in certain areas of the country such as the Eastern Cape, Northern Province and the Free State Province (Department of Agriculture, 2002), and the incidence of poverty was much higher in the rural areas of South Africa at 59.3% (Armstrong, Lekezwa & Siebrits, 2009).

According to Ayres and McCalla (1996:8) 75% of the world's poor and undernourished people live in rural areas where food is grown, but they have limited access to the food due to lack of monetary fund's thereby contributing to food insecurity. The Integrated Food Security Strategy (IFSS) for South Africa study conducted in 2002 indicated that the lack of access due to monetary constraints was true for 70% of the poorest South African citizens experiencing food insecurity (Department of Agriculture, 2002). Development in rural areas, especially local agricultural development within communities can reduce poverty and hunger (Ayres & McCalla, 1996:1; Sumelius, Backman, Kahiluoto & Rotter, 2009:17, 23).

According to Bonnard (1999:7), "Agriculture and nutrition form a synergistic cycle, whereby each supports and advances the other". At the launch of the Department of Agriculture's Food Security, Nutrition and Health Campaign in South Africa in 2002 to improve household food insecurity, the Minister of Health stated that the focus of this campaign was on the production and consumption of micronutrient dense foods (Tshabalala-Msimang, 2002). Objectives of this campaign include improved food utilization by establishing food gardens and subsequently helping households to become food secure, through promoting production and consumption of micronutrient dense foods (especially vitamin A), and promoting general

healthy eating practices. Household food security has been described with a three-factor definition: 1) the availability of food, 2) the access thereto, and lastly 3) the food utilization strategies and practices (Bonnard, 1999:2; USAID policy determination, 1992:3).
Webb (2000:66) states that consumption strategies of households deserve attention, as they have not been studied adequately in relation to food gardens and nutrition, and that such a study should include: "the cultivation cycle, dietary norms and practices, and methods of food preparation and preservation". Utilization strategies of foodstuffs should be studied to ensure that optimal food utilization combats food insecurity and subsequent malnutrition. Household food security and nutrition policies should be integrated into rural development programmes (Ayres & McCalla, 1996:1, Bonnard, 1999:10).

Webb (2000:66) also states that there is an obvious link between food gardens and nutrition, however, the collaboration between the Departments of Health and Agriculture in South Africa is limited. Food gardens are established in many communities, at clinics and schools to promote food security, but food access and availability alone does not ensure that communities are well-nourished (Agwu, Amadu, Morlai, Wollor & Cegbe, 2011:21), as they should also be educated in utilization of foodstuffs. One of the most effective ways of reducing poverty is investing in human capital as sustainable development. This is what the age-old saying implies: "*If you give a man a fish he will eat for a day. If you teach him to fish and enable him to buy and maintain his own gear and bait, he will eat for a lifetime and help to feed others"* (Whitney & Rolfes, 2010:696).

A study by Johnson-Welch (1999:7) emphasized the importance of educating mothers by teaching them good nutritional practices to alleviate malnutrition. This study, conducted in African countries such as Kenya, focussed on the improvement of nutrient status by food interventions, with specific focus on nutrients such as iodine, iron and vitamin A. Women were educated in basic provisioning principles to ensure optimal food utilization and consumption of vitamin A rich foods by focussing on production, processing and preparation of these foods to improve their family's nutritional status and ultimately also their health. The United Nations International Children's Emergency Fund (UNICEF) actively supports programmes that increase the nutrition knowledge of mothers and health workers to improve malnutrition, because the health of children is inextricably linked to the health and nutritional status of the mother (UNICEF, 2009). In many countries, men only work to deliver cash crops, and, therefore, relieving hunger has been focused on educating and empowering women to grow and utilize nutritious food to feed their own families (Whitney & Rolfes, 1999:633).

Dietary diversity is an important aspect that should be used to combat malnutrition, as a varied diet reduces the risk of developing nutritional deficiencies (Bezerra & Sichieri, 2011:4). Labadarios, Steyn and Nel (2011:4) reported that the dietary diversity of South Africans is low, and particularly so in the low living standards measurement (LSM) group and amongst black South Africans. Nearly 40% of South Africans only consumed between one and three different food groups on the day prior to the survey; these being a cereal, red meat or chicken and a vegetable other than a vitamin A rich one, and that the most neglected food groups were vitamin A rich fruit and vegetables, legumes and nuts.

One of the ten South African Food-Based Dietary Guidelines (FBDGs) states that people should enjoy a variety of foods (Maunder, Matji & Hlatshwayo-Molea, 2001:1). These FBDGs attempt to eliminate some of the consequences of the lack of dietary diversity. The South African National Food Consumption Survey (NFCS) (Labadarios, 2000:S8) indicated that the most consumed foodstuffs in South Africa include white sugar, tea, maize meal, whole milk and brown bread. Steyn, Nel and Casey (2003:637) reported similar findings, but also found that non-dairy creamer, brick margarine and chicken ranked higher than whole milk. The diet of the average South African household shows alarmingly low food variety and dietary diversity scores, both of which have been positively related to children's nutritional status (Steyn *et al,* 2006: 646). The nutrient density of the diet consumed by South African children is insufficient to meet their nutrient requirements (Labadarios, 2000). If dietary diversity is improved, and food utilization and consumption is optimized, nutrient-specific malnutrition could be alleviated.

The IFSS (Department of Agriculture, 2002:58) estimated that between 20% and 30% of young children in South Africa suffer from anaemia and vitamin A deficiency. It was also found that worldwide, almost two billion people run the risk of malnutrition, specifically deficiencies of vitamin A, iron and iodine (Ayres & McCalla 1996:8, Zhao & Shewry, 2011:S94). The NFCS (Labadarios, 2000:69) indicated that in South Africa, one in three (33%) children had a marginal vitamin A status and that the dietary intake of vitamin A was found to be below 67% of the Recommended Daily Allowance (RDA) of 800 microgram RE (Retinol Equivalents) (Department of Health, 2002a). This study also found that one in ten (10%) children aged one to nine years was underweight, one in five (20%) was stunted, with the more severely affected being those living in rural areas.

Many community-based projects with a focus on dietary diversity or alleviating micronutrient deficiencies are being implemented to combat malnutrition, and at the University of Pretoria, research was conducted to develop a food-based model to improve household food security in farm worker households on Orange Farm through the implementation of nutrition

interventions in this community. Farm workers and their families have been found to be amongst the worst-fed of the population – one out of every three children who grow up on a farm is stunted because of malnutrition (Labadarios, 2000:6). Iannotti and Gillespie (2002:3) states that experience has shown that malnutrition can be improved by community-based nutrition programmes and strategies.

Orange Farm in the Free State Province was used as the study site for investigation by the Department of Consumer Science of the University of Pretoria. Both food availability and access to food by farm workers on this farm have been studied previously (Green, 2004; Matl, 2008), and uncovered limited food availability and generally poor access that leads to low dietary diversity. In the present study food utilization was studied to gain understanding of how it contributes to household food security. Therefore, this study focused on the food utilization leg of household food security within the larger project.

1.2 MOTIVATION FOR THE STUDY AND PROBLEM STATEMENT

The South African Department of Agriculture has recognised that rural food insecurity can be overcome by increasing the participation of food insecure communities and households in agricultural activities (Department of Agriculture, 2002:62). Gillespie and Mouton (1994:6), and Valdez, Lopez, Schwartz, Bulux and Solomons (2001:62) reported that food-based approaches can be effective in the control of vitamin A deficiency.

A community project run by the Department of Consumer Science of the University of Pretoria, and financially supported by the May and Stanley Smith Charitable Trust was operating on Orange Farm in the Free State Province (on the R711 between Fouriesburg and Clarens, near the Lesotho border). This project investigated local hygiene and sanitation, as well as dietary diversity and food coping strategies (FCSs). The results indicated very low dietary variety and poor vitamin A intakes and it was decided, therefore, that a food-based approach should be implemented in this community with the technical support of the Agricultural Research Council (ARC) Roodeplaat. Vitamin A rich vegetable gardening including newly developed cultivars of orange-fleshed sweet potato (OFSP) were identified as vehicles for improving the nutritional status of the community. OFSP has high yields, contains high levels of bio-available β-carotene, is drought resistant, and has a short cultivation cycle, making it an optimal crop to alleviate poor vitamin A intakes in this community. It is also a crop high in carbohydrates which can make a significant contribution to the kilojoule intake of a community.

Although spinach (which is currently consumed by the community) is also a rich source of vitamin A, the bioconversion rate for vitamin A (carotenoids) has been found to vary between 33µg: 1µg and 73µg: 1µg (Ruel, 2001:5). Bioconversion refers to the amount of absorbed nutrient precursor converted to active nutrient (conversion of β-carotene to retinol in this instance) (Van Lieshout & West, 2004:3). The content and bioavailability of provitamin A carotenoids in plant foods are important determinants of vitamin A status. β-Carotene is the major provitamin A carotenoid, and cleavage of one β-carotene molecule generates two molecules of retinol, compared to only one retinol molecule on cleavage of all other provitamin A carotenoids (Hess, Thurnham & Hurrell, 2005:4). In dark green leafy vegetables, 26 µg of β-carotene is one vitamin A equivalent, whereas in sweet potato, 12µg of β-carotene is one vitamin A equivalent. The lower bio-availability of vitamin A in spinach is because the vitamin A is present in the chloroplasts in the spinach leaves, which are not readily digested in the body due to inhibition by the food matrix (Van Lieshout & West, 2004:6). Individuals with lower vitamin A status appear to have higher absorption and/or bioconversion of carotenoids (Hess *et al,* 2005:5).

The World Declaration and Plan of Action for Nutrition adopted at the 1992 International Conference on Nutrition in Rome recommended the use of locally available nutrient-rich indigenous and traditional foods as a vital strategy against food insecurity, malnutrition and disease (Frison, Smith, Johns, Cherfas & Eyzaguirre, 2010:4). Rodriguez-Amaya (2003:74) states that locally available or potentially available food sources of carotenoids, and production of richer sources of carotenoids should be promoted. The farm worker households on Orange Farm (Free State Province) were only aware of white-fleshed sweet potato which they occasionally purchased, but had never cultivated any kind of sweet potato as the farm workers believed that this vegetable would not grow in the area. When the ARC introduced a vitamin A rich gardening project on Orange Farm, various cultivars of OFSP were planted to determine which cultivar would be most suitable to the area. An attempt at harvesting in the home gardens by the community took place about five months after planting. They only found a few roots, and did not realise that there were many more roots to harvest. The community also did not utilize the roots and tubers for replanting as instructed by the ARC. The community did not actually believe that the sweet potatoes were growing in the nursery garden because the leaves had been consumed by roaming animals, such as chickens and goats that had access to the garden. The OFSP varieties were subsequently harvested by the research team and the community members were amazed at the yield. Two cultivars in particular showed excellent results, namely the Excell and A119 cultivar. These were selected for replanting for the food utilization project.

Most communities are familiar with a crop such as spinach, but if an unfamiliar crop or cultivar such as OFSP is introduced to alleviate food insecurity, increase dietary diversity or combat a certain deficiency, it is important to ensure that these communities are educated in the product specific food utilization cycle to ensure optimal food utilization of such a crop. The UNICEF Nutrition Conceptual Framework (Department of Health, 2002b:1) as illustrated in Figure 1.1, identifies the lack of education and information as an underlying cause of malnutrition and death, and it is evident that this is a very important aspect that requires specific attention. The importance of educating communities was noted in this community, where the known foodstuff spinach is successfully cultivated and consumed by the community, whereas OFSP was not consumed because the members of the community did not know how to utilize this food source optimally.

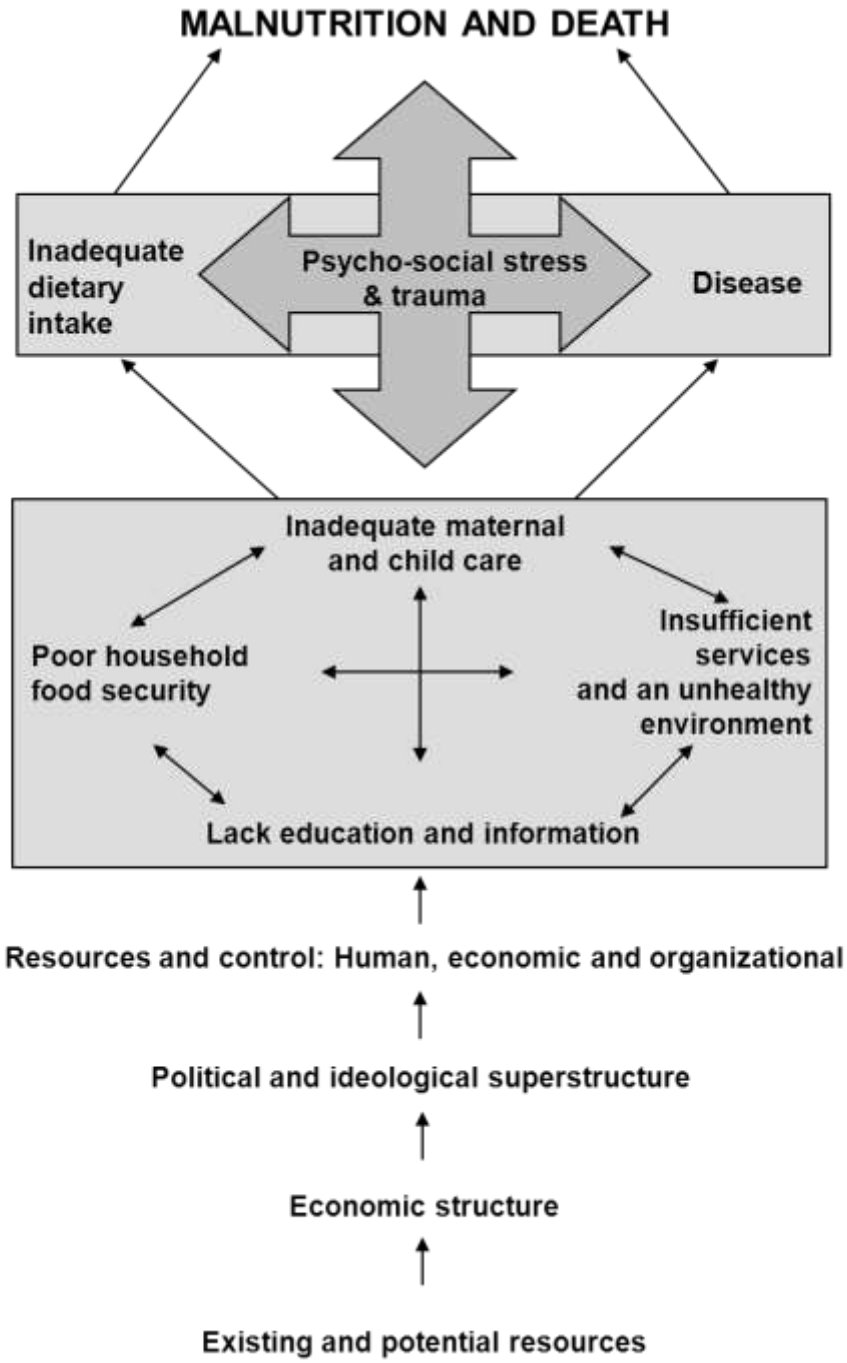

FIGURE 1.1: UNICEF CONCEPTUAL FRAMEWORK OF MALNUTRITION – 1997
(Department of Health, 2002b:1)

Rodriguez-Amaya (2003:39) indicates that basic preparation methods can affect vitamin A consumption, and, therefore, it is important to focus on all the stages of food utilization. Most foods undergo thermal processing of one sort or another before they are consumed, and this processing potentially affects many nutrients (Burlingame, 2006:281). For example bio-availability of carotenoids in sweet potato varies according to preparation method, with fried sweet potato yielding twice as much β-carotene than cooked sweet potato, which was also

found to be true for the bio-availability of lycopene from tomato juice when heat treated in the presence of oil, as it is a fat soluble phytonutrient (Institute of Medicine, 2000:356). Bio-Availability of β-carotene varies greatly depending on the plant matrix and is increased by the presence of oil and by heat processing (Hess *et al,* 2005:5). Also, cutting foods into small pieces exposes carotene to oxygen and reduces bio-availability (Rodriguez-Amaya, 2003:39). A food-based approach can also ensure that by informing home gardeners and those responsible for food preparation about the advantages of certain activities during the utilization cycle, and the subsequent effect on nutritional quality and vitamin A content, that a change in behaviour can be facilitated.

Labadarios (2000:68) states that before the National Food Consumption Survey was conducted in 1999, there was no nationally representative data to provide information on direct food security indicators such as food procurement strategies, food availability and food consumption strategies, people's perceptions of food security, energy and nutrient availability and intake, as well as nutritional status within the household, however this study only provided data for children aged 1-9 years. In addition many publications point to the fact that food-based strategies can form the basis for the development of nutrition interventions (Allen & Gillespie, 2001; Demment, Young & Sensenig, 2003; Roos, Wahab, Chamnan & Thilsted, 2007). A food-based approach could ensure that by educating primary food producers and those persons responsible for food preparation, the under-utilization of a foodstuff would not hinder the promotion of vitamin A consumption, dietary diversity, and subsequent household food security in this community.

Consequently, this study describes the community's current food utilization strategies of spinach (a known food crop), and these results will then be applied to develop a food-based strategy for the successful introduction of OFSP (an unfamiliar food crop) into this community, by describing the cultivation, food utilization and consumption strategies, to ensure that this crop can be optimally utilized to combat vitamin A deficiencies.

Food-based strategies can increase the amount of vitamin A available for body functions (Ruel, 2001:xiii). It is believed that this could be achieved in the current community project by the following:

1) By increasing the production and availability of foods high in this nutrient.
   Through this project, the community was encouraged to tend vitamin A rich home gardens to encourage dietary diversity and vitamin A consumption.
2) By increasing consumption of these foods through a nutrition education programme.
   The community was encouraged to consume OFSP and was taught about its health benefits.

3) Maximizing the bio-availability of vitamin A rich foods.
Home-processing and cooking techniques were encouraged that improve the bio-availability of vitamin A obtained through OFSP.

4) By breeding new varieties of plants that contain larger amounts and more bio-available micronutrients.
The ARC continues to cultivate OFSP with high β-carotene content.

Based on the above, the following study problem statement can be formulated:

Can the food utilization strategies of a known food crop be used to establish efficient utilization of a new, unfamiliar crop in a farm worker community?

This research will be beneficial to all farming communities, as recommendations can be applied in designing similar food-based community nutrition interventions and/or programmes. The food-based programme can also be applied by agricultural extension officers at grass roots level in the specific communities they serve. It was believed that the study would also provide the remaining generic information needed in respect of eating habits and practices of this specific community.

1.3 THEORETICAL FRAMEWORK AND SPECIFIC RESEARCH OBJECTIVES

The theoretical framework (Figure 1.1) is based on the UNICEF Nutrition Conceptual Framework (Department of Health, 2002b). The conceptual framework which flows from this theoretical framework is outlined later in Chapter 3 as a result of a thorough literature review. The UNICEF framework analyses malnutrition and death by means of the 'Triple A Cycle' of assessment, analysis and action. Household food security can be assessed through access, availability and food utilization as described under conceptualization.

Nutritional deficiencies usually do not occur due to a single event, but are rather the result of interrelated factors which all contribute to the outcome (Chin, Shepherd, Thomas, Patrick, Wilcox, Ong, Lynch & Strong, 1992:165). For example, vitamin A deficiency can result from an inadequate intake of protein and zinc, since these nutrients are necessary for the production of retinol binding protein, and iron deficiency can also affect vitamin A metabolism (Darling, s.a.). Although this study focused on food utilization exclusively to increase dietary diversity and ultimately vitamin A status, this research formed part of a larger study which will ultimately be capable of describing the causes of a specific community's nutritional status

based on household food security. Many environmental factors outside the control of the community can impact on their well-being (Labonte, 1998), and food security alone is the result of many indirect social, economic and political events.

The issues pertaining to food security were uncovered by seeking information to focus on the following objectives:

OVERALL OBJECTIVE: To design, implement and assess whether a food-based strategy could be applied to the introduction of an unfamiliar food crop as a community-based approach to improve their food utilization. (This strategy will be generic and will be provided to agricultural extension officers to adapt and implement within the communities they serve).

Objective 1: To understand how food utilization strategies impacted the food utilization of a known food crop in farm worker households on Orange Farm in the Free State Province (Chapter 4).

Objective 2: To formulate a strategy that may have contributed to optimal utilization of an unfamiliar crop as a community based approach based on the information obtained about the known food crop (Chapter 5).

1.4 APPROACH TO AND METHODOLOGY OF THE STUDY

A qualitative research method was chosen. Focus group interviews as well as direct observations were conducted in the community to gather information on their current food utilization habits and practices. Focus group interviews were used as the primary data collection technique. The remaining methods were used to verify the information and to explore research findings.

1.5 OUTCOMES

The three main deliverables of this study are (included):

a) Two articles that have been submitted to journals as follows:

- Design of an educational framework in introducing an unfamiliar food crop into a farm worker community for ensuring food security. African Journal of Agricultural Research. Submitted on 10 February 2012. Accepted on 17 May 2012; and

- Situation analysis to inform the introduction and utilization of new food crops towards improving household food security. Agrekon. Submitted on 1 February 2012, currently under review.

b) A training guide was developed for agricultural extension officers for the introduction and implementation of an unfamiliar food crop.

1.6 STRUCTURE OF THE THESIS

The thesis will be presented as follows:

Chapter 1: The study in perspective;
Chapter 2: The relationship between food utilization, food security and dietary diversity (A Literature Review);
Chapter 3: Research methodology;
Chapter 4: Research findings on utilization of a known food crop (Article 1);
Chapter 5: Research findings on the development of an educational framework (Article 2);
Chapter 6: Conclusions, evaluations and recommendations; with referencing per chapter.

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CHAPTER 2

THE RELATIONSHIP BETWEEN FOOD UTILIZATION, FOOD SECURITY AND DIETARY DIVERSITY (A LITERATURE REVIEW)

2.1 INTRODUCTION: FOOD SECURITY

The South African Department of Agriculture states in a document outlining the food security strategy for the country, that food security forms part of the section 27 Constitutional Rights in South Africa (Department of Agriculture, 2002). The Department of Agriculture, Forestry and Fisheries states that their 2011 structure was based on this document and that within the new structure, food security issues will be the main focus of the Chief Directorate (Du Toit, Ramonyai, Lubbe & Ntushelo, 2011:16).

The Department of Health identified three levels of food insecurity: 1) lack of availability of food; 2) reduced access to food, and 3) problems related to utilization of food (Department of Health, 2002b:4). Food insecurity is defined as the "limited or uncertain availability of nutritionally adequate and safe foods, or limited or uncertain ability to acquire food in socially acceptable ways" (Gulliford, Mahabir & Rocke, 2004:2). It encompasses three levels: food secure, food insecure without hunger, and food insecure with hunger (Kabbani & Kmeid, 2005:440). In Sub-Saharan Africa, one in three people are chronically hungry, the highest proportion of undernourished people in the total population of Africa (FAO, 2010).

Food aid and reclamations are not long-term solutions to continued insecurity (Ng'ambi, 2003:4; Thang, 2009:3), and this insecurity has to be improved at household level, to ensure that communities are self-sufficient and to strengthen local control over food production (Tarasuk, 2001:90). Food aid should not become a substitute for agricultural reform (Monyela, 2007:23). Barrett and Maxwell (2005:110) state that providing food to famine stricken people will not do much to cure starvation, as food availability and entitlement need to be created. Food self-sufficiency has been a food policy objective of many African governments. However, while this objective may have been politically desirable, it has not always been economically and ecologically feasible. The balancing of the immediate food aid issues with long-term and strategic considerations requires a multifaceted approach covering political, economic, social and environmental factors (Clover, 2003:14).

The agricultural production and food supply systems of a country depend on many factors including government policy, ecological potential, as well as the level of technology, inputs and skills of the agricultural producers (FAO, 1997). Food self-sufficiency is defined as being able to meet consumption needs (particularly for staple food crops) from own production rather than by buying or importing, and there is a long-standing debate on whether food self-sufficiency is a useful strategy to achieve food security (Peljor & Minot, 2010). In some countries food self-sufficiency has been taken to mean adequacy of food supplies of locally produced staple cereals (e.g. maize, sorghum, rice) to meet the population's energy requirements, but more often it has been seen as adequacy to meet market demand. Foods other than staple crops may be included, but in all cases the concept is that countries would not need to import foods or would minimize dependence on food imports as far as possible. There has been an increase in emphasis on self-sufficiency in food production, and wealthier countries with limited agricultural land have sought to secure access to land for agricultural production in other countries (United Nations ESCAP, 2010). While a certain degree of food security can be obtained with such an approach, especially in remote areas with risky or unstable markets or in those lacking markets, a strict policy of food self-sufficiency is generally not desirable (FAO 1997:70).

According to the FAO (1997:147), household food security can result in good nutritional status if people have nutrition security, thus:

- access to nutritionally adequate and safe food;
- knowledge and skills to acquire, prepare and consume a nutritionally adequate diet;
- access to health services and a healthy environment to ensure effective biological utilization of foods consumed.

A combination of actions needs to be adopted to: 1) increase the availability of micronutrient-rich foods, to 2) promote adequate food processing and preservation techniques, to 3) disseminate education related to food and nutrition, to 4) promote dietary diversification, to 5) establish legislation and implement programmes for food fortification and supplementation and to 6) implement appropriate public health measures (FAO, 1997:148).

2.1.1 Food availability

Food availability refers to the consistent supply of sufficient quantities of foods, nationally and at household level. It is impacted by the production capabilities of the local agricultural sector, as well as market conditions (Bonnard, 1999:2). Food availability is affected by political, economic, social, technical and climatic factors (Smith, 1998). Due to sanctions and import duties, many countries are not able to supply adequate amounts of foods to their

citizens. In fact in many countries, food is available at national level, but at household level people do not have the economic power to access it.

2.1.2 Food access

Access refers to the ability of a nation and its households to acquire sufficient amounts of food on a sustainable basis (VVOB Formulation Report, 2005:11). Food access is also the way in which such food is acquired (Williams, 2002:iii). Access depends on income available to purchase foods, the distribution of income within the households (thus funds allocated to purchase foods), and the price of foodstuffs (Bonnard, 1999:2). A stable local food supply usually is affected by factors such as:

- Access to land;
- Livestock ownership;
- Food garden availability;
- Safe, accessible water supply;
- Stable climatic conditions;
- Access to food shops;
- Access to alternate food supplies e.g. school feeding; and
- Cash (income) to buy food (Labadarios, 2000:68).

Food distribution within households and food serving practices also influence the amount of food eaten, as some members may be served last, or may have to skip meals altogether so that other household members could be fed. Unequal distribution of food within households is one major factor that promotes the lingering under-nourishment among household members (Akerele, 2011:546). Household behaviours can result in certain individuals receiving disproportionately more or less of the household food supply (Shankar, Gittelsohn, West, Stallings, Gnywali & Faruque, 1998:1128). Eating out of a communal bowl might also cause younger children to receive insufficient amounts, or an inadequate variety of foods (Labadarios, 2000:74).

2.1.3 Food utilization

According to Bonnard (1999:2), food utilization is the “proper biological use of food, requiring a diet providing sufficient energy and essential nutrients, potable water and adequate sanitation”. Effective food utilization depends in large measure on knowledge within the household of 1) food storage and processing techniques, 2) basic principles of nutrition, 3) proper childcare and 4) illness management. Food utilization is where food security and

nutrition intersect, and is frequently the most poorly understood or forgotten aspect of food security (UNAIDS, 2010:6).

Utilization is not always an automatic result of access and availability. Activities related to food utilization and consumption include those involved in the preparation, processing and cooking of food at both the home and community levels, as well as household decision-making regarding food, household food distribution practices, and cultural and individual food choices and access to healthcare, sanitation and knowledge (FAO, 1997:40).

2.2 THEORETICAL BACKGROUND

The study is based on a theoretical framework that presents the concepts related to malnutrition which stems from household food insecurity and its related components. Within this context, the theoretical background underlying this study will include a focussed discussion of food choice and acceptability, dietary diversity, malnutrition, agriculture and nutrition, home gardening, community-based approaches and educating women. A community education programme will be discussed.

2.2.1 Food choice and acceptability

Food preference is defined by Randall and Sanjur (1981:1) as a combination of the characteristics of an individual, the characteristics of foods, and the characteristics of the environment, whereas acceptability is defined as when attributes and food cues meet responsive minds and match expectations (Florkowski, Prussia, Shewfelt & Brueckner, 2009:45). Food choice or selection is ultimately the result of pre-determined food requirements and preferences, selectivity and the availability of food, as well as organoleptic properties, the ease and method of preparation, and digestibility (Golan & Unnevehr, 2008:466). Availability of food does not ultimately lead to consumption, as Marshall (1995:21) states that food consumption is part of a larger process linked to production and preparation, as well as various social aspects that drive acceptability.

2.2.2 Dietary diversity

Maunder *et al.* (2001:1) describe a possible relationship between dietary diversity and nutritional quality of the diet. Dietary diversity is measured as either the number of different individual foods consumed, or the number of foods consumed from different food groups

(Ruel, 2001:3). The human diet is very complex, and, therefore, it is difficult to measure the contribution of each food and nutrient to the diet in isolation, as people do not eat isolated nutrients, but consume meals consisting of a variety of foods with complex combinations of nutrients that are likely to be interactive or synergistic (Hu, 2002:3). It is therefore important to advocate the consumption of a variety of foods to ensure a positive nutritional outcome.

On average only five different foods from three different food groups (carbohydrates, dairy and fats) are consumed most often by children in South African households (Labadarios, 2000:S8), which is cause for concern in the light of the national vitamin A deficiency. A lack of dietary diversity has been found to directly contribute to the lack of vitamin A in the diet, as this micronutrient is limited to only a few foods (De Pee & Bloem, 2007:184).

In the United States of America (USA) the Food Guide Pyramid suggests that between 15 and 26 different foods should be consumed on a daily basis, and foods should be consumed from each of the five food groups (Whitney & Rolfes, 1999:633). Similarly, a variety of foods should be consumed from the various food categories when implementing the South African FBDGs (Vorster, Love & Browne, 2001).

2.2.3 Malnutrition and deficiencies

Whitney and Rolfes (1999:633) make the following statement about malnutrition: "*Although we usually associate world hunger with famine, the numbers affected by famine are relatively small compared with those suffering from chronic hunger and malnutrition*." In 2010, it was estimated that globally 925 million people were undernourished, with 239 million of these residing in Sub-Saharan Africa (FAO, 2010). The growing incidence of malnutrition indicates a gap between dietary recommendations and consumer behaviour. Targeted interventions are needed to close this gap (Kris-Etherton, 2004). Health and nutrition education can, therefore, play an important role in this respect (Brug, 2004). Malnutrition affects all members of a nation directly or indirectly, affecting children at various stages of their life cycles, and can result in mental retardation, growth failure and various other problems.

The NFCS (Labadarios, 2000:69) found that the level of maternal education was an important determinant for nutritional disorders, emphasizing the importance of education in communities. Mothers and caregivers should be educated to understand the importance of micronutrients in child growth (Maunder *et al,* 2001:8).

Vitamin A deficiencies

Vitamin A is found in two forms: ready-formed colourless vitamin A retinol, and carotene or provitamin A, which is an orange pigment (Adams, 2005). Carotene, found in foods such as tomatoes, spinach, sweet potato, papaya and mango is converted to retinol. ß -Carotene is the most important form of carotene, and in a mixed diet, one microgram (µg) of retinol is equivalent to six µg of ß-carotene or 12 µg of other provitamin A carotenoids (West, Eilander & Van Lieshout, 2002:2921S). Retinol equivalents are measured in microgram and refer to the concentration of vitamin A in foods (West *et al,* 2002:2921S).

Vitamin A is required for various critical functions in the body (Wardlaw & Kessel, 2002:32). Functions that vitamin A performs include:

- Vision: formation of rhodopsin, essential for sight;
- Cellular growth and differentiation; and
- Immunity.

Retinoids are essential for cellular differentiation and morphogenesis, synthesis of glycoproteins, gene expression, immunity, growth and the prevention of anaemia, cancer and heart disease (Van Lieshout & West, 2004:12). Vitamin A deficiency disorders include xerophthalmia and increased risk of infectious diseases, both of which increases the risk of mortality. Xerophthalmia is also a leading cause of preventable blindness (Sherwin, Reacher, Dean & Ngondi, 2012:206). Van Lieshout and West (2004:13) state that it is now recognized that vitamin A deficiency is a widespread problem, affecting 750 million people worldwide, almost all of whom are in developing countries. The NFCS (Labadarios, 2000:74) indicated that one in three children had a marginal vitamin A status, with a dietary intake of vitamin A below 67% of the RDA (<20µg/dL). The prevalence of vitamin A deficiency was also highest in non-urban areas in children with poorly educated mothers. In South Africa, it was found that only children in the urban areas of the Western Cape consumed the recommended intake of vitamin A and the remaining children had intakes equal to approximately half of the recommended amounts. In the NFCS conducted in 2005, it was found that two out of three children and one out of four women had a poor vitamin A status (Labadarios *et al*., 2008: 261). The estimated daily vitamin A requirements (in µg RE) for various age groups and genders are presented in Table 2.1.

TABLE 2.1: REQUIREMENTS FOR VITAMIN A (µg RETINOL EQUIVALENTS (RE)) PER DAY (Van Lieshout & West, 2004:3)

Group	Age (yr)	Basal requirement (mean, including variability)	Normative storage requirement (mean)	Safe level of intake
Both sexes	0-1 2-6 7-10 11-12 13-15	180 200 250 300 350		350 400 400 500 600
Boys	16-18	400		600
Girls	16-18	330		500
Men	19+	300	434	600
Women: **Non-pregnant/Lactating** **Pregnant** **Lactating**	19+	 270 370 450		 500 600 850

In developing countries, most of the vitamin A rich foods that are consumed are of plant origin. Vitamin A from plant sources is less easily absorbed and less bio-available to the human body than that of animal protein. Moreover, vitamin A from plant sources is usually found in large amounts in only a few fruits and vegetables, many of which are highly seasonal (Ruel, 2001:xiii). In countries where vitamin A deficiency is a problem, agricultural policies should be developed to increase production, processing, marketing and consumption of vitamin A rich foods. Adoption of desirable dietary patterns can be used as a basis for the formulation of agriculture policies and programmes for promoting the increased production and consumption of micronutrient-rich foods (Tontisirin, Nantel & Bhattacharjeef, 2002:247).

Further attention should be given to production of micronutrient-rich vegetable crops in household vegetable gardens and fruit orchards, as well as in school and community gardens, and commercial farming (FAO, 1997:196).

Improving vitamin A deficiency through community-based agriculture

According to Ruel (2001:xiii) it is a popular approach to increase the availability of foods rich in vitamin A by involving communities in agriculture and encouraging households to tend home gardens. Lyson (2004:63) states that enterprises that support civic agriculture can be seen as part of the 'problem solving capacity' of a community.

Home-processing techniques can be used to ensure the retention of carotenoids during food preparation, cooking and preserving. Home preservation techniques can be applied to maintain a constant source of vitamin A. An increase in knowledge and awareness about

vitamin A through nutrition education in communities have resulted in an increased intake of locally consumed vitamin A rich local crops and improvements in knowledge, attitudes and practices with respect to vitamin A, with no change observed in control groups where no educational support took place (Ruel, 2001:19).

2.2.4 Agriculture and nutrition

Nutritional well-being at the household level depends on the sustainability of agricultural productivity and on the concurrent sustainability of access of all household members to sufficient food of adequate quantity, quality and safety to meet their nutritional requirements (FAO, 1997:59). According to King and Burgess (1993) nutrition has been defined as being concerned with "... how food is produced, processed, handled, sold, prepared, shared, and eaten and what happens to food in the body - how it is digested, absorbed, and used".

Many food security interventions focus on the adoption of an agricultural strategy and promoting food production, but neglect the role of nutrition education (Brun, Reynaud & Chevassess-Agnes, 1989; Ensing & Sangers, 1986). Most agricultural projects do not monitor the link between agriculture and its subsequent nutritional impact (Bonnard, 1999:1). It is important to design agricultural interventions and projects to not only alleviate the short-term problem of food shortages, but to also alleviate nutrition problems in the country or region in the long run. It is imperative that the agricultural component of the intervention be integrated with a comprehensive nutrition education and behaviour change component, as the two components work synergistically to increase household consumption of micronutrient-rich foods (Faber, Witten & Drimie, 2011:28).

An agriculturally-based nutrition intervention programme should have a well-designed agricultural component (Bonnard, 1999:9). Agricultural interventions increase the potential for improved nutrition, while education ensures that malnutrition is improved in the long term. Ruel (2001:10) state that only a few studies have investigated the effects of home gardening promotion programmes on household food production.

De Klerk, Drimie, Aliber, Mini, Mokoena, Randela, Modiselle, Vogel, de Swardt and Kirsten (2004) found that domestic food gardens appear attractive in principle to alleviate poverty, as they do not create dependency, the amount of food delivered will not depend on the funds available, and food gardens should improve the flow and composition of nutritional intake. Findings of the NFCS (Labadarios, 2000:74) indicate that 33% of South African households produced crops, and the type of crop most frequently grown was green vegetables (40%), followed by maize/corn (26%) and herbs (16%).

The South African Department of Agriculture (Webb, 2000:63) states that empowering citizens to make optimal choices for nutritious and safe foods is one of the key food security challenges in the country. A strategic objective through which this can be achieved is to increase household food production and trading. While the complexity and underlying determinants of under-nutrition have been well-understood for decades, the scaling of food and nutrition system approaches that combine sustainable agriculture aimed, at improved diet diversity and livelihoods have been limited in their development and implementation (Burchi, Fanzo & Frison, 2011:358).

2.2.5 Home gardening

In many communities, people rely on one or two main staple crops (Oniang'o, Mutuku & Malaba, 2003:232). This means that there will be certain 'hungry' periods due to a shortage of that crop driven by seasonality, where people are forced to look for food elsewhere.

Home gardening can enhance food security in several ways, most importantly through creating direct access to a diversity of nutritionally-rich foods, increasing purchasing power from savings on food bills and income from sales of garden products, and acting as a fall-back for food provision during seasonal lean periods (Ekesa, 2002:15). Usually, home gardens are maintained by women, who often water and fertilize them from domestic wastes and use them to produce crops such as maize, herbs and vegetables needed to prepare relishes (FAO, 1997:114). Although these gardens are sometimes seen as labour intensive, they are usually close to the house, and children often help in maintaining these gardens - for instance by carrying water and weeding.

There are various forms of home gardening suited to family needs and lifestyles, such as urban dwellers growing maize in a garden, to traders planting for re-sale, and families planting for consumption. Some of these activities are often seen as 'haphazard' (FAO, 1997:114), but in the end contribute to a country's food production and availability.

Unfortunately, those who plant for the well-being of their own family, often lack knowledge and skills to make the home garden grow and produce, as well as how to utilize the products to their fullest potential (utilization). Knowledge, such as planting the right type of plant at the right time with proper spacing has significant impacts on garden yields. Because most home gardens are on small plots of land, the importance of cultivation to obtain meaningful yields to assist in reducing food insecurity is magnified (Hallberg, 2009:28).

Home gardens and nutrition

Traditional home gardens continue to be important sources of micronutrients for rural communities (Van Lieshout & West, 2004:36), and, therefore, offer exceptional opportunities for food-based approaches to prevent micronutrient malnutrition (Ijinu, Anish, Shiju, George & Pushpangadan, 2011:413-414). Three-quarters of the world's poorest people obtain their food and income from farming small plots of land (Gates Foundation, 2011:1). Poor people often obtain most of their nutrients from food plants, which are more affordable and more accessible than animal foods. In many countries, green leafy plants often grow wild and spontaneously, and are often used to supplement the diet (Odhav, Beekrum, Ajula & Baijnath, 2007:431). African leafy vegetables grow in soils of limited fertility, are relatively drought tolerant, provide good ground cover, and can be harvested within a short period of time (Shiundu, 2002). The leaves of these plants tend to be good sources of various nutrients. For example, a study conducted in 2006 found that Amaranthus, Black Jack and Water Navel (all commonly consumed wild leaves found in South Africa) were valuable sources of iron and zinc, as well as vitamins A, C and E (Modi, Modi & Hendriks, 2006:9). Communities can select a range of fruit and vegetable crops to be cultivated throughout the year, and can introduce succession planting, intercropping and double-cropping to provide a constant supply of micronutrients (Cooperative Extension, 2004:1).

Home gardening as a development strategy

Many of the currently running home-based gardening projects in South Africa are assisted and funded by non-governmental organizations (NGOs) and also focus on the income generating benefits of such practices. Home gardens despite their potential, have however been mostly ignored, and, therefore, few communities are properly educated in gardening techniques to improve diets and nutritional practices. Home gardens are often viewed as not significant in terms of national economic development. Their full potential is not understood, as little consideration is given to their social, nutritional or financial value in relation to rural livelihoods. The production and economic value of these resources are not included in indices of regional and national economic production, thereby underestimating the Gross Domestic Product (GDP) from rural areas (High & Shackleton, 2000:142). As a result, economic efforts are focussed elsewhere, resulting in the ultimate snowball effect that culminates in malnutrition.

According to Wilkinson (2010), the South African government has made a commitment to achieve eight Millennium Development Goals by 2015 and arguably the chief determinant

among these is food security. He states that ultimately, human development is dependent on human health, which again depends on nutrition. However, most of the funding in South Africa in terms of what is allocated as Corporate Social Investment is channeled towards education, health, human immunodeficiency virus (HIV) management and social and community development. Food security is only listed after Enterprise Development and Environmental initiatives, seventh on this list, despite the fact that Millennium Development Goal 1 focusses on food security.

However, as more evidence regarding the social, economic and nutritional benefits of home gardening becomes available, some governments and the private sector are showing renewed interest in gardening activities. Case-studies from neighbouring countries provide strong evidence that home gardening has significant economic benefits and that it can be a viable strategy for increasing food supplies for family consumption (Marsh, 1998:14). The potential economic benefits of home gardening are numerous, e.g.:

- The returns are often higher than those from traditional field agriculture;
- Gardening provides dual benefits of food provision and income generation;
- Gardens provide fodder for household animals and supplies for other household needs;
- Household processing of garden fruits and vegetables (preservation such as drying, canning, etc.) increases their market value and ensures year-round supply;
- Low-input, low-cost gardening has few “barriers to entry”; and
- Marketing of garden produce and animals is often the only source of independent income for women (Marsh, 1998:10).

Data from a Food and Agriculture Organisation (FAO) supported project in the Niger Delta promoting the production and consumption of vitamin A rich foods among women's groups and their families, showed that the proportion of healthy children increased in the project areas, when compared to the non-project villages (FAO, 1997:261). The successful components of this project were: 1) a strong emphasis on nutrition education to promote underutilized indigenous foods such as leafy vegetables; 2) the cultivation of traditional wild sources of vitamin A; and 3) the use of food preservation and solar drying to alleviate the problem of seasonal shortages.

Evidence clearly suggests that home gardening results in tangible benefits for the household, such as food on the table, extra income and healthy children. Access to home-grown fruits and vegetables ensures a more balanced diet for rural families with limited purchasing power and increases their self-reliance (Adedeji & Olarewaju, 2010:175). In communities where specific nutritional deficiencies persist or where there appear to be unexploited possibilities

for income generation, households can improve the diversity and productivity of their traditional gardens which will diversify their diets and increase overall nutritional consumption (Earl, 2011:22). Home gardening can also be a potentially important element in urban food security strategies (Krüger, 1998:128).

For home garden projects to be successful and sustainable, the following important elements need to be considered (FAO, 1997:120):

- Home gardening is a production system that forms part of a wider household economy. Thus, interventions to improve nutrition require a good understanding of local conditions so that project goals can be adapted locally. Therefore, it is necessary to work closely with local communities, to identify resource and other constraints and locally appropriate ways to promote home gardens that are sustainable.
- To ensure that availability of garden foods translates into nutritional benefits for the whole family, nutrition education and information about nutritional value and utilization of fruits and vegetables in the diet are essential (Faber, Laurie & Van Jaarsveld, 2008:6).
- Involving women in all aspects of garden management and nutrition training is crucial, as women do most of the work and are responsible for family food choices. Women, especially mothers, are the key target group for modifying food habits for the health of both themselves and their children (Sheikholeslam, Abdollahi & Haghighi, 2004:739).
- Regular monitoring of garden progress, although costly, could help to resolve problems and to provide information by quantifying gardening output and consumption as it increases.
- Results, if positive, could contribute towards inducing policy-makers and planners to direct more investment to the improvement of the home-gardening sector's output.
- Community organisations for gardening, preferably building on local farmers' and women's organisations, can also contribute to sustainability of gardens in the long-term.

2.2.6 A community-based approach: Educating women

Women in communities should be empowered with knowledge and information in relation to specific crops, technologies and practices (Bonnard, 1999:11), as well as the feasibility of preserving and processing local foods. Johnson-Welch (1999:7) makes the following statement: “Women make critical contributions to family nutrition. They produce food for home consumption and sale, they process and prepare food, and they care for themselves, their children and others”.

By educating women in communities, they can be entrusted with skills, knowledge and information to stimulate changes in the community's nutritional status. By strengthening the participation of women in agricultural interventions, as they are the primary caregivers in most rural communities, the potential for positive nutritional impacts can be enhanced. Bonnard (1999:10) confirms that interventions aimed at improving household food security should target women. A 'knowledge base' regarding programme design, agriculture and consumption linkages should be built up. The main objective of home gardening initiatives should be to improve the household food supply and dietary quality of the community (Ruel, 2001:10).

A community nutrition intervention programme will impart practical knowledge and a sustainable means of improving dietary intake and quality of life, while attempting to decrease or solve a nutrition problem by alleviating one or more significant causes of the problem (Terry, 1993:15). Wilkinson (2010) states that teaching the poor and malnourished how to cultivate their own nutritious food are both the most noble and the most cost effective food security interventions. Nutrition education messages must be tailored to the current consumption strategies and desired changes therein, including improved nutrient density, hygiene and feeding practices, and homegrown crops (Labadarios, 2000:73). Such a programme should be sensitive to available household appliances and cultural requirements and should be implemented through active participation (Terry, 1993:15). A community-based approach gives the educator the opportunity to interact with and understand the community.

In Kenya, new varieties of sweet potato rich in ß-carotene were introduced to women's groups. The control group participated in farm trials and received minimal agricultural support for the production of the new varieties of sweet potato, whereas the intervention group received nutrition education, lessons on food processing, and technical assistance. The intervention group experienced a statistically significant increase in the frequency of consumption of vitamin A rich foods, compared with a decrease in the control group (K'osambo, Carey, Misra & Hagenimana, 1999).

2.2.7 Community nutrition education

It is vital for nutrition education programmes to have at least the following three components in order to ensure effectiveness (FAO, 1997:276):

It should increase the nutrition knowledge and awareness of the community as well as the policy-makers (Contento, 2007:10). This can be achieved by providing information on:

- the relationship between diet and health;
- the relationship between nutritional and health status, individual productivity and national development;
- the nutritional needs of the population and of individuals;
- the importance of ensuring the quality and safety of the food supply;
- the causes and consequences of nutritional disorders; and
- the benefits of food labelling and legislation.

It has to promote desirable food behaviour and nutritional practices (National Food and Nutrition Council, 1995:6). This can be achieved by providing information on:

- the nutritional value of foods;
- the components of an adequate diet;
- making appropriate food choices and purchases from available resources;
- hygienic food preparation and handling of food;
- storage, processing and preservation of food; and
- equitable intra-household food distribution according to the nutritional needs of family members.

It should increase the diversity and quantity of family food supplies. This can be achieved by:

- providing information on methods of improving food production;
- crop selection and diversification;
- proper storage, preservation and processing;
- conservation of nutrients during food preparation; and
- the prevention of food waste.

Each of these components makes a special contribution to nutritional improvement. All three are important and need to form part of nutrition education and training programmes for personnel in agriculture, education and health in developing African countries. At community level, the people affected by nutritional problems should participate in determining which components should receive most emphasis to bring about lasting improvements in local food and nutrition conditions (FAO, 1997).

2.2.8 Community-based approach and participation

Experience has shown that reform processes are fostered by the participation of people in a participatory development process (Atinmo & Oyediran, 2005:52). The community-based approach to nutrition education emphasizes the importance of active community participation in making decisions and finding solutions for nutritional problems. The community-based approach addresses 1) the need for increased coverage, with 2) widespread training of community workers and members; 3) the importance of building on indigenous knowledge by incorporating community members as partners in programmes; and 4) the need for actions to transform the socio-economic conditions of the community (Cerqueira, 1992:4).

In a community-based approach the communication strategy involves face-to-face group interaction between the nutrition educators and the community members, yet learning is not restricted to the moment of delivery of the message (what to do); it also takes place in the context of many other activities focused on attaining a goal (Schall & Becker, s.a.). The involvement of the community members with nutrition educators in planning and carrying out these activities is an important part of the learning process.

Although community participation in nutrition activities and education programmes is considered vital to their success and sustainability, there are also recognized limitations to this participatory theory, as it changes the structure and relationships of power in decision-making about the use and control of resources (Cerqueira, 1992). This is often seen as threatening to established institutions and groups such as ministries of agriculture and health or village leaders. Changing from a top-down to a consultative style of leadership requires basic, continuous training and time. The goal of participation is to build a community's capacity to recognize its own problems and begin to solve them via implementing sustainable development strategies (Maiese, 2005); nevertheless, participation needs an initial stimulus and continued support, technical expertise and funding from outside sources. Generally, among experts in nutrition education, it is now recognized that changing food and nutrition behaviours in a sustainable manner is a long process requiring many steps by different sectors and at different levels to create agricultural, food security, nutrition and rural development programmes to eliminate the root causes of hunger and poverty (Guide for UNCTs, s.a.). The first step is to assist the poor to become aware of the socio-economic reality around them, and to alert them to what is keeping them in poverty, and the changes that they can bring about themselves (Fonchingong & Fonjong, 2003:204). Nutrition education needs to be comprehensive and coordinated for effectiveness (Child Nutrition Reathorization, 2009:1), to be participatory and to encourage ownership by the community (Ndure, Sy, Ntiru & Diene, 2009).

Households, in particular women and mothers, usually have the desire, and often also the knowledge, to improve the nutrition of their vulnerable members (Teklehaimanot & Haile, 2007:2). Success is impeded by a lack of resources, including the lack of a voice in relevant community decisions. Empowerment of the vulnerable is therefore needed in community nutrition actions. Empowerment can be fostered directly and indirectly. Direct forms involve the delegation of responsibility to individuals or teams for the execution and management of their tasks combined with the provision of knowledge and skills. Indirect forms of empowerment encompass participation in decision making bodies such as community-based nutrition programmes (Wall, 2002:2).

2.2.9 The importance of local inputs in developing the message

Messages addressing problems that are not perceived as problems by the community will not make much impact, even if the nutrition worker knows that these problems exist. The different perceptions may result from lack of information in the community or from widely held cultural beliefs. People's perceptions are important for their participation in any health programme as community members actively participate in programmes which they perceive as common in their community (Shah, Lohar, Shaikh, Usman & Usman, 2010:564).

For example, a condition of tiredness and dizziness during pregnancy may be so common as to be considered normal, although it may be attributable to low food intake, iron in particular, and anaemia. Similarly, traditional customs regarding the order of serving food or the best foods for weaning-age children may be so well established that the possibility of any ill-effects arising from the practices will never be considered. In these circumstances, before change can be expected, it will be necessary to explain convincingly the reasons why change is needed. Ledford, Eckert and Sleeman (2002:69) state that the constructs that evolve from the beliefs of many people can create an attitude of ridicule towards a concept, and at the same time – the concept is often surrounded by mystery.

Pre-testing is an important stage in the development of educational material (Wurzbach, 2002:509), as pictures may cause offence or may be misinterpreted, and technical words such as "vitamin A" and "nutrient" may not be familiar to viewers/participants. The pre-testing of messages focusses on five characteristics:

- attention (does the message have stopping power to ensure people are interested to listen to it, and change their behaviour as a result?);
- comprehension (is it clearly understood?);
- relevance (is the message of concern to the audience?);

- credibility (is the message and the source believable?);
- acceptability (is the message free from offensive references?) (FAO, 1997).

Family trials are useful for pre-testing messages concerned with practical activities (Palmeri, Auld, Taylor, Kendall & Anderson, 1998:41), such as the best way to prepare a boiled cereal food for weaning. Such trials will help to determine the best ingredients and methods in terms of family income, the mother's work pattern, family eating habits, the type of utensils and cooking facilities available and the infant's taste preferences. For the purpose of this study, the community will be observed as they utilize a crop from their gardens, and interventions will then be designed, trialed and discussed with experienced agricultural extension officers who are active in the communities and understand habits and practices as well as restrictions and limitations.

2.2.10 The role of women in home gardening

The role of women in home and community gardens is of special importance (Shirley, 1995:23). In addition to being responsible for producing crops on small plots of land, women, especially those who are elderly, often have good knowledge of indigenous species of green leafy vegetables; they know how to prepare them and how to preserve both seeds and produce. In a study by Kemei, Wataaru and Seme (s.a.) elders and women in the community were the main sources of indigenous knowledge on the crops and other species that are used for food.

Extension services unfortunately tend to focus mainly on major field crops (Swanson, 2008:xi). Improved planting materials, better cultivars and advice on cultural practices are rarely offered to cultivators of home gardens (FAO, 1997). Women do the bulk of the work, and often tend to various different plants in the environment in the form of home gardens (Aquilar-Sta, Moe & Camargo-Ricalde, 2008:68). Women are more conscious of, and concerned with, the nutritional needs of their family (Moreno-Black, Somnasang & Thamthawan, 1996:5) and thus extension advice, credit, and agricultural inputs should be provided to them for maximum benefits. The organization of women's groups should be promoted to facilitate their access to inputs, to improve the efficiency of their work and thus to improve the diversity and productivity of gardens.

2.2.11 Planning a community nutrition education programme

As in all programmes, proper planning is crucial for the success of a nutrition education programme. Nutrition education is effective only when it is based on adequate analysis of the nutritional problems (Cerqueira, 1992), and a clear and concise definition of the objectives and the methods of communications have been identified.

The social communication approach to nutrition education promoted by FAO combines elements of social marketing and community-based approaches (Contento, 2007:21). It emphasizes community participation in programme planning and implementation and recommends the use of multimedia strategies, i.e. several channels of communication, to influence undesirable behaviour strategies related to nutrition. A scheme has been developed which divides programme planning into four phases, including problem identification, formulation, implementation and evaluation (Figure 2.1) (FAO, 1997:283). The scheme and approach were incorporated into this study as a community-based intervention.

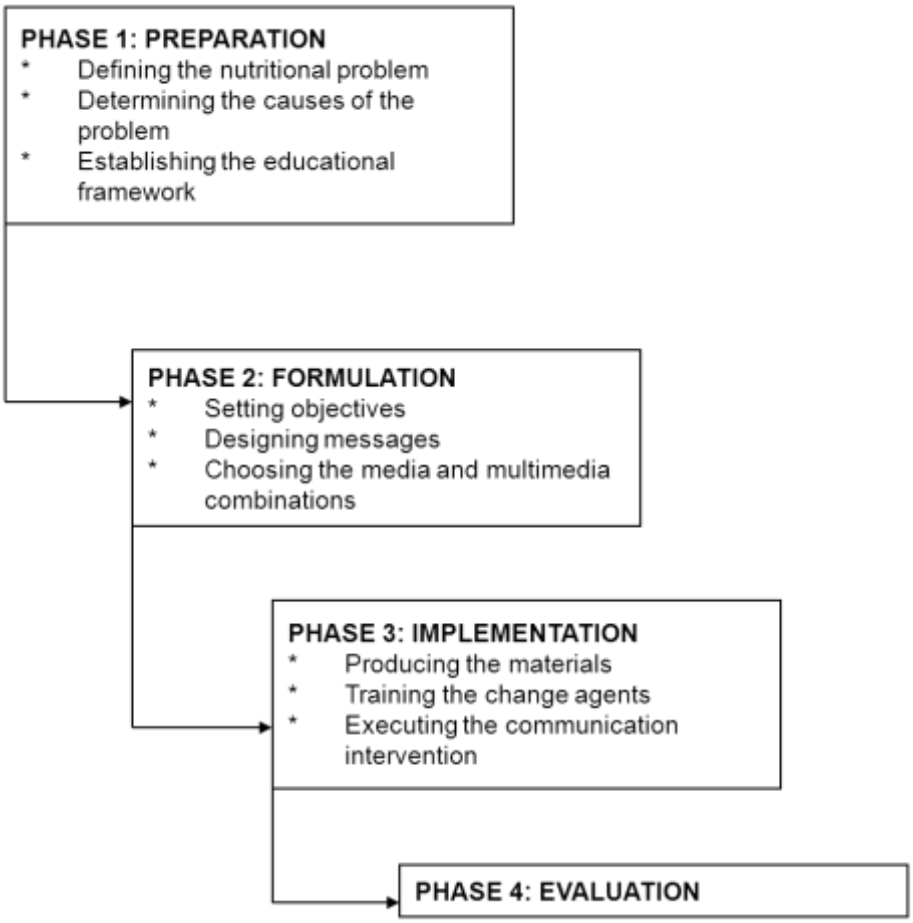

FIGURE 2.1: A SCHEME FOR PLANNING NUTRITION EDUCATION PROGRAMMES (FAO, 1997:283)

Problem identification

Planning and developing a nutrition education programme should begin with the systematic analysis of nutrition and health-related problems (Mahan, Escott-Stump & Krause, 2004:71). The use of focus groups within a community (e.g. rural women of child-bearing age, health workers or male subsistence farmers) can be particularly effective in such an analysis (Kaufman, 1990:49).

Among the factors influencing a course of action, a distinction has to be made between those that can be addressed by the people concerned and those that are out of their control. The best way to design programmes to achieve positive changes in health behaviour is to have an understanding of why people behave as they do and what might motivate them to change (Breslow, 2002). This understanding can be acquired through audience analysis using in-depth, individual or focus group interviews which aim to elicit the factors that motivate people to behave in certain ways (FAO, 1997:285).

Formulation and implementation of the nutritional strategy

Once the factors and behaviour patterns on which action needs to be taken have been identified and discussed with the community, the next step is to formulate an action plan and a communication strategy. To plan a strategy, it is necessary to define clear objectives. The nutrition education team determines the goals and objectives of a communication campaign, which should be defined for each group of beneficiaries. During this stage messages are designed, materials are field-tested, and the media are selected. A multimedia plan is formulated in which all communication activities are integrated (FAO, 1997:286).

The implementation phase begins with the production of the support materials. In addition, field staff or "change agents" (e.g. health and agricultural extension workers and teachers) need to be trained to ensure that all persons involved in the various communication activities carry out their roles excellently. Change agents serve as a liaison between the person or group that will change and the person or group promoting the change, allowing information to flow back and forth between the parties (Windahl, Signitzer, Olson & Haynes, 2008:270). They must be very familiar with the communication activities to be able to communicate messages effectively. Since a single medium cannot by itself significantly alter nutrition-related habits (Konate, 2012:2), nutrition education normally entails the use of multiple delivery media, which calls for training of all involved and effective coordination. Face-to-face personalized contact is considered the optimal medium for providing nutrition education (WIC

works resource system, 2006:5). Once the materials and training have been established and ensured, communication with the people can begin.

There are many guidelines to ensure a message is well designed. Marsh (1979:312) broadly states that it should be designed to meet the requirements of the source, take into consideration constraints and variables, and be adapted to the medium of translation.

Evaluation of nutrition education programmes

Despite their importance, there is evidence that evaluations of training programmes are often inconsistent or missing (Carnevale & Schulz, 1990; Holcomb, 1993; Kin & Mathuvay 2011; McMahon & Carter, 1990.). Possible explanations for inadequate evaluations include: insufficient budget allocated; insufficient time allocated; lack of expertise; blind trust in training solutions; or lack of methods and tools (McEvoy & Buller, 1990). The evaluation should be conducted with the participation of the beneficiary population and the field workers or change agents, as the actions to be evaluated concern them directly and the evaluation may help them improve their performance (Cousins & Earl, 1995:9). Government representatives should also participate so that they can see the impact of the activities they have promoted and consider further expansion of the programme.

A main weakness in the evaluation of nutrition education programmes is that quantitative changes are often not assessed (Shike, 2005:1680). Well-defined programme objectives, however, allow a measurement of success. To provide guidance for expanding or continuing a programme, it is also important to examine why changes did, or did not occur, and which aspects of the communication and activities were most effective in promoting change. If the attitudes of a significant number of mothers did not change, the evaluation must determine whether the mothers understood the message as intended and whether they encountered difficulties in finding, growing, preparing, cooking or serving the vegetables.

It is necessary to define the degree of behaviour change that is considered successful (Kanfer & Goldstein, 1991:112). If the programme objective was to increase the number of mothers feeding their children vegetables daily, then feedings taking place only once or twice a week indicate a failure. Regardless of the results, however, the outcomes of the evaluation must be made known to the proposed beneficiaries and discussed with them so as to help improve and reinforce newly adopted behaviour.

2.2.12 Beneficiaries of a nutrition education programme

The beneficiary population for a nutrition education intervention is normally made up of several groups as women, households, and communities are empowered through economic and social development (Iannotti, Cunningham & Ruel, 2009:25). The vulnerable group may not be among the groups to whom the messages are directed (Contento, 2007:398). For example, a group at risk of vitamin A deficiency may be weaning age children. In this case, the educational intervention will be directed at all those involved in or interacting with those involved in the care and feeding of weaning-age children, such as mothers, grandmothers, adolescents and the rest of the family.

The primary group is composed of people whose behaviour is to be modified; and the secondary group comprises people who act as intermediaries (Contento, 2007:150), i.e. those who will deliver the message to the first group, such as health workers, nutritionists, horticulturists, agricultural extension officers, teachers, broadcasters and journalists. The composition of the secondary group depends on the type of communication network that will be used. The tertiary group is made up of people who can help to make the programme a success through their influence and authority. These may include community leaders, financial donors and politicians, together with members of the extended family of the at-risk child.

2.2.13 Sustainability of community-based interventions

Nutritional well-being is also dependent on a sustainable food supply (Williams & Schlenker, 2003:4). According to the FAO (1997:58) there are four requirements of a sustainable food impact system to ensure long-term stability of the household food supply and the ability of households to meet consumption and nourishment needs on a continuous basis.

Firstly, a sustainable food production system is required, and communities should be assisted to manage resources with as little impact on the environment as possible. Secondly, food production should be sustainable in the long-term and should not impact on the productive capacity of the household and its members. A third requirement is that food be procured through self-reliance and not dependency. The family should be able to procure foods through their own efforts and resources, as dependence is not sustainable in the long term. The fourth and last requirement is that all efforts to achieve food security must be placed in the context of a wider overall framework of basic household needs in which resources are limited and there is competition for needs and priorities.

2.3 COMBATING VITAMIN A DEFICIENCY AND THE LACK OF DIETARY DIVERSITY THROUGH THE CONSUMPTION OF ORANGE-FLESHED SWEET POTATO

Van Lieshout and West (2004:21) indicated that a food-based approach is one of the methods that can be applied to identify and control vitamin A deficiency (VAD). A trial in Kenya, conducted by Johnson-Welch (1999:1) showed a significant impact on vitamin A deficiencies through the production and consumption of OFSP by local communities (Low, Arimond, Osman, Cunguara, Zano & Tschirley, 2007). Bonnard (1999:11) states that more attention should be given to crops that can be vegetatively propagated, such as cassava, potato, sweet potato, etc. These crops are easy to grow and distribute.

The ARC Roodeplaat Vegetable and Ornamental Plant Institute, has been conducting extensive research on sweet potato varieties, and had, since the start of the programme up to end 2004, released 22 new cultivars (Niederwieser, 2004:65). In South Africa, white-fleshed sweet potato is widely consumed, but OFSP is not well-known, as was also found by Van Jaarsveld, Faber, Tanumihardjo, Nestel, Lombard and Benade (2005:1081). Roodeplaat is focussing on breeding varieties that can improve vitamin A deficiencies experienced on a national level by ensuring high ß -carotene yields in addition to natural adaptability. Not only are OFSP a nutritionally valuable source of various nutrients such as vitamin A, vitamin B6, biotin, thiamin and vitamin C (refer to Table 2.2), but they are sweet varieties that are widely accepted because of the pleasant taste.

TABLE 2.2: MACRONUTRIENT AND MICRONUTRIENT CONTENT OF VEGETABLES HIGH IN VITAMIN A (PER100g EDIBLE FOOD) (Wolmarans, 2010)

	Units of measurement	Butternut		Carrots		Sweet potato		Spinach	
		Raw	Boiled	Raw (flesh and skin)	Boiled (flesh and skin)	Raw white- fleshed	Baked orange-fleshed with skin (flesh only)	Raw (Swiss Chard)	Boiled (Swiss Chard)
Macronutrients									
Moisture	g	85.2	85.5	89.2	89.7	80.4	72.9	89.9	91.7
Energy	kJ	243	235	170	162	323	446	130	134
Total fat	g	0.1	0.1	0.0	0.1	0.1	0.1	0.2	0.3
Available Carbohydrate	g	10.8	10.2	6.4	5.3	15.6	21.3	1.6	2.0
Total Nitrogen	g	0.26	0.24	0.14	0.14	0.18	0.27	0.43	0.43
Saturated Fatty Acids	g	0.02	0.02	Trace	0.02	0.02	0.02	0.03	0.05
Total dietary fibre	g	1.7	1.9	2.7	3.1	2.1	3.0	2.9	2.5
Protein	g	1.6	1.5	0.9	0.9	1.1	1.7	2.7	2.7
Monounsatured fatty acids	g	0.01	0.01	Trace	Trace	Trace	Trace	0.04	0.06
Plant Protein	g	1.6	1.5	0.9	0.9	1.1	1.7	2.7	2.7
Polyunsatured fatty acids	g	0.04	0.04	Trace	0.05	0.04	0.05	0.07	0.11
Ash	g	1.0	0.9	0.8	0.5	0.8	1.1	2.0	1.2
Minerals									
Calcium (C)	mg	13	16	24	31	12	28	117	109
Phosporus (P)	mg	44	43	23	29	34	55	50	36
Zinc (Zn)	mg	0.31	0.29	0.35	0.39	0.18	0.29	0.73	0.52
Iron (Fe)	mg	0.4	0.3	0.6	0.6	0.3	0.5	4.4	2.3
Potassium (K)	mg	344	274	242	156	285	348	348	177
Copper (Cu)	mg	0.09	0.10	0.02	0.03	0.11	0.21	0.17	0.1
Magnesium (Mg)	mg	20	18	10	11	13	20	78	56
Sodium (Na)	mg	2	2	24	29	12	10	892	143
Manganese (Mn)	µg	100	70	110	150	100	560	1680	1190
Vitamins									
Vitamin A	µgRE	128	332	3250	2880	3	2182	468	342
Vitamin B6	mg	0.110	0.090	0.060	0.050	0.080	0.241	0.080	0.040
Biotin	µg	7.6	6.3	2.4	4.6	5.2	6.6	5.7	3.9
Thiamin	mg	0.07	0.05	0.03	0.03	0.07	0.07	0.03	0.02
Folate	µg	23	8	10	6	8	23	52	22
Vitamin C	mg	12	4	4	4	22	25	24	6
Riboflavin	mg	0.02	0.02	0.12	0.02	0.01	0.13	0.10	0.07
Niacin	mg	1.6	1.4	0.6	0.4	0.6	0.6	0.6	0.4
Panthotenic acid	mg	0.33	0.26	0.07	0.15	0.35	0.65	0.25	0.11
Vitamin E	mg	0.17	1.35	0.39	0.42	0.14	0.28	0.3	0.99

Roots and tubers can serve as a valuable asset to promote household food security in times of unfavourable conditions. K'Osambo *et al.* (1998:673) wrote that sweet potato has been receiving a lot of attention as a part of the development of a sustainable food system, as it is a drought tolerant product, and can grow in soil with limited fertility. Van Oirschot (2002:673) continues by saying that sweet potato is one of the most efficient food crops in terms of energy value per land area. Sweet potatoes also grow in a much shorter period than other root crops and show less seasonality than other crops (Oke, 1990:5).

The leaves of the sweet potato plant are also commonly consumed in many countries (Chen, Wang, Ribaya-Mercaod, Khan & Blumberg, 2006:A573; Chen, Lin, Chen, Hsu, Shieh & Liu, 2008:409), and contain minerals such as iron and calcium (Abubakar, Olayiwola, Sani & Idowu, 2010:413), and are a good source of vitamins A, C, B2 (riboflavin) and lutein (Meludu, 2010:89).

The nutritional content of sweet potato leaves is presented in Table 2.3. The leaves are also a source of various nutrients and consumption together with the sweet potato should, therefore, be encouraged.

TABLE 2.3: NUTRITIONAL CONTENT OF SWEET POTATO LEAVES (PER 100g EDIBLE FOOD) (Wolmarans, 2010)

	Units of measurement	Sweet Potato Leaves	
		Raw	Steamed
Macronutrients			
Moisture	g	88.0	88.7
Energy	kJ	188	174
Total fat	g	0.3	0.3
Available Carbohydrate	g	4.4	5.4
Total Nitrogen	g	0.64	0.37
Saturated Fatty Acids	g	0.07	0.07
Total dietary fibre	g	2.0	1.9
Protein	g	4.0	2.3
Monounsatured fatty acids	g	0.01	0.01
Plant Protein	g	4.0	2.3
Polyunsatured fatty acids	g	0.13	0.13
Ash	g	1.4	1.4
Minerals			
Calcium (C)	mg	37	24
Phosporus (P)	mg	94	60
Zinc (Zn)	mg	0.29	0.26
Iron (Fe)	mg	1.0	0.6
Potassium (K)	mg	518	477
Copper (Cu)	mg	0.04	0.03
Magnesium (Mg)	mg	61	61
Sodium (Na)	mg	9	13
Manganese (Mn)	µg	256	229
Vitamins			
Vitamin A	µgRE	103	92
Vitamin B6	mg	0.190	0.160
Biotin	µg	0.1	0.1
Thiamin	mg	0.16	0.11
Folate	µg	80	124
Vitamin C	mg	11	2
Riboflavin	mg	0.35	0.27
Niacin	mg	1.1	1.0
Panthotenic acid	mg	0.23	0.20
Vitamin E	mg	0.96	0.96

2.4 INTRODUCING A NEW CROP INTO A COMMUNITY

One of the interventions that could improve the productivity of farming systems, with potential to improve farming incomes, is the introduction of new crops for which market demand can be developed (FAO, 1997:108). Provided the new crops are compatible with ecological conditions and constraints, crops already grown and utilized in farming systems elsewhere within and outside the African continent could be considered.

A good example of a food-based intervention is the introduction of the soybean into African smallholder agricultural production (Faber *et al,* 2011; Sadler, 2004). A survey in the late 1980s revealed that resistance to consumption was due to a lack of information and education with regards to processing and cooking methods. Techniques were developed and implemented to enable the communities to integrate the product into their diets in the form of flour. Despite soybean being seen as a poor man's protein, it has great contributions to make to dietary diversity as it provides protein and fat, and its nutritional composition compares favourably with other legumes.

In the case of the soybean products, their adoption was dependent on ease of preparation and cost, but the whole food supply system needs to be evaluated from cultivation and production to the actual consumption and disposal to ensure overall consumer acceptability. Consumers must also be trained to understand the health benefits of the product to combat malnutrition, and must learn how to incorporate the crops into their local dishes and how to cultivate the crop at home.

The following criteria were applied to the selection of the soybean for the study conducted by Sadler *et al.* (2004), and can be re-applied to the selection of OFSP for the local community in question:

- The crop can be incorporated into and can support current farming systems. It is sustainable. OFSP can be cultivated in current food gardens alongside other crops. It is a hardy crop that will be able to grow in the soil on the farm, and it also does not require additional human input above what is needed to cultivate crops such as spinach.
- OFSP is a profitable crop amongst farmers and processors, and is accepted as a local food crop. OFSP cultivation only requires once-off purchase of stems or seeds if these are not made available by agricultural extension officers. Thereafter stems can be used for replanting. The product can also be incorporated into various dishes

and prepared in various ways for the purpose of selling if the community decides to do so. To ensure that OFSP is accepted as a local crop the focus will be on the nutrition education and diversity of usage opportunities.

- OFSP yields high nutrient value per unit of land when compared to other crops. It is cost-effective to promote the cultivation and growth of this crop. On average, sweet potato yield more in tonnes than maize which is widely cultivated in South Africa (FAO, 1997:73).
- OFSP can be used to fortify and supplement the diet of rural communities. The OFSP crop can be incorporated into current diets and does not require a great change in behaviour or dietary patterns. It can be prepared in many different ways based on usage needs of the community.
- OFSP has good nutritional attributes, which makes it cost effective in combating malnutrition. OFSP is high in various nutrients, specifically vitamin A.

The case of soybean underlines the need to create awareness within the consumer sector before introducing unfamiliar food or cash crops to small-scale farmers, to realize the full nutritional benefits of the new foodstuff at the household level (FAO, 1997:109).

The next chapter describes the research design and methodology based on the findings of the literature review.

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CHAPTER 3
RESEARCH METHODOLOGY

3.1 INTRODUCTION

From the previous chapter, it is evident that food security is directly linked to dietary diversity and nutritional status as a result of current usage habits and practices associated with foodstuffs. Knowledge about these current consumption patterns and practices of the community will serve three purposes:

1) Ensuring that it is kept in mind which tools and equipment these women have at their disposal in order to prepare foods.
2) Identifying practical improvement areas to ensure that the newly introduced crop will be optimally utilized.
3) Identifying current belief systems that require education regarding food preparation, cooking and serving.

The manner in which this study was conducted, is described below in terms of the following:

- Research objective, problem and parameters;
- Theoretical background conceptualization;
- Choice of research design;
- Choice of sample;
- Operationalisation;
- Choice and description of data collection;
- Validity.

3.2 RESEARCH OBJECTIVE, PROBLEMS AND PARAMETERS

Fisher and Foreit (2002:25) point out that for every research study, the problem situation should be stated, the parameters identified to ensure clarity on what will be researched, the importance of the problem should be justified, and it must be clarified how measurement will take place. Therefore, in the present study, an overall objective was selected from the problem statement from which problems and sub-problems were identified individually.

3.2.1 Research objective

The objective was to design, implement and assess a food-based strategy that could be applied to the introduction of an orange-fleshed sweet potato unfamiliar to the community studied in order to improve their food security. (This strategy will be generic and will be provided to agricultural extension officers to adapt and implement within the communities which they serve in a train-the-trainer approach).

3.2.2 Research problem

Can the food utilization strategies of a known food crop be used to establish efficient utilization of a new, unfamiliar crop in a farm worker community?

3.2.3 Sub-problems

a) *How do the food utilization strategies contribute to optimal food utilization of a known food crop in farm worker households on Orange Farm in the Free State Province?*

How does a farming community in the Free State Province (as applicable):

- acquire
- cultivate
- harvest
- store
- prepare
- cook
- consume
- preserve
- dispose of cooked unconsumed food or peels, stems, etc., after preparation of a known food crop?

b) *To formulate a strategy that may contribute to optimal utilization of an unfamiliar crop as a community-based approach using the information obtained about the known food crop.*

How can a farming community in the Free State Province (as applicable):

- acquire

- cultivate
- harvest
- store
- prepare
- cook
- consume
- preserve
- dispose of cooked unconsumed food or peels, stems, etc., after preparation of an unfamiliar food crop?

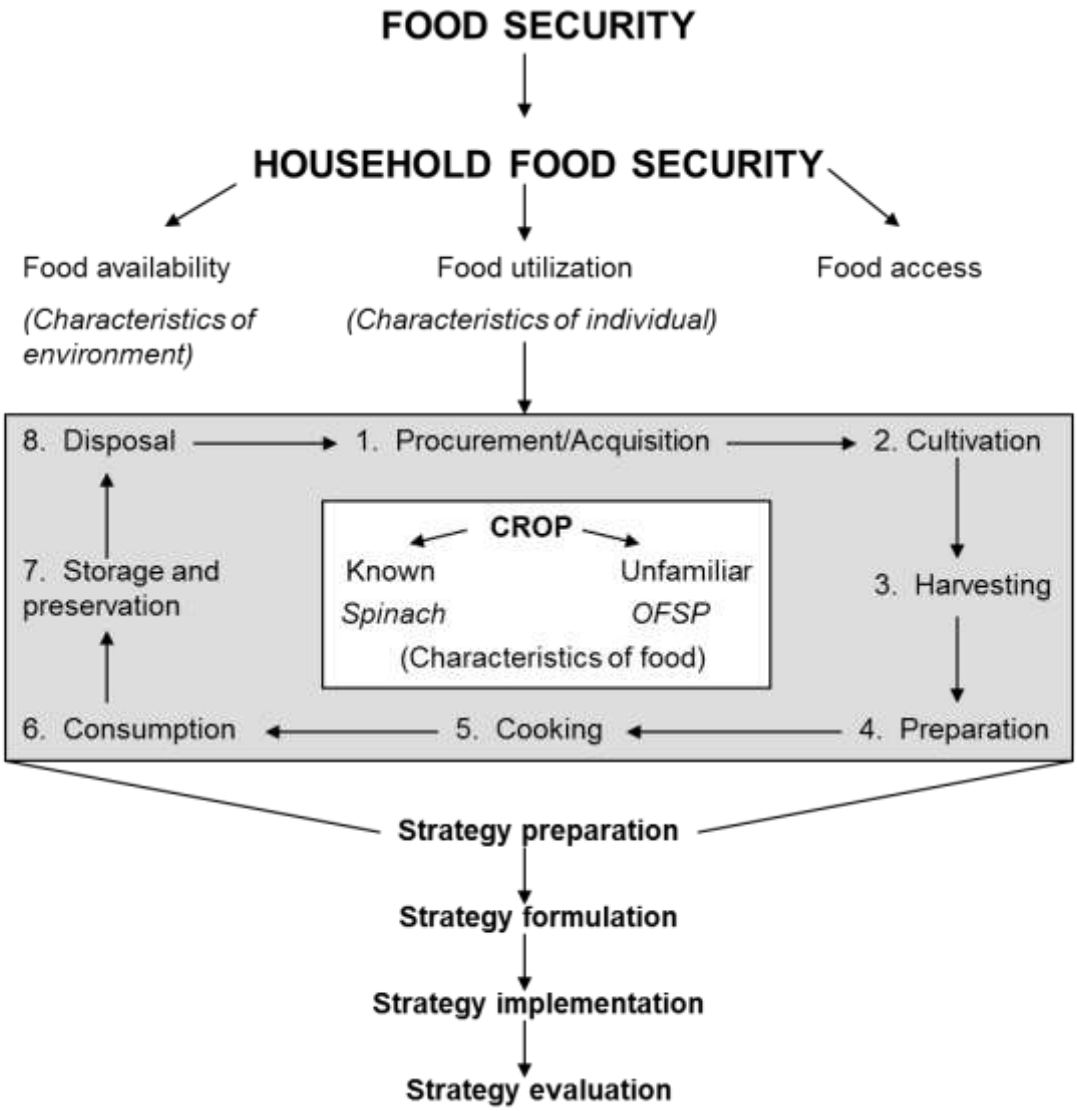
3.2.4 Research parameters/limitations

The following research parameters were formulated for this study:

- The study included all households that had adult female occupants from Orange Farm to gather data for strategy formulation.
- The study only included the women as primary caregivers, who were over the age of 24 years, and responsible for food preparation.
- The study focussed on all aspects of food (crop) utilization, from cultivation to disposal, and excluded components such as purchasing or food sharing.
- The study did not focus on the quality of the food or dishes prepared, but only the extent to and frequency with which a product was used or utilized.
- The implementation and assessment of the strategy was tested during a sharing session with agricultural extension officers to obtain their feedback – they will in turn implement the strategy in the respective communities these officers work in. This will also ensure that the strategy is applicable and sustainable.

3.3 THEORETICAL BACKGROUND CONCEPTUALIZATION

Figure 3.1 illustrates the conceptual framework designed for this research study based on the identified research problems. The conceptual framework shows the importance of the major concepts implicated in household food security, and highlights the fact that the process of food acquisition and usage forms part of the food utilization concept. The various steps required to optimally utilize a food product are depicted in the central part of the framework and the food products that will be utilized in the process of designing the strategy, are also shown.



***OFSP = orange-fleshed sweet potato**

FIGURE 3.1: CONCEPTUAL FRAMEWORK

3.3.1 Definitions of components of the conceptual framework and knowledge application (conceptualization)

Food utilization is when food is used for its intended purpose, proper food processing and storage techniques are employed, adequate knowledge of nutrition and child care techniques exist and are applied, and adequate health and sanitation services exist (Findiastuti, Singgih & Anityasari, 2012:227). Constraints to food utilization include: 1) nutrient losses associated with food preparation, 2) inadequate knowledge and practice of healthcare and sanitation techniques, including those related to nutrition and child care; and 3) cultural practices that limit consumption of a nutritionally adequate diet by certain groups or family members (USAID, 1992:3). Utilization of food encompasses both preparation and storage (Adenyiyi, Abdulrasheed, Bello & Mukaila, 2009:170). Differences in the quality of preparation or storage will yield different levels of food security given the same level of acquirement (USAID, 1992:4). For the purpose of this research study, food utilization refers to all activities and processes that take place between access to and consumption of spinach and OFSP. Optimal food utilization refers to any behavioural change observed in the community after implementation of the strategy.

Food procurement/acquisition refers to the method of obtaining food used by the household from all sources, and includes food grown, livestock reared, food donated and/or food purchased (Labadarios, 2000:12). For the purpose of this research study, food acquisition refers to the various sources from which spinach and OFSP are acquired for consumption.

Cultivation refers to raising or producing, preparing and using soil for crops or gardening (Readers Digest Oxford Complete Wordfinder, 1993). For the purpose of this research study, cultivation refers to any agricultural activities applied to produce spinach or OFSP.

Harvesting refers to the process of gathering in crops (Readers Digest Oxford Complete Wordfinder, 1993). For the purpose of this research study, harvesting refers to any activity used to remove spinach or OFSP from the site of cultivation.

Preparation includes all aspects of preliminary work, cooking and dishing up (Marshall 1995: 11). For the purpose of this research study, preparation refers to any activities that take place after harvesting and before cooking, including washing, peeling, soaking, grating, etc., of spinach or OFSP.

Cooking refers to the application of heat to food (Muir, 2003:1). For the purpose of this research study, cooking refers to the application of heat to spinach or OFSP, as well as the addition of other ingredients.

Consumption is the act or instance of eating or drinking (Readers Digest Oxford Complete Wordfinder, 1993). For the purpose of this research study, consumption refers to eating of spinach or OFSP.

Storage refers to the storing of goods (Readers Digest Oxford Complete Wordfinder, 1993). For the purpose of this research study, storage refers to the storing of spinach or OFSP.

Preservation refers to treating or refrigerating food to prevent decomposition or fermentation (Readers Digest Oxford Complete Wordfinder, 1993). For the purpose of this research study, preservation refers to the treatment of spinach or OFSP to prevent decomposition.

Disposal refers to the physical dispersal of food (Marshall 1995:314). For the purpose of this research study, disposal refers to the dispersal of spinach or OFSP (including stems and peels), which could be either cooked but not consumed (plate waste), or uncooked and not consumed (discarded before cooking).

Crop refers to the produce of cultivated plants (Reader's Digest Oxford Complete Wordfinder, 1993). For the purpose of this research study, crop refers to either spinach or OFSP.

Known (Food) Crop for the purpose of this research study refers to spinach as a crop currently being cultivated and consumed by the community, with low bio-available β-carotene.

Unfamiliar (Food) Crop for the purpose of this research study refers to orange-fleshed sweet potato (OFSP), a crop that is not currently being cultivated and consumed by the community, but high in bio-available β-carotene.

3.4 CHOICE OF RESEARCH DESIGN

The research design for this study was exploratory in nature and can be described as prospective and descriptive. A qualitative research approach was implemented to build

theory and provide answers to the research problem. The research objective gives a broad indication of what researchers' wish to achieve (Mouton, 1998:78). Neuman (1997:44) states that exploratory research is conducted when the researchers' goal is to formulate questions for future research concerning a topic that there is little literature available on.

According to Babbie and Mouton (2001:79) an exploratory study is undertaken when a researcher decides to research a new interest, or when the subject of study is new, to satisfy curiosity or to illustrate constructs for a study. Explicating constructs is done in a six step process (Meier, 2008:281):

1. Naming the construct;
2. Defining it;
3. Elaborating on its critical components;
4. Providing examples;
5. Describing questionable instances and whether these instances should count as data; and
6. Describing the units of measurement.

An exploratory study is conducted as the pilot study to a more systematic and extensive study, and rarely yields answers, but rather yields a considerable amount of information on a topic that is potentially very important. Exploratory research is often conducted because a problem has not been clearly defined as yet, or its real scope is as yet unclear (Senapathi, 2010). It allows the researcher to familiarize him-/herself with the problem or concept to be studied, and perhaps generate hypotheses. Mouton (1998:103) states that exploratory studies reveal patterns of data, which is why this approach was applied to this study to develop a strategy based on the identified beliefs, habits and practices that are applicable to the food utilization cycle.

3.5 CHOICE OF SAMPLE

3.5.1 Population

The population that was studied in order to formulate a strategy was a farming community which forms part of the larger population of the Free State Province, on a farm in the Fouriesburg district (Orange Farm). There are 18 households in this community, and 17 of the households were included in the study, as one of the households had only a single male occupant. The women responsible for food preparation that reside on the farm between the

ages of 24-64 years (21 women in total) were included in the study. The population is further described in chapters four and five as part of the research findings.

3.5.2 Units of analysis

For the purpose of this study, the units of analysis were all the adult women on Orange Farm that were involved in food preparation for their families. Agricultural extension officers also later formed part of this study as the evaluators of the designed strategy.

3.5.3 Sample selection

All adult women, aged between 24 and 64 years, residing on Orange Farm were included in this exploration study (n=21). They had previously been introduced to OFSP by a research group but due to the unfamiliarity of the crop the women had not continued to utilize it. These women were selected because their initial behaviour of non-acceptance after the exposure to OFSP formed the basis of the design of this strategy. Thus, selection was done by means of non-probability sampling, as no attempt was made to introduce random selection (Sarndal, Swensson & Wretman, 2003:531). The adult female component of the community was included as a convenience sampling type. In convenience sampling, the person conducting the sampling uses his/her knowledge or experience to select the items to be sampled. The fact that women were responsible for the food preparation was, therefore, why they were selected (Westfall, 2008:2). The agricultural extension officers based at the ARC Roodeplaat were included in the second stage of the strategy evaluation process, to obtain their informed views. These officers are active in many different communities, establishing home and/or community gardens, and it was, therefore, believed that the agricultural extension officers would be able to make meaningful inputs regarding the strategy.

3.6 OPERATIONALISATION

3.6.1 Biographic information

Basic biographic information was taken from the baseline study (an earlier study conducted in this community) (Green, 2004). This data had been gathered using a structured

questionnaire. Interviewers gathered information regarding demographics, socio-economic factors and environmental factors. This information was used to describe the sample in terms of frequency distributions.

3.6.2 Food utilization

Food utilization practices regarding known food crops were explored using focus group interviews as well as direct unstructured observations. A trained interviewer conducted three focus group interviews with 21 respondents in total based on a discussion schedule with suitable probes, designed to cover all the aspects of food utilization. The interviewer was of the same cultural group as the women, spoke the same language, and acted as the translator and as an observer together with the researcher. The focus was on spinach as the known food crop – and the research conducted with regard to this crop was done separately to the exploration of the utilization cycle of OFSP. The focus group interviews and observations were repeated for OFSP after the data on spinach utilization had been collected, but less time was spent on this crop as the purpose was to only gauge what their level of knowledge with regard to this crop was after the previous introduction. The various components of utilization were each observed in detail during the observation procedure as follows:

Food procurement/ acquisition **–** during focus group interviews the respondents were asked to list their sources of spinach and OFSP if any. For observational purposes, respondents were then asked to procure spinach or OFSP (which was already known to them as they were exposed to OFSP during the research phase of another project conducted on this farm).

Food cultivation – during focus group interviews the respondents were asked to describe how they cultivate spinach and OFSP, including soil preparation, how they acquire stems/seeds for planting, preparation of the garden, how regularly spinach and OFSP is watered, etc. For observational purposes, respondents were then asked to demonstrate how they cultivate spinach or OFSP – if applicable.

Food harvesting – during focus group interviews the respondents were asked to describe how and at what time of the day they harvest spinach and OFSP, the time-lapse after planting, the quantity harvested, and which tools they use for this purpose. For observational purposes, respondents were then asked to demonstrate how they would harvest spinach or OFSP.

Food preparation - during focus group interviews the respondents were asked to describe all activities that take place after they harvest and before they cook spinach and OFSP. For observational purposes, respondents were then asked to demonstrate how they prepare spinach or OFSP for cooking.

Food cooking - during focus group interviews the respondents were asked to describe how they cook spinach and OFSP, the cooking utensils used, as well as the ingredients added. For observational purposes, respondents were then asked to cook a spinach or an OFSP dish, while recording the detail of the process.

Food consumption - during focus group interviews the respondents were asked to describe how and in which portion sizes they consume spinach and OFSP, as well as which cutlery and crockery they used for this purpose. For observational purposes, respondents were then asked to illustrate how, and in which portion sizes, they would dish up and consume spinach or OFSP.

Food storage/preservation - during focus group interviews the respondents were asked to describe how they store or preserve raw spinach and OFSP for consumption at a later stage; or how they would store or preserve cooked foods left over after a meal. For observational purposes, respondents were then asked to demonstrate storing or preserving raw spinach or OFSP, as well as cooked left-over food.

Food disposal - during focus group interviews the respondents were asked to describe how they dispose of spinach or OFSP left over after a meal, or plant materials not used for cooking and consumption purposes during preparation. For observational purposes, respondents were then asked to dispose of spinach or OFSP deemed unusable.

3.6.3 Strategy

Both the researcher and interviewer observed, monitored and recorded various food utilization practices. A strategy was designed based on the data gathered regarding food utilization strategies of the known food crop, namely spinach. This approach was then implemented amongst a group of agricultural extension officers to transfer to the communities they serve, and was tested and evaluated for OFSP. A participatory communication method was applied to facilitate the discussion, which was an interactive process between the researcher and the educational team (agricultural extension officers).

3.7 CHOICE AND DESCRIPTION OF DATA COLLECTION

The owner of the farm granted permission to conduct the research, the University of Pretoria gave ethical approval, and the participating women were informed about the purpose of the research and were allowed to ask questions about this specific study. The women were also assured of confidentiality. None of the women indicated that they wanted to be excluded from participating in the study, and all the respondents completed a consent form prior to taking part in the study.

Two data collection methods were used and were found to be suitable because the objectives of the study were achieved:

- Focus group interviews
- Direct unstructured observations with field notes

Data was collected through focus group interviews and direct unstructured observations including field notes to obtain information on food utilization, including cultivation, harvesting, preparation, cooking, consumption, preservation, storage and disposal.
Data was collected in four phases:

1. Visit 1: Focus group interviews

Three focus group interviews were conducted on both the current food utilization strategies of spinach and OFSP. The women were asked to describe how they currently utilize these crops to understand what actions they take during each phase of utilization, from access to disposal as described under conceptualization. The women were asked to describe which tools and methods they apply, and who participates in all these various activities. All the women (21 from 17 households) were allocated to different focus group interviews conducted during the day (morning, early afternoon and early evening) to accommodate those at home, working or visiting elsewhere. A moderator of the same culture and gender who spoke their native language, who also conducted earlier research in this community and is trusted by the community, conducted these focus group interviews following a pre-compiled and tested discussion guide. The discussion guide was designed based on a review of literature, was assessed by nutritional experts, and assessed by people from the same cultural and language group as that of the respondents (Addendum A). The moderator was not viewed as an outsider or intruder, and this reduced the possibility of women being evasive or

providing misleading information. The focus group interviews were recorded as an auditory record.

2. Visit 1: Direct unstructured observations

The respondents were subsequently observed (independently of each other) following all steps in the food provisioning cycle, from acquisition to disposal in their own home environment, to directly observe current practices regarding spinach and OFSP. Suitable probes were used where necessary to gather information on how these women utilize the crops, from the access to the disposal stage (Addendum B).

3. Development of a strategy

Data obtained from the focus group interviews and the observations was transcribed and categorized under themes. Information obtained was continuously re-applied in subsequent groups by including new areas of interest to be explored in the discussion guide. Data was collected until data saturation occurred and no new themes or areas were uncovered. This information was then used to design a strategy to improve the utilization of an unfamiliar crop (OFSP). This strategy addresses areas where it was noted that either OFSP or spinach are not being utilized optimally, and includes advising the women on more suitable methods to apply.

4. Visit 2: Testing of strategy

The researcher tested the strategy by training seven agricultural extension officers who are active in encouraging agricultural production in communities where food insecurity and malnutrition exist. These agricultural extension officers then provided input on the application of the strategy and identified areas for improvement. The strategy was designed based on the knowledge gathered from the community regarding their food utilization of spinach (and OFSP), and the household items they have at their disposal to produce and prepare foods. This strategy focussed on a nutritional message (the benefits of a varied diet), and how the women can utilize OFSP optimally to improve dietary diversity and reduce vitamin A deficiencies. The testing of the strategy was conducted in a group session.

3.7.1 Semi-structured focus group interview schedule

It was decided that the most appropriate data collection method for the study would be a semi-structured interview schedule which would be used to guide the focus group interviews as described above. Focus group interviews can be used to gather qualitative information. Interviews of this type are suited to working with small samples and are useful for studying specific situations or for supplementing and validating information derived from other sources

used for making diagnoses (Laforest, 2009:1). The interviews were conducted to support the observations and to determine the reasons for certain actions. Practices within the community with regard to food utilization are based on habits and experience, rather than formal education, and these were identified through this interview schedule. The semi-structured interview schedule ensured that most areas and topics were covered, and as stated by Babbie and Mouton (2001:289), it was a general plan and not a formal questionnaire. The semi-structured interview schedule only served as a guide, and was structured according to the steps of the food acquisition cycle (Refer to Addendum A).

3.7.2 Semi-structured observation schedule

A semi-structured observation schedule to observe food and note down utilization practices was used during the first visit. Observations were made after the focus group interviews during the same visit. These were once again structured according to the steps of the food acquisition cycle (Refer to Addendum B).

3.8 VALIDITY (RESEARCH QUALITY)

It can be said that this study and the development of the strategy will have internal and transferential validity. External validity cannot be claimed because the repeatability of the study in another context is limited (Smaling, 1992: 31).

- De CastroPinho (2006:15) states that in order to have transferential validity the researcher will use a description around the research situation, context and research process as well as an explication of the arguments for the different choices of methods used. The researcher will further aim to ensure a logical framework contributing to logical validity. The research results may be useful for other researchers who are either involved or interested in research of the same kind.
- Trochim (2006) defined internal validity as follows: “Internal validity is considered a conditional methodological requirement for every research study. It is the approximate truth about inferences regarding cause-effect or causal relationships”. For studies that assess the effects of social programmes or interventions, internal validity is perhaps the primary consideration.

To ensure trustworthiness, objectivity and internal validity of the research, the following were applied:

3.8.1 Credibility

McCroskey and Teven (1999:2) identified competence, trustworthiness and goodwill as the three antecedents of credibility.

In the present study:

- Interviews and observations were conducted until data saturation was reached (no new information was discovered);
- All interviews were recorded, translated and transcribed;
- The respondents were asked to verify the information obtained (member checks);
- Respondents were encouraged to be honest and truthful;
- The moderator was of the same ethnic group and gender and was fluent in the same language as the respondents;
- The moderator was trained on research procedures;
- Leading questions were avoided;
- Neither the researcher, nor the moderator, conveyed their own opinions; and
- The researcher worked through the moderator during data collection. She and the moderator had a discussion regarding the interviews before and after each interview to agree on any changes or additional areas of exploration needed.

3.8.2 Transferability

Transferability is accomplished by providing a rich description of the research findings and permitting research consumers to draw their own inferences about research transferability to different groups, circumstances, or events (Green, 2004; Lewis, 2009:5; Moopa, 2004).

In the present study:

- Study leaders oversaw and approved the research process;
- All concepts in the framework were defined and conceptualized;
- The relationships between concepts were identified;
- All adult female members of the community were included in the study; and
- The study formed part of a larger study conducted by the University of Pretoria (Green, 2004; Matla, 2008; Moopa, 2004).

3.8.3 Dependability

Lincoln and Guba (1985:317) propose a measure which enhances the dependability of qualitative research. That is the use of an "inquiry audit," in which reviewers examine both the process and the product of the research for consistency.

In the present study:

- Triangulation was applied by using data from the baseline study, focus group interviews, as well as direct observations; and
- Extensive field notes were made, including any non-verbal responses made by the respondents which had been observed.

3.8.4 Confirmability

To achieve confirmability, researchers must take steps to demonstrate that findings emerge from the data and not their own predispositions (Shenton, 2004:1).

In the present study:

- All raw research data was kept (audio cassettes, field notes and transcriptions) in a locked cabinet;
- All analyses, summaries, notes and ideas were kept;
- The women can also be visited again to confirm the research findings, (Walsh, 2003:69); and
- The data was kept confidential and the responses of the women confidential as to not compromise the research results.
-

Thus the data record supports the fact that the findings emerged from this study and not from the predisposition of the researcher.

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CHAPTER 4

RESEARCH FINDINGS ON UTILIZATION OF A KNOWN FOOD CROP (ARTICLE 1)

Article prepared for and submitted to Agrekon on 1 February 2012, currently under review.

*PLEASE NOTE THAT THE REFERENCING OF THIS ARTICLE REFLECTS THE REQUIREMENTS OF THIS JOURNAL

Situation analysis to inform the introduction and utilization of new food crops towards improving household food security

ABSTRACT

Objective

To explore the outcomes of the integration of household food security elements following a food-based intervention involving vitamin A rich crops.

Setting

A farm worker community in the Free State Province, South Africa.

Outcome measures

Food access (household), food availability, and food utilization (daily use) practices were assessed regarding the introduced food crop. Barriers and enablers of the food-based intervention were identified and used to compile an appropriate food utilization cycle for this community.

Results and Discussion

Various food accessing strategies were used. Land was accessible for gathering indigenous plants and fruit and cultivation of crops, thereby driving the availability of fruit and vegetables. Crops were cultivated, but lack of knowledge resulted in poor utilization of the introduced food crop, contributing to the community's poor diet. Food habits/practices within their use of the food cultivation and utilization cycle were observed to identify barriers/enablers (education, habits, tools/equipment, attitude) regarding crop cultivation.

Conclusions

A successful food-based intervention requires a nutrition education programme improving access, availability and utilization of the intervention food/crop, building on enablers by

identifying and alleviating barriers. A cultivation-to-utilization training programme focussed on training-the-trainers should be designed to achieve optimal outcomes.

Keywords

- *Food-based approach*
- *Dietary Diversity*
- *Utilization*
- *Train-the-trainer*
- *Home gardens*

4.1 INTRODUCTION

In 2002, the Department of Agriculture launched the Food Security, Nutrition and Health Campaign in South Africa, with a focus on the production and consumption of micronutrient-dense foods (Tshabalala-Msimang: 2002). The objectives of this campaign included improved food utilization by establishing food gardens and subsequently helping households to become food secure, by promoting production and consumption of these foods. While the importance of establishing food gardens in food insecure communities is commonly regarded as a good intervention method to assist in relieving food insecurity, poverty and hunger, the utilization of food items from, and consumption patterns of foods from cultivated food gardens have not been studied adequately and deserve further attention (Webb, 2000:66). The food cultivation cycle of rural communities, their dietary norms and cultural practices, as well as methods of food preparation and preservation, should be explored to understand how these factors can play a role in ensuring optimal food utilization and how these can be integrated into rural development programmes (Webb, 2000:67). Access to, and availability of food does not ensure well-nourished communities; it requires going one step further, namely, utilizing the available food.

4.1.1 Household Food Security

Household food security has been described with a three-factor definition involving the availability of food, the access thereto, and lastly the food utilization patterns and practices (USAID, 1995:8; Bonnard, 1999:2). Food utilization is the “proper biological use of food, requiring a diet providing sufficient energy and essential nutrients, potable water and adequate sanitation” (Bonnard, 1999:2). Effective food utilization depends to a large extent

on knowledge within the household of food storage and processing techniques, basic principles of nutrition, proper childcare and illness management (USAID, 1992:3). Food utilization or consumption is frequently forgotten as the third link in household food security, as it is mostly assumed or implied. However, utilization or consumption is often not an automatic result of access and availability to foods within a household environment. Many studies (Yang & Hansen, 2009:633; Kaiser, 2011; Coveney & O'Dwyer, 2009:45) have been conducted to further understand food availability and food access, but food utilization has not received equal attention to understand how this contributes to improved household food security (Renzaho & Mellor, 2011:2). Food consumption patterns of households before and after the introduction of interventions deserve attention to measure adoption and assess the success of the intervention.

Dietary diversity is an important concept within the context of household food security. It refers to the number of individual food items (food variety) and food groups (food group variety) consumed over a given reference period, and may predict the individual nutrient adequacy and thus household food security (Ruel, 2002a:3). By improving dietary diversity, and ensuring maximum food utilization and consumption of available food, nutrient specific malnutrition can be alleviated. Experience has shown that malnutrition can be alleviated by community-based nutrition programmes and strategies (Tontisirin & Nantel, 2002:841). Rural household food insecurity can be overcome by increasing participation of food insecure communities and households in agricultural activities, such as food cultivation (De Klerk *et al,* 2004:4).

Dietary diversity is often promoted to enhance the chances of achieving an adequate diet, to lessen the risks of developing a deficiency or excess of any one nutrient, to ensure an appropriate balance of micronutrients as well as energy from fat, and to reduce the likelihood of exposure to excessive amounts of contaminants (Ruel, 2002b:12). Low dietary diversity is often the primary reason for the persistence of malnutrition (Thompson & Meerman, 2010:3).

Internationally, 12% of children between 6-71 months suffer blindness due to vitamin A deficiency, 20% of children between 6-71 months are anaemic due to iron deficiencies, and iodine deficiencies are endemic in many regions of the world (Malnutrition and Micronutrient Country Fact Sheets: Africa, 2004). Worldwide, almost two billion people also run the risk of malnutrition due to deficiencies of these three nutrients in their daily diets. In South Africa the National Food Consumption Survey (NFCS) of 1999 found that there is a severe lack of nutrients such as vitamin A, iron and iodine in the South African diet (Labadarios, 2000). For South African children the dietary intake of these nutrients was less than 67% of the Recommended Dietary Allowances.

Farm workers and their families have been found to be amongst the worst-fed members of the population – one out of every three children who grow up on a farm is stunted because of malnutrition (Labadarios, 2000:6). In some instances, socio-economic indicators paint a profile of extreme poverty and deprivation as some farm dwellers have little access to social infrastructure and have little education (Hall, 2003:2). In some cases, socio-economic marginality and geographic isolation also contribute to the limited access of farm workers to foods and tools.

Strategies or approaches to address household food insecurity and malnutrition

The three most common strategies for combatting nutrient deficiencies are supplementation, food fortification and food-based approaches which reflect in similar order short, medium and long-term approaches (Low *et al,* 2007:1320). Food-based approaches are important as food contains not only the target nutrient for which the intervention has been developed, but also various additional nutrients as well as phytochemicals and other substances important to human health. Food-based approaches also encourage community cooperation, and can be structured to empower communities (Probart, 2003:3).

Food-based programmes could alleviate vitamin A deficiency by offering a long-term sustainable solution to malnutrition and a diet low in vitamin A (Kuhnlein, 2000:130). Food-based approaches promote the consumption of foods that are naturally rich in micronutrients or are enriched through fortification. Food sources of vitamin A or provitamin A that are unfamiliar in local food variety must be introduced with education or media techniques in ways that make the foods culturally acceptable to the community and the individual (Kuhnlein, 2000:131).

Food-based strategies were often overlooked in the past as governments, researchers, the donor community and health-orientated international agencies sought approaches that had rapid start-up times and produced quick results to overcome micronutrient malnutrition. Many developing countries now realize that food-based strategies are the only viable, cost-effective and sustainable solution to micronutrient malnutrition (Underwood, 2000:122). In South Africa both the Agricultural Research Council (ARC) and the Medical Research Council (MRC) have invested in establishing food gardens in malnourished communities, incorporating crops rich in nutrients that are currently below optimal intake levels, specifically vitamin A rich orange-fleshed sweet potato (OFSP), to alleviate micronutrient deficiencies (Faber, Phungula, Venter, Dhansay & Benade 2002a; Faber, Venter & Benade, 2002b; Faber & Venter, 2006; Laurie, Mphaphuli, Faber, Mtileni & Domola, 2007; Laurie & Faber, 2008).

Food-based strategies should be viewed as encompassing the total food chain from production in gardens or fields, to procurement from local or centralized markets, to processing commercially or domestically in preparation of meals, to consumption within or outside the home (Underwood, 2000: 122). Educational and communication strategies that accompany food-based approaches are important because they can further consumers' understanding of the association between food consumed and nutritional status (Verrall & Gray-Donald, 2005:897). Crop-based interventions should have well designed agricultural and nutritional components that are mutually reinforcing (Faber, Laurie, Ball & Andrad, 2010:13).

This became clear in a farm worker community in the Free State Province of South Africa, where an orange-fleshed sweet potato (OFSP) crop was introduced as a food-based agricultural strategy to improve food availability and to alleviate vitamin A deficiency (Low *et al,* 2007). The aim of this strategy was to increase the production and consumption of vitamin A rich vegetables. A community garden was established, and the community was trained in the cultivation of vitamin A rich crops including OFSP in their own home gardens (including preparation of the soil, irrigation systems, and fencing of the gardens).

Food preparation with vitamin A rich vegetables was demonstrated by serving a meal prepared with vitamin A rich vegetables. The meal consisted of a traditional relish made with OFSP, OFSP served as a cooked vegetable, and OFSP as part of a stew containing chicken. Stiff maize meal porridge was prepared by the community and served with the meal. The members of the community, who partook of the meal, expressed their appreciation regarding the acceptability of the taste and texture of OFSP at that time. However, at a follow-up visit six months later it was evident that the community did not utilize the newly introduced crop despite the introduction and training provided. The community did however continue to cultivate the food crops that were known to them.

Therefore, the aim of this paper is to explore the outcomes of the integration of household food security elements following a food-based intervention of vitamin A rich crops.

4.2 METHODOLOGY

4.2.1 Setting

The population that was studied to test a strategy was a farm worker community in the Fouriesburg district of the Free State Province. The farm covers an area of 1500 hectares, and produces a variety of commodities such as maize, wheat, cattle and sheep, as well as fruit (e.g. apricots, peaches, cherries) and walnuts for use at a guest house on the farm. The farm receives an average rainfall of 780mm per year and the climate is moderate. Constraints to farming are droughts and hail.

4.2.2 Participants

This exploratory study focussed on women, and their habits and practices within the household in relation to food access, availability and utilization. In many countries, men only work to deliver cash crops, and, therefore, interventions to relieve hunger have often focussed on educating and empowering women to grow and use nutritious food to feed their families (Johnson-Welch, 1999:7). Dietary approaches that engage women build self-worth, confidence and self-reliance, which in turn foster culturally acceptable, sustainable solutions (Underwood, 2000:118).

Labour on the farm is the main source of income and it was calculated that the average income was R600 per month per household at the time of the study. The male community members were employed as farm workers, while some of the females were employed in a guest house operating on the farm. Employment on the farm increased the women's access to foods available in the guest house and thus the variety of their diets.

There were 18 homesteads on the farm, but only 17 homesteads were included in the sample as one of the households had only a single male occupant. On average, households consisted of seven members.

4.2.3 Data collection

Various data collection methods were used throughout the study, including both qualitative and quantitative strategies. Focus group and individual interviews were conducted by someone who understood and spoke the local vernacular language to complete

questionnaires, conduct nutrition education sessions, and demonstrate food gardening. Observations were done in the environment and within the various households as follows:

Food access (including dietary diversity) data were collected via focus group interviews using a semi-structured interview schedule to assess foodstuffs accessed and strategies applied and how this contributed to dietary diversity, which was measured during the previous seven days. These interviews were conducted on five occasions during the year to make provision for seasonal changes. Following the initial assessment, a lecture and discussion were provided. The lecture and discussion emphasized the importance of vegetable gardening, specifically focussing on vegetables rich in vitamin A, as well as the need to keep a home garden to increase food access and availability. Furthermore, the existence of or feasibility of each homestead having their own home garden was observed. Water access was also observed, as well as what was currently being cultivated, if applicable, to provide guidance on home food production and the gardening education strategy implemented (see food availability).

Food availability data were collected via interviews on food coping strategies to assess their contribution to food availability and how these impact on dietary intake which was assessed using a 24 hour recall. After the data collection phase, and identifying the area for a garden for each household, tools were provided, as well as a lecture on vegetable gardening, followed by a hands-on teaching approach to establish the community garden. Participating women were also provided with seeds of the most common vegetables cultivated, and roots/stems for orange-fleshed sweet potato (OFSP), an unfamiliar vitamin A rich crop that was introduced as a new crop. Measuring equipment for laying out the community garden and their own home gardens as well as spacing the seeds/stems was provided, and a rain water tank was purchased, established and filled for use in the gardens.

Food utilization of the crops was addressed by providing women with nutrition education specifically focusing on vitamin A and vitamin A rich crops, and the importance of a diverse diet including vitamin A rich products (such as spinach and OFSP from their new gardens). The women were exposed to a demonstration on how they could prepare a meal with the available vegetables, including OFSP.

4.3 RESULTS AND DISCUSSION

The majority of farm residents had access to land for cultivation on a small/household scale. There were also sheds for cattle, and poultry runs. Some members owned some implements like garden forks, spades, wheelbarrows, and hoses. A well/borehole tap situated at a distance of 200m was the only communal water source. Although the households had unlimited access to this tap, the only way to obtain water was to fetch it with buckets and to carry it back home up a steep hill. Electricity was available, although the members of the community had to buy coupons to utilize it. The electricity was utilized mainly for light during the evenings. Wood fires mostly situated in separate cooking rooms (kitchens) were used for cooking, and one household had an electric stove that was used for their cooking.

All the women, aged between 24 and 64 years, responsible for food preparation living on the farm were included in the study. The maximum level of education of 62% of the women was grade 7 (last year of primary school). The food security and dietary diversity of this community was assessed by studying the availability of food and methods used by the community to access food. This was followed by a food-based intervention to improve both food availability and food accessing. The food-based intervention included cultivation of vitamin A rich crops and demonstrations of how these foods should be utilized. The success of the food-based approach that was introduced via the vegetable gardening strategy was assessed after six months to explore whether these crops were being utilized by the community.

4.3.1 Food access refers to whether the available food can be reached and it includes households that have the resources, ability and knowledge to produce or procure food. The households living on the farm used a variety of different types/kinds of foods accessed through different food accessing strategies to prevent household food insecurity. The investigation into dietary diversity and methods of food access revealed strategies of cultivation, holding of livestock, purchasing, bartering, gathering, hunting, fishing and payment in kind. Figure 4.1 demonstrates to what extent each strategy was applied within this community.

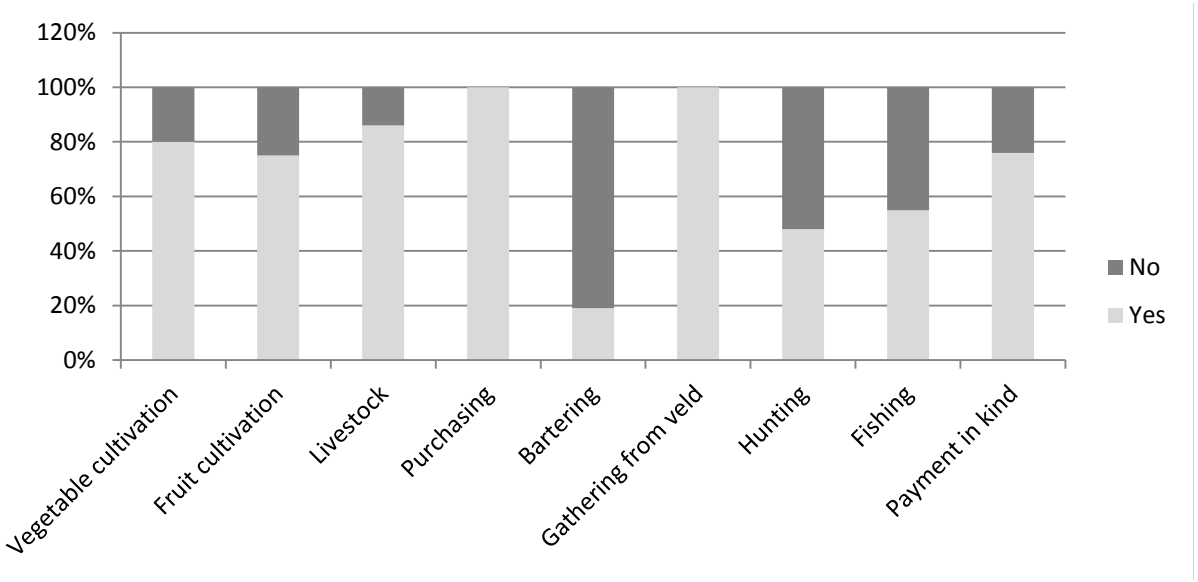

FIGURE 4.1: FOOD ACCESSING STRATEGIES APPLIED WITHIN THE COMMUNITY DURING THE YEAR (N=17)

Cultivation: The majority of the households (85%) had access to an area of land allocated to them for the purpose of home cultivation. These plots were located next to each house, ranging in size from 20 to 165 square metres. Most households had food gardens and cultivated vegetables all year round. Crops planted included mainly vegetables, fruit (peaches and apricots) and corn. The most common vegetables cultivated in the garden plots were spinach (76%), green beans (71%), pumpkin (65%), tomato (41%), turnip (41%) and cabbage (35%), i.e. mainly vegetables that grow above ground.

Holding of livestock: 85% of the households had livestock such as chickens, cows and pigs. These were however not really used as a food source on a daily basis, other than eggs from the chickens.

Hunting: "Gaka" (Guinea fowls, Sesotho) were present on the farm but eaten only during dry and hungry seasons. The men hunted rabbit with their dogs, but these and other wildlife had become scarce. When food was scarce and money was limited, 48% of the households hunted small wild animals such as guinea fowl and rabbit, or larger game such as springbuck, or fished.

Gathering: The women gathered food from the field, such as green leafy vegetables, e.g. "thepe" (pigweed, Sesotho) or "sempaile" (mustard leaves, Sesotho), and they prepared these as a relish to accompany their staple food (maize meal porridge).

Purchasing: All of the community members purchased from spaza shops (small retail enterprises operating from a residential stand or home) or small shops in the nearby rural town.

Payment in kind: The farmer supplied some food (such as maize meal and wheat flour) as part of payment to the families with a household member employed on the farm.

The variety of foods (dietary diversity) eaten by the households was investigated by calculating the number of different food items consumed over a period of seven days (Hatloy, Torheim & Oshaugh, 1992:894). The respondents had a rather low dietary diversity, with limited seasonal changes and with an increase in consumption of vegetables limited to autumn only. This was regarded as a second reason for the introduction of OFSP to improve vitamin A intakes as the OFSP would provide variety to the diet, and due to its versatility, be well accepted.

TABLE 4.1: FOOD TYPES ACCESSED DURING THE YEAR BY THE COMMUNITY (N=17)

Food groups	Specific foods accessed	Access strategies
Cereals	Bread Maize meal	Purchasing Payment in kind
Vegetables	Green leafy vegetables such as *thepe* (pigweed, Sesotho), *seruwe* (lambs quarter, Sesotho), *tjhaku ya kgomo* (lion tooth, Sesotho), *sempaile* (mustard leaves, Sesotho), *tjoto, papasane* (horse radish, Sesotho), *tenane* (harebell leaves, Sesotho), *sewediwetla* (wild carrot, Sesotho)	Gathering
	Spinach, beetroot, cabbage, onion, tomato, sugar bean, pumpkin, potato, green bean, turnip	Cultivation
Fruits	Apple *(or bought),* Apricot, Peach	Cultivation and gathering
	Prickly-pear	Gathering
Proteins	Chicken, chicken runners (feet) & heads, Chicken livers	Own livestock
	Egg	Gathering
	Tinned fish, *malana & mogodu* (animal's small intestines, Sesotho)	Purchasing
	Fresh fish (sardines)	Fishing
	Pela (Rabbits, Sesotho), *Letsa* (Steenbok, Sesotho), *Phuthi* (Springbuck, Sesotho), *Kgaka* (Guinea Fowl, Sesotho), *Mmutla* (Rabbits, Sesotho), Caracal	Hunting
Milk	Milk	Purchasing, own livestock
Beverages	Imitation drinks e.g. Foro, Drink-o-pop, Tea	Purchasing
	Traditional beer	Own making
Miscellaneous	Sugar, Salt, Soup, Tomato sauce, Curry powder	Purchasing
Fats & oils	Sunflower oil	Purchasing
	Lard	Own making

A food procurement and household inventory study conducted in 1999, found that on a national level, the average number of foods procured by a household is 35, while it is 16 for the Free State Province (Labadarios, 2000). In addition, when comparing formal urban areas

and commercial farms or rural areas, the amount in a formal urban area was found to be 45, and significantly lower at 32 and 26 for commercial farms and rural areas respectively. It was also found that the actual household inventory differs significantly from the number of items procured by a household. On a national level it was found that actual inventory at any point in time is always lower than the total number of items procured. Nationally, this procurement number is nine, while in the Free State Province it was found to be five.

It was found that over seven days, between 17 and 36 different products were consumed (considered as low and medium dietary variety respectively), which is consistent with the findings of other research on rural communities (Labadarios, 2000). According to the NFCS, purchasing is the main strategy to access food in South Africa (Labadarios, 2000). This was consistent with the findings for this community. The community employed gathering/fishing/hunting as a secondary strategy, and food production was their third choice of food accessing strategy. On a national basis, food production was employed before gathering/hunting/fishing. This difference is probably mainly due to the rural location of this community, and the access they have to animals and wild plants within their immediate surroundings. It was found that food production was not being applied as a key strategy to accessing foods by this community. Therefore, strategies to increase food production would probably improve the dietary diversity of this community.

In assessing the types of products consumed, it is evident that products purchased are those that cannot be home produced, and those which the community do not have immediate access to from their surroundings. These are available to them from a small store in the nearby town, and availability is only impacted by the household's monetary constraints. Likewise products accessed by payment in kind are at the discretion of the employer. Although the women ranked purchasing as the main accessing strategy, it only contributed 24% to the overall number of products they accessed.

It is significant to note that most (61%) of the foods accessed in this community are from either cultivation, gathering, fishing or hunting which require little or no financial input. Thus, to a large extent, the community drives their own dietary diversity. Therefore, the community's dietary intakes and dietary diversity could be significantly increased by increasing the variety of crops that they currently cultivate in their home gardens, instead of making fortified crops available that the community would need to purchase available.

4.3.2 Food availability

Food availability is understood as having a continuous supply of a sufficient quantity of quality food for consumption at national and household level (Department of Agriculture, 2002). Food availability was assessed by understanding the food coping strategies (FCS) of this community. When confronted with a food shortage that results from a poor economic status that limits or changes access to food, respondents make changes to their diet by employing food coping strategies. The status of a household's food security level is not only depicted by the type of food coping strategy applied, but also by the frequency and severity level of the food coping strategy used. These households employ different food coping strategies up to four times per week. This community grouped and ranked their food coping strategies as least severe, severe and very severe, excluding the moderate level as discussed by Kruger, Schönfeldt and Owen (2008: 8). The food coping strategies applied by the community throughout the year were ranked as follows from least severe to very severe (Table 4.2).

TABLE 4.2: FOOD COPING STRATEGIES EMPLOYED BY THE COMMUNITY THROUGHOUT THE YEAR

FOOD COPING STRATEGIES	THE FOOD COPING STRATEGIES INDEX (FCSI) SCORE PER SEASON						
	Early summer (n = 13)	Late summer (n = 13)	Autumn (n = 13)	Winter (n = 13)	Spring (n = 13)	Total N = 65	Total %
Purchase cheaper food	13	12	13	12	13	63	96.9
Gather wild food	6	13	13	13	13	58	89.2
Consume seed stock	10	4	3	10	4	31	47.6
Purchase food on credit	3	4	5	1	6	19	29.2
Reduce portion sizes	0	4	4	7	3	18	27.6
Decrease adult food intake	0	4	3	5	3	15	23
Borrow food or money	0	3	4	1	0	08	12
Feed workers first	1	1	0	2	2	06	0.09
Eat elsewhere	0	0	2	1	0	03	0.04
Ration money	0	1	0	2	0	03	0.04
Beg for food	1	0	1	0	0	02	0.03
Skip meals	0	0	0	0	0	00	0.0

Eating less preferred or cheaper food and gathering wild food, are commonly employed during all seasons. Of the total community, only 38% of the households reported that they sometimes run short of certain food items, or reported a vegetable shortage. This supports the finding that food insecure households have a limited variety of food that result in the consumption of high energy and low cost foods (Adams, Grummer-Strawn & Chavez, 2003: 1072). As food insecurity increases, there is usually a shortage of specifically fruits and vegetables. Thus, in a very food-insecure setting, it is usually necessary to increase the

number of fruits and vegetables being cultivated to reduce food insecurity and increase dietary diversity. It was discovered that, in this community, lack of knowledge contributes to the poor diet because even though there was an increase of a wide range of food during early summer, they usually only preserve wild leafy vegetables and fruits, which cause food shortages during the dry seasons (Kruger *et al,* 2008:4).

4.3.3 Food utilization

When the community was revisited after OFSP had been introduced, it was found that the community had not continued to cultivate and utilize the crop. The women indicated that the crop had not survived in their gardens as they could not see the leaves of the crop growing above ground. Therefore, despite the education provided with regard to the cultivation of the crop, it seems that either some aspects of the cultivation were not understood, or that for other reasons the women were not motivated to continue producing the crop. In addition, there was no follow-up from the local agricultural extension officer to ensure that there were no barriers to continuous cultivation or to address any new concerns or issues that may have arisen after the educational implementation.

The theoretical success of the introduction of a new crop can be determined by analyzing the barriers to introduction and acceptance, as well as possible enablers that could be utilized when a food-based agricultural intervention is made. In order to understand what the possible reasons were for the success or failure of the newly introduced food crop in this community, the food habits and practices of the community were observed to identify barriers that could have led to the non-utilization, and enablers that could be used to expand the nutrition education component of the food-based strategy, and to form the basis for possible reintroduction of OFSP or another crop in this or any other community. Food utilization was, therefore, further explored by studying spinach which is a widely cultivated and consumed crop in this community, to establish the factors that may have helped (enablers) or hindered (barriers) the utilization of the new crop (OFSP) by means of focus group interviews with the women, and observing several participants implementing the utilization cycle for the known food crop (spinach) and unfamiliar food crop (OFSP) (see Tables 4.3 and 4.4). Before designing and implementing a food-based strategy, it is crucial to assess all the barriers and enablers that could be encountered during implementation to decide where to focus efforts, and tailor the intervention to focus on specific barriers (Donoghue, 2006:1). For example, activities to support food-based approaches, such as learning cooking skills, can have a positive impact not only on the dietary behaviour of the target group, but also on the dietary behaviour of the extended family (Verrall & Gray-Donald, 2005:902).

TABLE 4.3: IDENTIFIED BARRIERS AND ENABLERS OF THE ELEMENTS OF HOUSEHOLD FOOD SECURITY (N=17)

Component	Element	Finding
Food availability	Availability driven by coping strategies	*Enablers:* • Almost 100% of fruits and vegetables procured are via cultivation or gathering • 38% of households reported a fruit or vegetable shortage • 53% of the women had low intake of vitamin A rich vegetables
		Barriers: • High staple food availability but low fruit and vegetable availability • Lack of follow-up by the agricultural extension officer
Food access	Strategies	*Enablers:* • 85% of households cultivated their own food all year round • Food choices were limited during certain months of the year
		Barrier: • Food production was identified as the third choice of food accessing strategy
	Types of food accessed – dietary diversity	*Enabler:* • Low dietary diversity, specifically in autumn months
		Barrier: • OFSP is an unfamiliar crop
Food utilization	General belief	*Enabler:* • Crops are consumed that are believed to be tasty, nutritious, readily available and assists in disease prevention

The barriers and enablers related to the elements of household food security are presented in Table 4.3. While home cultivation had been the focus of the introduction, and the community was keen to utilize the fruits and vegetables they gather and cultivate, and the community understood that the crop would be available for most of the year if they chose to continue to cultivate it, all the benefits of continuous cultivation were not emphasized during the introduction. The crop could, for example, have been 'marketed' to the community as a solution to limited food access in autumn as they currently experience. OFSP was introduced as a crop that is hardy, grows easily and is readily available, but there was not sufficient focus on nutritional deficiencies currently experienced as well as on disease prevention, and this was not followed up by the agricultural extension officer. Although OFSP was sampled by the community so that they could experience its sensory appeal in a meal, a wide variety of uses were not demonstrated or promoted afterwards by the agricultural extension officer.

The barriers and enablers related to the elements of the food utilization cycle are presented in Table 4.4. Garden procurement as the main accessing strategy was included in the original implementation. The community was educated on how to grow and plant stems, and a nursery garden was established, but the agricultural extension officer did not follow up on training in terms of harvesting and follow-up planting, and this was thus a wasted effort. As there was an issue with water access, a rainwater tank was provided for irrigation. Tools were also made available to prepare the gardens and continuously tend them, but usage was

not reinforced. Continuous replanting of the stems was not encouraged. Various aspects related to harvesting were not covered during the initial introduction. The community was not educated in or equipped with a method or referencing materials to identify when the crop was ready for harvesting. They were not provided with tools to harvest the crop, and most of them did not have spades or pitchforks to remove the OFSP from the soil. They community did not receive any information or training on how many roots to harvest in relation to the size of their family. In terms of cooking, they were not taught on methods to preserve nutritional value, such as peeling, cutting, cooking method, time or temperature. They were also not exposed to various additional ingredients that could be added to the OFSP. In terms of serving the OFSP, the community did not have information on appropriate portion sizes. While information was shared on the benefits of disposing of the organic waste in the garden, no education was provided on preservation of the roots by means of leaving them in the ground, or storing them in the home in a cool place.

TABLE 4.4: IDENTIFIED BARRIERS AND ENABLERS OF THE CULTIVATION AND UTILIZATION OF A NEWLY INTRODUCED FOOD CROP (N=17)

Component	Element	Finding
Food utilization	Procurement	*Enabler:* • Home gardens for ease of access and reduced cost
	Cultivation	*Enablers:* • Continuous availability for replanting via stems • Root vegetables do not require much physical labour to cultivate
		Barriers: • Habit of use of seeds – stem planting requires education • Watering of garden is done frequently
	Harvesting	*Barriers:* • Leaves as indicator of harvestability • Harvesting by hand • Knowledge of quantity to harvest • Experience that harvesting all the leaves would cause the plant to perish
	Preparation	*Enabler:* • Crops are washed prior to preparation
		Barriers: • Pieces such as stalks are removed that are considered difficult to digest • Crops are chopped up into very small pieces
	Cooking	*Enablers:* • Addition of other ingredients
		Barriers: • Boiling as main cooking method • Long cooking time • Foreign colour of the sweet potato (orange vs. known white)
	Consumption	*Enablers:* • The community enjoy mainly starch-based meals • Individual containers • Prepare crops that taste good
		Barrier: • The community were only used to white-fleshed sweet potato
	Preservation	*Barrier:* • No preservation method applied or equipment available
	Disposal	*Barrier:* • No existing habit of continuous disposal of organic waste in home gardens

The barriers that were identified can be grouped and classified as follows:

1. Education – this was found to be the main barrier, basic education about the crop and how to best harvest and utilize it, and how it can complement the community's current diet. The significance of nutritional requirement was not completely understood and the benefits that this particular crop may bring to the community need to be reinforced.
2. Habit – such as cultivation from seeds, chopping up vegetables before cooking, and including the vegetable in regular meals.
3. Tools/equipment – such as garden equipment to plant, grow and harvest, as well as cooking equipment to steam rather than boil and how to preserve appropriately.

4. Attitude – food production is not seen as the main accessing strategy – food production needs to become an important food accessing strategy, and the acceptance of newly introduced crops needs to be regularly encouraged.

It was concluded that the main limitations of the initial implementation of the food-based approach was that the time spent on the educational component of the training was not adequate as it did not equip the community for complete adoption of the newly introduced OFSP crop. This became apparent in focus group interviews with the women on why they failed to continue cultivating the crop. They lacked knowledge of basic concepts pertaining to the crop. It was also found that the agricultural extension officer, despite being involved in the establishment of the garden and the training, failed to continue to support this community. Therefore, the community never utilized the new food crop to its full potential, and it was found that they regarded the crop as unsuccessful based on no evidence of leaves on the surface without considering the roots underground. For a food-based approach to be sustainable, regular follow-up and interaction is required. As the ARC has not rolled out their OFSP planting strategy into many regions yet, the agricultural extension officer had not been trained appropriately on the full OFSP utilization cycle either. She could have potentially encouraged continuous use from a consumption driven point of view vs. a cultivation focussed one. Poor field worker performance has been identified as one of the constraints experienced in many projects, and that regular monitoring as well as in-service training is crucial to the success of an intervention (Faber, Schoeman, Smuts, Adams & Ford-Ngomane, 2009:193). Regular interaction regarding the garden and the new food crop is also critical in terms of cultivating the crop, but also to ensure full utilization of the crop once it is harvested.

After a six month period it was clear that this newly introduced food crop was not optimally utilised in this community as the crop had not been harvested or further cared for – the leaves and stems had not been utilized for either food or replanting purposes, the garden was left unattended, and no roots were harvested. No-one in the community realized that the roots were ready for harvesting underground. It was however clear that this community used cultivation to some degree as vegetables, particularly spinach, which is a crop harvested from above the ground, flourished in certain home gardens. Due to the failure of the introduction of OFSP, and to assess the success of the introduction of a new crop as a food-based approach, spinach was selected as the crop which would be studied to better understand this community's food utilization practices. Spinach was the most commonly cultivated and consumed vegetable and was, therefore, chosen to be studied to gain insights into the community's habits and home food garden practices. This approach was used to better understand how to introduce OFSP cultivation and to design the best approach to

introduce a new food crop particularly OFSP and establish its use in a community. This approach is also known as an integrated stage-based model in which behaviour change is viewed as a cyclical process that involves five main stages (Travel Smart, 2009:5), namely:

1. Awareness of the problem and a need to change (awareness of lack of dietary diversity and resultant nutritional deficiencies and subsequent diseases experienced);
2. Motivation to make a change (benefits of a more varied diet and improved health);
3. Skill development to prepare for the change (cultivation and nutrition education);
4. Initial adoption of the new activity or behaviour (crop incorporation into gardens and diet); and
5. Maintenance of the new activity and integration into the lifestyle (follow-up by the agricultural extension officer).

The knowledge from the spinach cultivation cycle was applied to an OFSP cultivation cycle (see Figure 4.2) to facilitate understanding whether OFSP, a crop that can offer the same perceived benefits to the community that spinach currently does, would require a significant behaviour change as a food-based strategy.

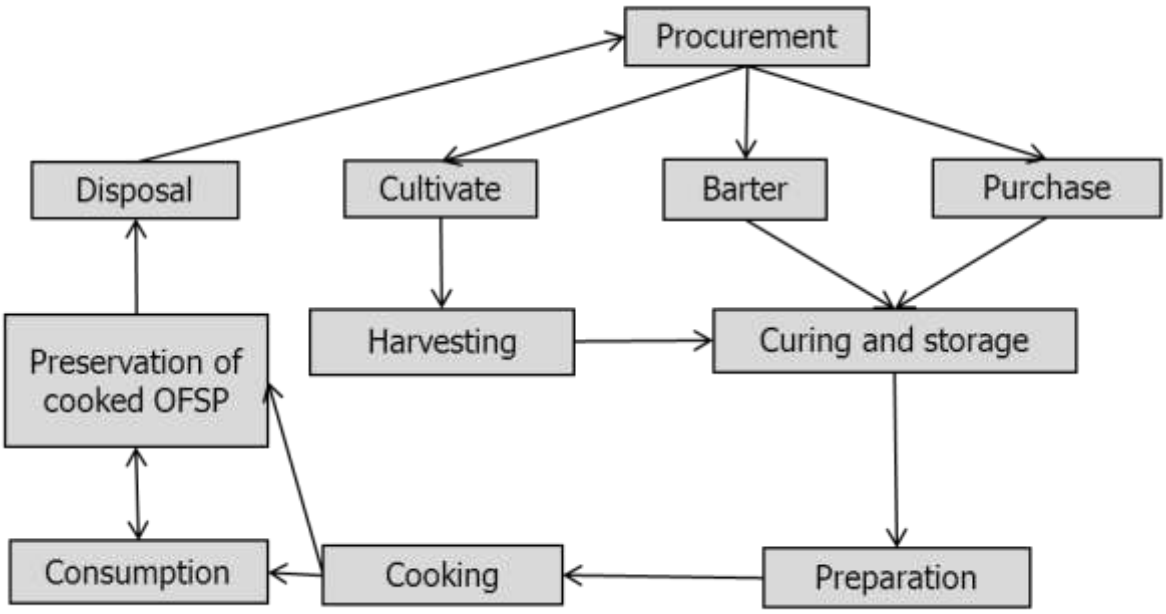

FIGURE 4.2: UTILIZATION CYCLE OF OFSP

4.4 CONCLUSION

The long-term impact of the introduction of an unfamiliar-food crop as a short-term food-based intervention was evaluated in a community to alleviate food insecurity, low dietary diversity and malnutrition. From the outcomes it can be seen that while key components of access and availability were addressed during the introduction of the crop, limited information was shared on utilization of the new food crop. It is important to not only cover the full utilization cycle as part of a food-based agricultural intervention, but also to fully observe and understand current accessing and specifically cultivation strategies. This is important to identify all the barriers in terms of education and equipment outages that need to be addressed before and during implementation to ensure a positive long-term impact.

Furthermore, it is very important to involve agricultural extension officers in the process to ensure that they have sufficient knowledge not only on the cultivation component of household food security, but that the agricultural extension officers are empowered to assist communities to achieve optimal food utilization to ensure that a long-term sustainable impact can be made via a food-based approach. It is, therefore, recommended once a community has been identified that requires the implementation of a food-based intervention, that a situation analysis be conducted, after which the required interventions are compiled in the form of a robust nutrition education programme that incorporates all the elements that contribute to food security. Thus, such a programme should address access, availability and utilization of the newly introduced crop or crops in detail, and will build on enablers, as well as identify barriers to usage. This programme should then be designed to assist agricultural extension officers, who will implement and monitor the programme at community level, so that they are equipped with the required information and tools needed to not only implement the programme, but also conduct the necessary follow-up visits that are needed, and are able to address and rectify problems as they arise. The recommendation from this review is to design a training programme focussed on agricultural extension officers, applying the approach of train-the-trainers (designed to create effective, result-oriented trainers) to achieve optimal community-based outcomes, which has shown promising results in various studies (Mclelland, Irving, Mitchell, Bearon & Webber, 2002:34).

Sustainability can be achieved by increasing food access (stable local adequate food supply), encouraging home gardening (production), food availability (sufficient quantities of physically and culturally available food) through food production (by providing tools and knowledge for cultivation), and food utilization (applying nutrition and health knowledge),

educating the community on all elements of the utilization cycle, and with an integrated agricultural component.

Acknowledgements

The authors acknowledge the May and Stanley Smith Charitable Trust for funding this research. We also acknowledge Dr. Ciska Green (decd.), Hope Matla and Irene Moopa who conducted parts of the study. We further acknowledge all stakeholders (participants, fieldworkers, and agricultural extension officers) who were responsible for the success of this research, as well as the owner of Orange Farm for granting us access. A special thank you to Dr. Sunette Laurie from ARC-Roodeplaat for her assistance with the establishment of, and community training in the gardens.

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CHAPTER 5

RESEARCH FINDINGS ON THE DEVELOPMENT OF AN EDUCATIONAL FRAMEWORK (ARTICLE 2)

Article accepted by the African Journal of Agricutural Research on 17 May 2012.

*PLEASE NOTE THAT THE REFERENCING OF THIS ARTICLE REFLECTS THE REQUIREMENTS OF THIS JOURNAL

Design of an educational framework in introducing an unfamiliar food crop into a farm worker community for ensuring food security

ABSTRACT

Objective

To design an educational framework in introducing an unfamiliar food crop into a farm worker community based on the utilization cycle as a food-based strategy, integrating both agricultural and nutritional components for ensuring food security. To empower people to improve their food security based on an in-depth understanding of current practices utilizing known food crops.

Setting

A rural farm worker community in the Free State Province, South Africa.

Outcome measures

An educational framework was designed to guide the nutrition intervention strategy. This strategy was based on information gathered on utilization of spinach (known crop) and was then applied to design a training manual for the intervention using an unfamiliar crop (orange-fleshed sweet potato (OFSP)) in collaboration with agricultural extension officers.

Results and Discussion

The community was explored at grass roots level, and the current utilization patterns of spinach were observed. Behaviours, habits and drivers behind utilization were identified, as well as tools and equipment available. This was combined with theory of what could drive optimal utilization to design an educational framework for a food-based intervention. The framework was tested and refined by exposing agricultural extension officers to it. The design of the strategy is a problem-solution format, and consists of 4 phases:

1. *Addressing shortcomings of current diet – not providing the minimum daily requirements for various vitamins and minerals as per the findings of the National Food Consumption Survey (NFCS);*
2. *Addressing the main underlying cause – in this case low consumption of fruits and vegetables and low dietary diversity;*
3. *Proposed changes – inclusion of OFSP in their diets to not only increase dietary diversity but to also improve vitamin A status; and*
4. *Desired outcome – Optimal utilization of OFSP via home garden cultivation.*

Conclusions

By observing the current strategies applied to the utilization of food crops, a framework was designed that was suitable for the unique local situation of a community to ensure maximum acceptance and application of unfamiliar food crops. By involving agricultural extension officers in the process, the strategy was refined to be used by trainers in any rural community to implement introduction of a new food crop to support the community in utilizing the new food crop and to ultimately improve dietary diversity.

Keywords

- *Food-based approach*
- *Home gardens*
- *Utilization cycle*
- *Educational framework*
- *Agricultural extension officer*
- *Rural farm worker community*

5.1 INTRODUCTION

Food-based approaches are currently being utilised in many studies in many parts of the world to alleviate food insecurity and malnutrition. Currently, there is an abundance of agriculture-based frameworks available, however these are not focussed on nutrition information or dietary behaviours (Morris, Briggs & Zidenberg-Cherr, 2002). At the time of this study, no widely tested curriculum could be found that links nutrition lessons to growing vegetables in the garden (agriculture) – especially if new food crops are introduced (Faber & Van Jaarsveld, 2007).

The South African National Food Consumption Survey (NFCS), conducted during 1999, identified a monotonous diet with a lack of intake of nutrients such as vitamin A, iron and iodine, especially amongst children (Labadarios, 2000). The national prevalence of vitamin A deficiency among 1-9-year-old children in South Africa was found to be 64% (Labadarios, 2000). This could be alleviated by the increase in consumption of vitamin A rich fruits and vegetables as a food-based approach. According to Heim, Bauer, Stang and Ireland (2011), the home food environment may be the most prominent environmental factor influencing a child's eating behaviours, as home availability and access to fruits and vegetables have, amongst other things, been associated with children's fruit and vegetable intake. There is a worldwide acknowledgement that a link exists between poor food choices and nutrition (Zeidan, 2007).

5.1.1 Support for food-based strategies

The most effective and sustainable way to alleviate vitamin A deficiency is through food-based strategies (Underwood, 2000). This can be achieved by: dietary diversification (food supplementation, horticultural interventions, management of proper distribution, and availability of vitamin A rich foods), nutrition education on all issues related to vitamin A (e.g., sources of vitamin A, importance of and need for vitamin A, methods of obtaining vitamin A rich foods, and community involvement and participation in the process), and food fortification (identification of foods that can be fortified, development of proper cost-effective methods taking into account local food tastes and availability, and development of a mechanism to reach the most needy) (Chakravarty, 2000).

Food sources of vitamin A or provitamin A (ß-carotene) that are new in the local food supply, must be introduced with education or media techniques in ways that make the foods culturally acceptable to both the community and the individual (Kuhnlein, 2000). Kuhnlein (2000) also states that identification of the food resources, their methods of preservation, preparation for consumption, as well as knowledge of the amounts of the food consumed by vulnerable groups, must be recorded for their potential contribution to food-based programmes. However, introducing people to new crops and/or new food products does not necessarily result in their adoption for cultivation and/or consumption thereof. Low *et al.* (2007) states that food-based approaches have been found to play a promising role in integrated strategies, but that many knowledge gaps still exist, specifically on efficacy, effectiveness, cost-effectiveness and sustainability.

A food-to-food fortification approach assumes that there are locally available naturally rich food sources of vitamin A that are currently being under-utilised, and it encourages those

preparing meals to incorporate these foods into their vitamin-A poor diets (Underwood, 2000).

To some, food-based strategies suggest only homestead gardens, which, they argue, are not a sustainable intervention for micronutrient control on a national scale. Food-based strategies should be viewed as encompassing the total food chain from production in gardens or fields, to procurement from local or centralized markets, to processing commercially or domestically in preparation of meals, to consumption within or outside the home (Underwood, 2000).

5.1.2 Successes and failures of food gardens

A small-scale pilot study by Faber *et al.* (2002a) aimed at increasing the production of yellow and dark-green leafy vegetables to increase the serum retinol concentrations of 2–5-year-old children in South Africa was developed as an integrated health and gardening system, and was adapted to local conditions and gardening practices, thus making the model viable in the rural African context. The children's caregivers were trained by nutrition monitors. The nutritional education component of the food production programme focussed on the relation between vitamin A and health, the identification of vitamin A rich foods, cooking methods, and the importance of a home garden as source of vitamin A rich foods. The results were that 20 months after implementation of the home gardening project, approximately one-third of all households in the experimental village had a project garden. Maternal knowledge regarding vitamin A nutrition, the frequency of consumption of yellow and dark-green leafy vegetables, and the serum retinol concentrations of 2–5-year-old children were more favourable in the experimental village than in the control village. The home gardening project strengthened existing gardening activities, and it was recommended that the yellow and dark-green leafy vegetables be planted in addition to existing crops, thereby increasing the variety of vegetables available (Faber *et al.,* 2002a).

Low *et al.* (2007) designed a study with the aim to assess whether an integrated package of agriculture, nutrition, and market interventions focussed on introduction and promotion of OFSP could increase vitamin A intake and serum retinol concentrations in young children in Mozambique. The new varieties were well accepted by farmers and by consumers, including targeted children. In intervention areas, mean sweet potato plot sizes were nearly 10 times higher and OFSP emerged as the least expensive source of vitamin A in local markets. Nutrition knowledge increased in both men and women in the intervention area. For intervention children, the 24-hour recall data suggested that OFSP was a major source of vitamin A, providing 90% of vitamin A for those children who consumed OFSP the previous

day and 35% for intervention children overall. Median vitamin A intakes were much higher for children in intervention areas compared with control areas. OFSP was eaten regularly by intervention children during the harvest season.

Even gardens implemented at schools have shown very positive results. In a study by McAleese and Rankin (2007), garden based activities together with nutrition education resulted in significant increases in fruit and vegetable consumption amongst school children. In addition, vitamin A, vitamin C, and fibre intakes showed significant increases. These results show the importance of hands-on activities when attempting to change nutrition-related behaviour such as fruit and vegetable consumption, building self-efficacy regarding the preparation of fruits or vegetables, increasing nutrition knowledge and awareness. Home gardening has multiple benefits, and many studies focus on narrow achievements only and fail to account for other successes (Niñez, 1984; Von Braun, 1993). If all benefits are considered, the benefit: cost ratio of gardening projects will probably be more favourable than alternative interventions. Dietary supplements and fortified foods have their place in clinical management, but their overall efficacy, due to costs and the capability of poor communities to sustain fortification and supplementation programmes, remains highly debatable (Zotor & Amuna, 2008). With fortification, there are limits to the amount of some micronutrients that can be added to a foodstuff due to their cost and their effect on the sensory properties of the food (Allen, 2008). Fortification of home produced foods is difficult, and, therefore, limits the potential reach of this strategy to the neediest of the population. Compliance with supplementation programmes is notoriously poor, and apart from some specific situations (such as supplementation of pregnant and lactating women, or children in school), these programmes have been relatively ineffective. Supplementation also increases the risk of micronutrient interactions and adverse effects (Allen, 2008).

There are advantages in utilising commonly-accessible, affordable, identifiable food sources and processing methods that are familiar and culturally appropriate to poor communities. There is also evidence that natural food sources of nutrients are better absorbed than expensive synthetic supplements (Zotor & Amuna, 2008).

Dietary strategies should also be viewed from a local or regional perspective as local opportunities can be tapped where these exist, not attempting to force the same strategy where the context is not receptive (Underwood, 2000). A national unified approach is often difficult due to variable conditions and resources, and, therefore, local adaptations are necessary requiring local planning where management skills may be lacking. Advocates of gardening cite evidence that home gardening can be a sustainable strategy to improve food security and household incomes when gardens are well adapted to local agronomic and

resource conditions, cultural traditions and preferences (Midmore, Ninez & Venkataraman, 1991). Supporters of gardening do not refute the evidence of mismanagement of gardening projects. Many supporters of gardening believe that mismanagement and lack of sustainability are largely results of failure to invest the necessary resources in understanding the existing garden system in the context of changing household objectives (Niñez, 1984; Brownrigg, 1985; Midmore *et al.,* 1991). Therefore, "improved" gardens are planned and developed for which the effort and costs for the household often outweigh the benefits, leading to eventual abandonment of the gardens after the project subsidies terminate.

A different approach to food gardening and an understanding of the traditional gardening system is vital for success. If improved gardens are built on the characteristics and objectives of traditional gardens in the region, many resource constraint problems could be anticipated and avoided (FAO, 1997). Even in communities that have not traditionally gardened, exploration of nearby communities that do garden can give a more thorough understanding of the constraints (whether climatic, economic or cultural) that have inhibited gardening in the past. Once a good understanding of current gardening practices, constraints and objectives is established, project promoters and households can design appropriate improvements (FAO, 1997).

One such knowledge gap became clear in a farm worker community in the Free State Province of South Africa, where an OFSP crop was introduced as an agricultural strategy to improve food availability particularly of vitamin A rich vegetables. The aim of this strategy was to increase the production and consumption of vitamin A rich vegetables, thereby improving dietary diversity. A community garden was established, and community members were trained in the cultivation of OFSP in their own home gardens (including preparation of the soil, irrigation systems, and fencing of the gardens), as well as food preparation with vitamin A rich vegetables, and by finally demonstrating the outcome with a meal prepared with vitamin A rich vegetables. All the food was prepared utilizing community recipes but replacing one of the ingredients with OFSP. The meal consisted of a traditional relish made with OFSP, OFSP served as a cooked vegetable to which butter and sugar was added (to increase availability of the vitamin A) and as part of a stew containing chicken. Stiff maize meal porridge as the staple food choice was prepared by the community and served with the meal. The members of the community who partook in the meal, expressed their appreciation of the acceptability of the taste and texture of OFSP at the time. However, in the following months, they failed to continue cultivating the crop despite the introduction, resources and training provided. The local agricultural extension officer who should have provided support and guidance regarding the food gardens and subsequent food utilization also failed to do so. Upon further investigation it became apparent that the community members were not

utilizing this new food crop appropriately. This was likely due to insufficient education on the crop, its lifecycle and uses. This community concluded that the crop did not survive in the gardens because the leaves were no longer visible, due to grazing livestock such as chickens and goats that could access the area occasionally. They assumed that the OFSP roots had also perished and that OFSP was, therefore, not a suitable crop to cultivate in this area. The agricultural extension officer also failed to encourage continuous production of the crop as she also lacked information specific to this crop which she could utilize to educate the community.

In view of these findings, it was concluded that re-implementation of training or nutrition education through a food-based approach using an educational framework designed for the specific community could ensure success in terms of vitamin A intakes, dietary diversity and subsequent household food security. By educating primary food producers, persons responsible for food preparation and persons supervising these activities, the under-utilization or non-utilization of OFSP would no longer be an obstacle preventing consumption of vitamin A rich foods and dietary diversity in this community. It was also apparent that it is necessary to cover all elements of the food utilization cycle to ensure that nothing is left out in terms of education that will hinder utilization. Here, a simple concept of leaves that did not last lead to non-utilization. Throughout the utilization cycle, there could be many other such obstacles or barriers that could hinder utilization and could in turn impact on food security. The full utilization cycle also impacts the nutritional quality of the crop, thus there is a dual benefit of designing the educational framework to cover all aspects ranging from garden preparation to disposal. This realization led to the design of the food-based approach to successfully re-introduce OFSP to improve the nutritional status of a community, firstly by training-the-trainers responsible for sustainability of the food crops in the rural communities.

5.1.3 The role of supervisors and change agents

At present, it appears that many interventions lack a change agent that can play an active role (FAO, 1997). Training materials designed for agricultural extension are crucial to increase the quality of these interventions. A study by Hoque and Usami (2008) suggests that providing training programme planners with relevant information is crucial to design a more effective training programme for agricultural extension personnel. Another study in Pakistan showed that agricultural extension officers need in-service training to increase their work efficiency (Malik & Khan, 1997). Effectiveness of interventions in many cases depends on staff capacity and attitude, which can be developed through training, visits to successful sites and participatory meetings (Goodman, 2004). In a study conducted in Bangladesh by Helen Keller International, the extension staff was trained in the cultivation of primarily

indigenous vitamin-rich vegetables using low-cost, low-risk methods for home gardening, and the average weekly per capita vegetable consumption for target households increased from 5.8 to 7.5 kg (Marsh, 1998).

In another study by Dirorimwe (1998), trainers and extension workers were trained in basic and new concepts in nutrition; the household food security concept and how this is locally perceived; crop, livestock and dietary diversification; management of small animals; common forms of malnutrition, including their detection and monitoring; diarrhoea prevention and management; and community participatory planning and implementation of household food security and nutrition interventions. For these sessions a training manual was produced through a consultative process to facilitate the training of the extension workers and the communities. These materials served as a reference for follow-up training. The participatory and multi-disciplinary approach to appraising the household food security and nutrition situation was a revelation for extension workers who were often used to working solely on issues in their technical areas, using a top-down delivery of messages or packages of technological options.

Therefore, the aim of this study was to illustrate how a food-based intervention can be designed that integrates both agricultural and nutritional components, empowering those involved. It further aimed to integrate those unique traits and behaviours that form the basis of behaviour modification and training-the-trainer, in this instance, the agricultural extension officer. A food-based strategy was designed for a specific community-based on an in-depth understanding of the current situation, and was piloted with agricultural extension officers to confirm that the designed educational framework and resulting training manual could be utilized to introduce the unfamiliar crop OFSP to any community that may require food garden training in future. The food-based strategy was designed according to the food utilization cycle, to ensure that the training provided was systematic and incorporated all the relevant information, and care was taken to ensure that the training would be transmitted to the community in the same sequence in which it was deployed for ease of understanding.

The focus was on increasing food access (stable local adequate food supply), by encouraging home gardening (production), food availability (sufficient quantities of physically and culturally available food), through food production (by providing tools and knowledge for cultivation), and food utilization (properly used by applying nutrition and health knowledge). This was done by designing the food-based strategy to educate the community in all elements of the utilization cycle, and by adding an integrated agricultural component to ensure sustainability.

5.2 METHODOLOGIES

5.2.1 Setting & design of the educational framework

The population that was studied to design the educational framework to introduce a new food crop was a farming community in the Free State Province of South Africa, on a farm in the Fouriesburg district. The farm (situated between the towns of Clarens and Fouriesburg in the north-eastern part of the province on the R711 main road), covers an area of 1500 hectares, and produces a variety of commodities like crops (maize, wheat), cattle and sheep for commercial purposes, fruit (apricots and peaches, etc.) and walnuts for use in a guest house on the farm. The farm receives an average rainfall of 780mm per year. Constraints to farming include drought and hail. Labour on the farm is the main source of income and an average income of R600 ($75) per month per household was calculated at the time of the study. Households consisted of seven members on average, and thus these people live below the common international poverty line of $1/day as defined by the World Bank. The male community members were employed as farm workers, while some of the females were employed in the guest house operating on the farm. Employment on the farm increased their access to available foods, specifically to the women working in the guest house, and thus the variety of their diets. However, the diets of their household members were less varied.

Information needed to design the educational framework for the food-based intervention was gathered by interviewing adult women responsible for food preparation living in farm worker households on the farm, observing their habits and practices within the household in relation to food access, availability and utilization. Subsequently, the framework was designed and refined during a workshop with agricultural extension officers. The educational framework was presented, discussed and finalized at the workshop so that it can be used as an educational tool.

5.2.2 Baseline data

To design an educational framework that adheres to current and existing practices within a community, it was decided to investigate the food utilization cycle of a known food crop (spinach) and to use this as a basis to develop and introduce a food utilization cycle for a new unfamiliar food crop (OFSP). This approach is more likely to result in success, and was done in four stages as shown in Figure 5.1.

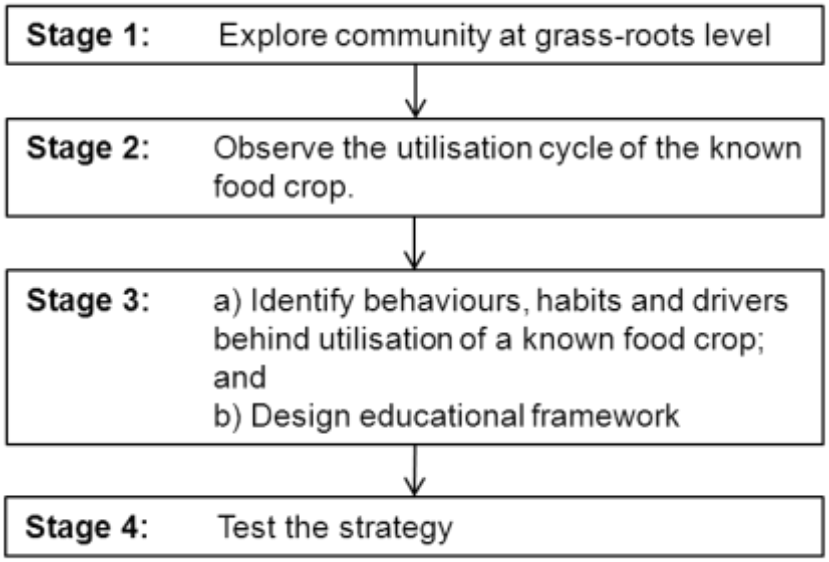

FIGURE 5.1: METHODOLOGY TO DESIGN AN EDUCATIONAL FRAMEWORK

Stage 1 – Explore the community at grass roots level to ensure appropriate data is gathered to build the strategy.

Three focus group interviews were conducted on current food utilization patterns of spinach (commonly used) and white-fleshed sweet potato (known, but not planted/cultivated; orange cultivar unfamiliar). The women were asked to describe how they currently utilize these crops to understand what actions the women take during each phase of utilization, from access to consumption. The women were asked to describe which tools and methods they apply, and who participates in all the various activities.

Stage 2 – Observing the utilization cycle of the known food crop.

Subsequently, the women were asked (independently of each other) to demonstrate in their own food preparation area, all the steps they follow in the food provisioning cycle, from acquisition to disposal, to directly observe current practices regarding spinach and OFSP.

Stage 3 – Identifying behaviours, habits and drivers behind utilization of a known food crop, and combining these with theory to design the educational framework and training manual for a behaviour change approach.

Data from the focus group interviews and the observations was transcribed and categorized under themes within the food utilization cycle. This information was then used to design an appropriate educational framework and resultant training manual to improve the utilization of an unfamiliar crop (OFSP).

Stage 4 – Testing the strategy by exposing knowledgeable agricultural extension officers to it, and adapting where necessary.

The strategy was tested by exposing agricultural extension officers who are active trainers in communities where food insecurity and malnutrition exist to it. These officers then provided input on the general approach, the re-application potential of the educational framework and identified areas for improvement. This was conducted during a workshop, and the educational model was explained to the agricultural extension officers who have been involved in the cultivation cycles of various products, including OFSP, and in community level food-based interventions.

Following this stage, the training tool was finalized for general use by agricultural extension officers.

5.3 RESULTS

5.3.1 Formulation of the educational framework

Based on the successful results of an approach where local gardening practices formed an important component of an intervention, and where health, nutrition and agricultural education were integrated, the educational framework for the nutrition intervention was designed according to the steps as outlined in Hoelscher, Evans, Parcel and Kelder (2002) in the following phases:

a) Needs assessment

Knowledge was gathered about the problem and the population. This was done by reviewing the data collected through this study as well as a review of the baseline data collected during other studies. Relevant national surveys were also studied; in this case the South African NFCS (Labadarios, 2000).

For the purpose of this study, spinach was selected as the crop that is most widely consumed to be able to draw conclusions about the specific needs of this community. Key findings are summarised in Table 5.1.

TABLE 5.1: FINDINGS RELATING TO THE UTILIZATION OF SPINACH

Category	Conclusion	To be included
1. Food accessing strategies	• The community already cultivates their own crops and have access to land to produce home gardens, although not optimally. • Home gardens are not a new concept. • They produce only a limited number of fruits and vegetables and they have a shortage of such during certain months of the yar.	• Home cultivated produce needs to be expanded and quantity increased for sustained incorporation into their diets. • Hardy crops that can be a food source all year round
	• The community relies heavily on purchasing as their main food accessing strategy. They, however, mainly access foods that they do not cultivate at home by means of this strategy. • They have severe monetary constraints.	• Increased dietary diversity at little or no cost to the community. • Variety of potential uses for crops they are introduced to that could also potentially reduce their spending on other food categories.
2. Types of food accessed	• A variety of foods is consumed, but their overall weekly dietary variety remains low.	• Introducing a crop that satisfies all their needs to increase dietary diversity.
	• Their diet relies heavily on starchy foods and vegetables.	• OFSP, although a starchy food – has many nutritional advantages - specifically bio-available vitamin A.
	• The crops that the community currently cultivate indicate that they are more likely to produce more hardy crops that require little human involvement and offers resistance to environmental and weather changes (such as pumpkin, potato and beetroot), or crops that offer versatility in use (such as spinach, tomato and cabbage).	• They need a crop that is hardy and versatile in use.
3. Food production	• They produce a variety of crops, however spinach is the only crop that is truly produced all year round by some women and less often by others (but overall, spinach remains the most produced crop). • They find the crop tasty, versatile and nutritious.	• The community has a need for a similar crop that fits into their current habits and practices.
4. Food gathering	• The women currently rely on wild leaves from the surrounding field to supplement the cultivation of spinach. • They did not attempt to increase production from their garden to increase the availability of leafy vegetables.	• The women could access foods from their cultivated gardens. • They could easily access vegetables on a continuous basis, and would not need to walk long distances in search of wild leaves.
5. Food preparation & consumption	• Very little work is required to prepare spinach. • It is consumed by the whole family.	• They need a crop that can be easily prepared and will be well accepted by all.
6. Dietary diversity	• The community has poor dietary diversity which worsens during certain months of the year. • They consume mostly starchy foods with lower micronutrient content, including vitamin A.	• The introduction of any crop that can be easily home produced. It will be particularly effective in the warmer months when only tomato, cabbage, onion and potato are produced – none of which contain high levels of vitamin A.

b) Objectives

The objective was to design an intervention by providing both verbal (in the form of a workshop) and written (posters) information that:

Increases the nutrition knowledge and awareness of the community, as well as the policy-makers, by providing information on:

- the relationship between diet and health (and a varied diet to prevent malnutrition);
- the relationship between nutritional and health status, individual productivity and national development;
- the nutritional needs of the population and of individuals (as described in the food-based dietary guidelines);
- the importance of ensuring the quality and safety of the food supply; and
- the causes and consequences of nutritional disorders.

Promotes desirable food behaviour and nutritional practices by providing information on:

- the nutritional value of foods (current diet vs. proposed diet including OFSP);
- the components of an adequate diet (food groups and portion sizes);
- making appropriate food choices and purchases from available resources;
- hygienic food preparation and handling;
- storage, processing and preservation of food; and
- equitable intra-household food distribution according to the nutritional needs of family members.

Increases the diversity and quantity of family food supplies by:

- providing information on methods of improving food production;
- crop selection and diversification;
- proper storage, preservation and processing; and
- conservation of nutrients during food preparation; and the prevention of food wastage.

c) Developing an educational framework for the nutrition education intervention through intervention mapping.

To design effective interventions the determinants of food choice need to be identified and matched with relevant intervention strategies grounded in a theoretical framework that is most likely to produce positive changes in these mediators (Zeidan, 2007). The steps that were followed are:

Defining proximal programme objectives: Desirable behavioural and environmental outcomes

This strategy focusses on a nutritional message (the benefits of a varied diet), and how OFSP can be optimally utilized to improve dietary diversity and reduce vitamin A deficiencies. It should encourage and motivate all adult female community members to participate in and collaborate within the intended intervention. For families who do not consume OFSP, the programme should encourage them to include the product in their diet. For families who do consume OFSP or white-fleshed sweet potato, it should encourage them to increase consumption of OFSP to:

- Increase dietary diversity;
- Increase nutritional knowledge, specifically that of vitamin A rich foods;
- Improve and alleviate food insecurity amongst the community;
- Build on the current knowledge base; and
- Enforce any current nutritional knowledge.

Delineating intervention methods from theory and translating the methods into practical strategies

To translate the theory into a strategy, the health belief model was applied. This model proposes that several factors affect whether or not people change their behaviour. These include the following: First, evaluation of their own susceptibility to a certain condition, second how serious the consequences of the condition would be, and then, whether a change in behaviour would prevent the condition, and finally, whether the benefits of the change exceed the costs of taking action (Zeidan, 2007). In this study, vitamin A deficiency was used as the basis to communicate the intervention to the target population to encourage OFSP cultivation and utilization. To assess how this can be communicated and applied, spinach cultivation and utilization was studied.

5.3.2 Results relating to the current utilization of spinach

The findings with regard to the utilization of spinach were incorporated into the educational framework as shown in Figure 5.2 to reintroduce the unfamiliar crop OFSP.

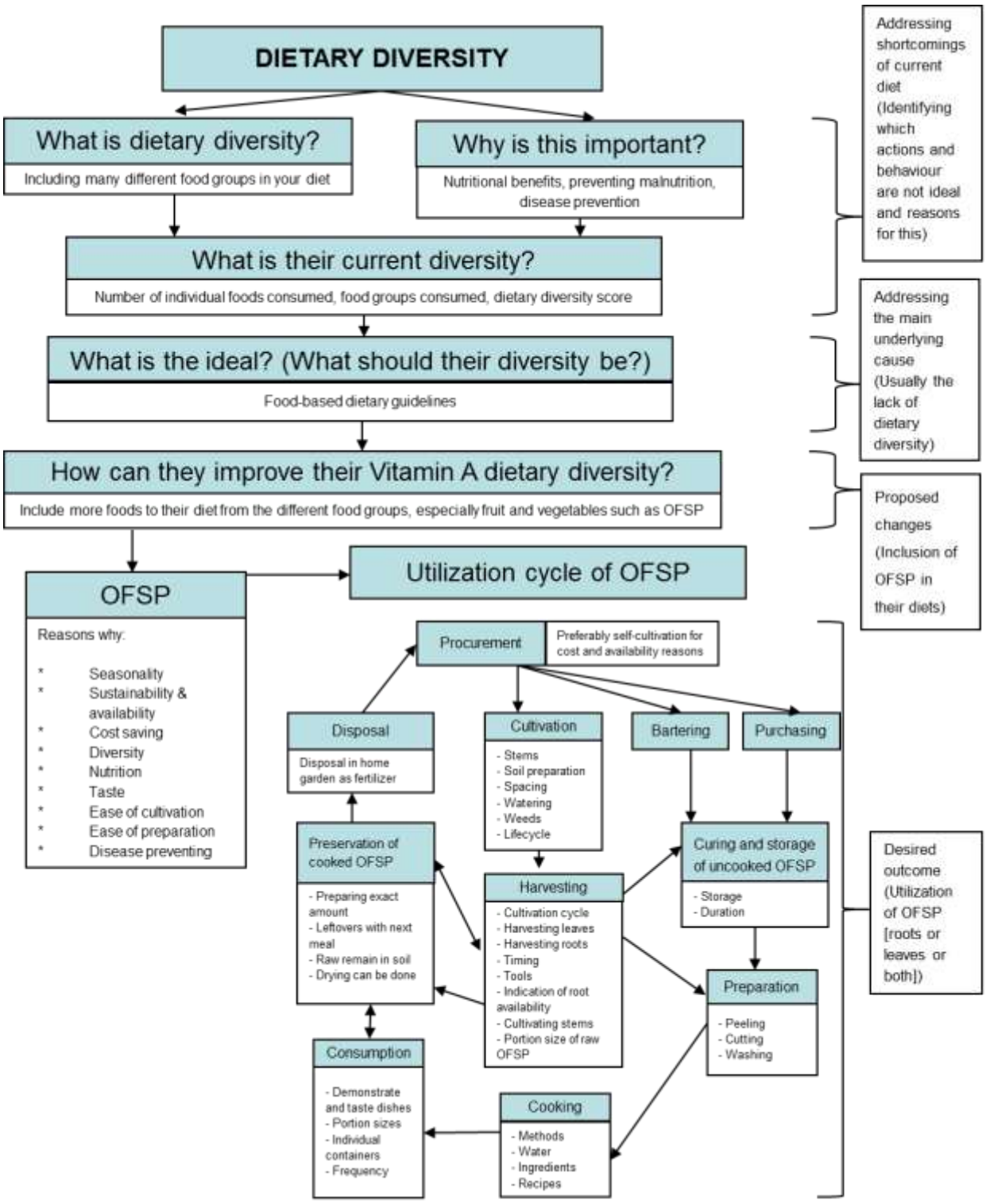

FIGURE 5.2: EDUCATIONAL FRAMEWORK FOR THE INTRODUCTION OF OFSP

General usage habits and beliefs

Spinach is consumed often, two to three times per week. Women mentioned the following reasons for this: the crop is nutritious, it helps to prevent disease, it is a convenient food and is also tasty. Thus, OFSP can be introduced by:

- Explaining the benefits of the crop in terms of micro- and macronutrients;
- Explaining the nutritional benefit by creating the linkage between the macronutrient or micronutrient and commonly known and experienced diseases;
- Demonstrating techniques and recipes that are easy to prepare with the tools and equipment that are available in the community;
- Ensuring that the prepared recipes and products are palatable and tasty.

Procurement

Spinach is currently continuously harvested from home gardens as needed. This is done because the women realize spinach is cost saving, and they plant it regularly to ensure availability. Consequently, the following should be taken into consideration regarding the introduction of OFSP:

- Emphasize that this crop also requires no monetary input if they continue to cultivate it and plant stems;
- Ensure that the crop is self-sustaining by providing stems during introduction, and teaching the community how to cultivate and plant the stems continuously in an active nursery garden.

Cultivation

The main steps of cultivation were covered as outlined in Faber *et al.* (2006). Spinach is traditionally cultivated from seeds. Before the women plant the seeds, they prepare the soil by loosening and watering it. They evenly space the seeds, cover them with soil, and water them. Thereafter, the women water the spinach daily and remove weeds when necessary, to ensure the plant remains healthy, which in turn will ensure continuous availability. Based on this, the following should be kept in mind when OFSP is introduced:

- Stems should be supplied for the first round of planting, and women should be shown how the stems are prepared;
- Soil preparation should be discussed, with specific focus on continuous enrichment as this is not currently practiced;
- Spacing of plants should be covered as different crops require different spacing;
- Timing of watering and quantity of water should also be covered as this is very crop specific;
- The women should be encouraged to continue removing weeds, however they should be provided with a reference of the leaves of the OFSP plant to ensure they are not mistaken for weeds and removed;
- The life cycle of the plant should be explained to ensure that the community or women understand the differences compared to spinach, including time lapse

between planting and harvesting, continuous harvesting of both roots and leaves, and removal of the complete plant that would require stems to be replanted or utilization in the nursery.

Harvesting

The women currently harvest by hand as there are few tools available, and with manual harvesting no tools are required. The crop is harvested as needed for a meal as the community has no storage facilities. However, they do practice sun-drying of any excess leaves. The women judge when the plant is ready to be harvested based on the size of the outer leaves, as they use the leaf size as the indicator for readiness. The full plant is never removed, only the outer leaves, and it is then left to grow new leaves. The women know from experience that approximately 30 leaves are sufficient to prepare a relish for a family of five. Based on this, the following would have to be included in the re-introduction strategy:

- Women should be educated about the cultivation cycle of the crop to ensure that they know when it is ready for harvesting;
- Harvesting of both the OFSP roots and leaves has to be demonstrated, and tools such as pitch-forks and spades have to be made available for this;
- Women should be encouraged to harvest as needed, and to leave the remaining roots in the soil;
- Part of the education should focus on the leaves of the crop that can also be prepared as a relish. It must, however, be pointed out that the plant may perish if all the leaves are removed, much like the spinach plant.
- Women should, however, understand that even if no leaves are visible, viable roots may remain in the soil;
- Women should be taught that if all the roots are removed, some should be kept to cultivate new stems;
- Teach women how many roots and which sizes are needed in the raw form to prepare a meal for their families. 0.5kg will yield approximately 3 portions (Ceserani, Kinto & Foskett, 1995).

Preparation

Spinach leaves are washed in water to remove soil. Afterwards, stems and stalks are removed, as the women perceive these parts to be less-digestible. The spinach is then chopped for ease of cooking, consumption and digestion. Consequently the following should be covered by the strategy as outlined by Bennion (1995):

- Washing is essential as it removes dirt, pesticide contaminants, microorganisms and mycotoxins;

- Spoiled and discoloured portions should be trimmed off;
- If the skin is removed, it should be scraped, not peeled because most of the nutrients are located underneath the skin;
- If the skin is too thick to be scraped, then the OFSP should first be cooked before peeling to retain nutrients;
- Using a sharp knife for cutting also ensures that the minimum amounts of nutrients are lost. A blunt knife used during the preparation of vegetables will cause a decrease in the Vitamin A content as it will rupture the plant cells which will cause seepage;
- Washing after the OFSP has been cut will lead to more nutrient losses as it will dissolve in the water. The crop should be properly cleaned before cutting;
- Soaking the roots in water before cooking will also lead to nutrient losses as it will dissolve in the water;
- If OFSP is chopped or cut up, smaller pieces will expose a larger surface area, which will lead to more losses during cooking due to oxidation or seepage;
- The sweet potato should be cooked immediately after cutting or peeling because it may discolour while standing.

Cooking

Women usually boil the spinach or steam it without water, for ease of consumption and digestion. They know that spinach generates a lot of liquid when it is steamed, and if the water should boil away they would add more. They then add ingredients such as other vegetables, spices, oil, milk and eggs, to make the spinach tastier and because healthcare professionals have in the past taught them to do this to increase the nutritional value. They cook the spinach for approximately 30 minutes to soften it sufficiently to be used as a relish with maize meal porridge. Based on this the women should be educated regarding:

- Various cooking methods. Roasting OFSP over the coals is a very easy method, but can destroy most of the nutrient content. Baking in the skin will retain the most vitamin A. Vitamin A appears to be less stable when heated in a water medium than when heated in a dry state (Bennion, 1995);
- The amount of water that should be added must be limited to ensure that nutrient losses are kept to a minimum (Bennion, 1995);
- The benefits of adding additional ingredients (such as oil, butter, sugar, tomato) to increase the nutritional value of the OFSP and enhance its versatility;
- The approximate cooking time of OFSP to ensure that it is not overcooked which could lead to further nutrient losses;

- Cooking temperature is vital. Because vitamin A is heat sensitive any intense or direct heat will lead to increased losses (Bennion, 1995).

Consumption

Spinach is served together with other starchy foods such as 'pap' (thick maize meal porridge) that forms the basis of most meals in this community (staple food). All household members consume spinach as they believe it is tasty, nutritious and helps to prevent disease. The family's meals are served in individual containers, and the women know that the approximate portion size for a spinach relish is 3 tablespoons per adult. This can be reapplied by:

- Demonstrating the preparation of various OFSP dishes that can accompany starchy foods such as 'pap', bread or potato in a sweet or savoury relish;
- Encouraging all household members to taste the dishes and to continue consuming the product;
- Advising that any dishes prepared for the household should be served in individual containers to ensure that each family member receives the correct portion size;
- Demonstrating the importance of serving the correct portion sizes (1/2 cup of cooked OFSP per person) (Whitney & Rolfes, 1999); and
- Encouraging frequent consumption of the crop.

Preservation

The women knew of only one preservation method for spinach as they tend to harvest as needed and any food is seldom left after a meal. They would roll the leaves into balls and sun-dry them. The resulting product was found to be quite sour and not pleasant tasting. Very few of the households have access to a refrigerator or a freezer; hence they were in the habit of consuming all the food that is prepared. Considering this, the following should be incorporated into strategy:

- Women should be encouraged to prepare the exact amount required for a meal for their families as there is no preservation method they can apply with the tools and facilities at their disposal;
- They should be encouraged to cover any left-over cooked OFSP and to consume it with the next meal;
- Raw OFSP should be left in the soil (Faber *et al.,* 2006), however if it has been harvested/purchased it should be stored in a cool dry place until prepared;
- Teach the women that the crop can also be dried as a method of preservation to ensure access during the few months during which it cannot be cultivated.

Disposal

Women disposed of spinach stalks that they removed during preparation in either the garden or regular household waste. Women should be encouraged to dispose of any OFSP peels or leftover OFSP in the garden as a form of compost.

Designing the programme and producing the intervention materials:

Based on work done by Lytle and Perry (2001) relating to theory driven healthy behaviour change programmes and other planning models, the importance of theory-based and systematic planning of interventions was identified. Planning models help practitioners develop programmes step by step using theories to explain and address health problems (Zeidan, 2007). Hence an educational framework was designed to guide the nutrition intervention strategy. This strategy was based on the information that had been gathered on utilization of spinach and was then applied to design the training manual for the OFSP intervention.

5.3.3 Planning for programme adoption and implementation

The implementation and evaluation of this strategy was done concurrently in collaboration with agricultural extension officers, to improve the strategy before its implementation at community level by these trainers. Agricultural extension officers are active as trainers in the communities, support local gardening practise, and are aware of restrictions and limitations which result from a lack of education, resources and facilities. The strategy was presented to them in a training manual format to illustrate how the strategy would be implemented, and a workshop was used to facilitate the discussions. The training manual was prepared according to the flow of the educational framework. The overall implementation of the strategy is a problem-solution format, and was formulated in four phases, and was also explained in these steps:

1. Addressing shortcomings of current diet (Identifying which actions and behaviour are not ideal and reasons for this);
2. Addressing the main underlying cause (Usually the lack of dietary diversity);
3. Proposed changes (Inclusion of OFSP in their diets); and
4. Desired outcome (Utilization of OFSP roots or leaves or both).

The session commenced with a discussion on the current approach of introducing food gardens to communities. The groups found that there are in most instances various shortcomings in terms of education provided to the community. It was then proposed that a strategy such as the one that had been designed be applied within their communities. An explanation was provided that this approach is based on an understanding of the habits,

practices, knowledge, beliefs and constraints within the community, and to uncover these it is best to study an existing widely consumed crop. The manual encourages the use of group interaction and visual aids which are also provided in the manual because this makes it easier to involve the illiterate consumer. It was discussed that the target for implementation would be those household members responsible for food preparation.

The steps in the training manual, the overall approach, the tone of the messages, the visual aids, and the timing of implementation were discussed. The agricultural extension officers assisted in strengthening the messages based on their knowledge, making it more locally relevant, and including some additional steps or information to ensure that the deployment is tailored to the needs of the community.

5.4 CONCLUSION

The design of an educational framework for the introduction of an unfamiliar food crop to a farm worker environment was evaluated. The framework was designed by studying the community utilization patterns of a known crop and was also refined with agricultural extension officers to ensure relevance, adequate content and ease of application within the community. By observing the current strategies, a framework was designed for the unique local situation to ensure maximum acceptance and application by the community.

By involving agricultural extension officers in the process, it was possible to refine the strategy for implementation in any rural community to implement introduction of new food crops to support the community in utilizing the new food crop and ultimately improve dietary diversity. The successful tool consists of a detailed guideline of how to assess the current access to and utilization of a known food crop, including pre-work that needs to be done by the agricultural extension officer when each aspect of access or step in the utilization cycle is assessed, and visual and other aids to apply when interacting with the community to uncover information vital to the design of an educational framework.

Acknowledgements

The authors acknowledge the May and Stanley Smith Charitable Trust for funding this research. We also acknowledge Dr. Ciska Green (decd.), Hope Matla and Irene Moopa who conducted parts of the study. We further acknowledge all stakeholders (participants, fieldworkers, and agricultural extension officers) who were responsible for the success of this

research, as well as the owner of Orange Farm for granting us access. A special thank you to Dr. Sunette Laurie from ARC-Roodeplaat for her assistance with the establishment of, and community training in the gardens.

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CHAPTER 6
CONCLUSIONS, EVALUATIONS AND RECOMMENDATIONS

6.1 INTRODUCTION

In South Africa, approximately 35% of the total population is classified as being food insecure, and women, children and the elderly in particular are more vulnerable to this (Labadarios, 2000). In addition, there is a severe lack of nutrients in the diet of certain South Africa population groups, as 12% of children between 6-71 months suffer blindness due to vitamin A shortage, 20% of children between 6-71 months are anaemic, and iodine deficiencies are endemic in some regions of South Africa (Labadarios, 2000:74). The Department of Agriculture estimated that between 20% and 30% of young children suffer from anaemia and vitamin A deficiencies due to lack of access to micronutrient-rich food (Department of Agriculture, 2002). Labadarios *et al.* (2011:4) reported that the dietary diversity of South Africans is low, and particularly so in the lowest Living Standards Measurement group and amongst black South Africans. Nearly 40% of South Africans only had between one and three different food groups on the day prior to the survey; these being a cereal, meat or chicken and a vegetable other than a vitamin A rich one and that the most neglected food groups were vitamin A rich fruit and vegetables, legumes and nuts.

It was found by various researchers that local food production is sustainable (Flora, 2010:1-2). Rural food insecurity can be overcome by increasing participation of food insecure communities and households in agricultural activities as a sustainable food-based approach to control vitamin A deficiencies (Marsh, 1994 in FAO 1997:119). A more comprehensive approach to agricultural development, based on the uniqueness of local ecosystems and cultures was introduced in August 2002, at the World Summit on Sustainable Development (WSSD) in Johannesburg. Thus, there is a general acknowledgement that agricultural interventions will have more impact if they take the unique characteristics and situations of communities into account (Flora, 2010:3).

This study formed part of a research project that has been carried out on Orange Farm in the Free State Province to assess various elements of food security. Results from the literature review also informed the study and led to the challenge to design, evaluate and refine a community-based intervention model that can be used on a broad scale by agricultural

extension officers to facilitate change and adoption of new foods, with the aim to alleviate nutrition-related problems in a rural community on commercial farms in South Africa.

The population that was studied to formulate a strategy was a farming community which forms part of the larger population of the area in the Free State Province, on a farm in the Fouriesburg district (Orange Farm). There are 17 households with adult women (n=21) in this community, and all these households were included in the study. The women responsible for food preparation that lived on the farm were between the ages of 24 and 64 years, and were all included in the study.

The assessment and adaptation of the strategy was done in conjunction with experienced agricultural extension officers who serve rural communities promoting vegetable gardens. The purpose of this was to ensure that the developed strategy could be broadly implemented in various communities, but contained enough detail to guide these officers in assessing the community and their unique situation and implementing a strategy that has the highest likelihood of success. Although the strategy was developed based on what was observed and learnt from one specific community, the findings were used to develop a strategy that is generic to the implementation of an unfamiliar food crop, and that can then be refined for a specific community before implementation. The strategy was not re-implemented in the studied community as 1) they had previously been exposed to OFSP and, therefore, the results of the implementation of the strategy would not truly have reflected the potential impact and 2) the objective of this study was to develop a broader strategy based on key findings rather than to develop one for this specific community.

The research approach was exploratory in nature and can be described as prospective and descriptive. A qualitative research approach was implemented to answer the research problem of whether the food utilization patterns / strategies of a known food crop can be used to establish efficient utilization of a new, unfamiliar crop in a farm worker community. Two main data collection techniques were used, namely 1) focus group interviews and 2) direct unstructured observations. These techniques were used to collect data on the utilization patterns of spinach as a known food crop to form the basis of the design and to pre-test the strategy. The interviews were conducted by a moderator who was known and trusted by the community. The respondents were recruited through non-probability sampling, a judgmental sampling type as all women on Orange Farm were included in this study. Biographic and socio-economic information and data with regard to current dietary diversity, food accessing strategies and food production were taken from a sister-study conducted during the same time in the same community (Matla, 2007).

Biographic information: There were 18 homesteads on the farm (one homestead had a single male occupant and thus 17 homesteads were included), households consisted of seven members on average, and the women who were included were between 24 and 64 years of age.

Socio-economic information: Labour on the farm was the main source of income, with average incomes of R600 per month per household recorded at the time of the study. The community cultivated some products that indirectly contributed to their income, and those who were employed on the farm received payment in kind.

Food accessing strategies: The households living on Orange Farm used a variety of different types of foods acquired through different food accessing strategies to prevent household food insecurity. The investigation into the food diversity and methods of food access revealed strategies of cultivation, keeping of livestock, purchasing, gathering and hunting. 90% of the households cultivated fruits and vegetables for household consumption. All households cultivated vegetables all year round and 75% utilised fruits such as peaches and apricots in summer due to seasonality. The women also gathered food from the field, such as leafy vegetables (morogo) “thepe” and “sebitsa”, and they prepared these as a relish to accompany maize meal porridge (‘pap’).

Food types accessed: A variety of foods were accessed by this community by means of all the accessing strategies. With regard to vegetables, mainly green leafy vegetables (morogo) were gathered from the field while they cultivated spinach, beetroot, cabbage, onion, tomato, pumpkin, potato, green beans, turnip and occasionally white-fleshed sweet potato.

Food production: The vegetables most commonly cultivated in garden plots were spinach, green beans, pumpkin, tomato, turnip and cabbage.

All the above factors were considered when the strategy was designed. The final conclusions of this study will be presented in the following section based on the stated research objectives. The recommendations are based on these conclusions. Overall, this chapter encompasses four sections, conclusions, value of the study, evaluations, and further research possibilities and recommendations.

6.2 CONCLUSIONS

The specific research problem which was investigated, included the overlying question of whether the food utilization strategies of a known food crop can be used to establish efficient utilization of a new, unfamiliar crop in a farm worker community, based on the sub-problems outlined below. The conclusions below are grouped according to the specific sub-problem that had been identified.

6.2.1 Conclusions with regard to how all the food utilization strategies contribute to optimal food utilization of a known food crop in farm worker households on Orange Farm in the Free State Province

The overall conclusion with regard to this sub-problem is that it is necessary to thoroughly study, investigate and understand all the elements of the food utilization system, to truly understand the reasons for the observed behaviour, habits and practices. As stated by Labadarios (2000:73): "Nutrition education messages must be tailored to the current consumption patterns and desired changes therein, including improved nutrient density, hygiene and feeding practices and homegrown crops". Planning and developing a nutrition education programme should begin with the systematic analysis of nutrition and health-related problems in a given community to identify the extent to which the problem exists in a population (Summer, Briggs & Bell 1997:4). Behaviour change communication (BCC) appears in some intervention programmes, though there is no systematic approach to nutrition BCC (Iannotti & Gillespie, 2002:20). It is important to also seek understanding/clarification of all the habits demonstrated by a specific community to fully interpret and apply these as general principles for future intervention programmes.

While studying the community on Orange Farm, it was found that each step of the utilization cycle was as critical as the next in delivering optimal nutrient-rich foodstuffs to the end consumer – and all should enjoy equal attention. It was also concluded that overall utilization or non-utilization of a crop is driven by the beliefs concerning or knowledge about the crop – at each step of the utilization cycle.

6.2.2 Conclusions with regard to the formulation of a strategy that may contribute to optimal utilization of an unfamiliar crop (OFSP) as a community-based approach using the information obtained about the known food crop (spinach)

As current utilization practices of known food crops provide insights into the habits and practices, knowledge, resources, accessing strategies and limitations that communities are faced with – it was decided to assess whether a strategy based on these could be designed that would ensure successful introduction of new crops into the community. This would ensure feasibility, relevance and longevity.

After all the factors and behaviour patterns on which action needed to be taken were studied and questioned until data saturation had occurred (no new information was collected), the action plan was formulated. It was important that objectives were first clearly defined as they guided the design of the intervention plan throughout. There were constant sense-checks made against this objective to ensure a quality outcome. As this intervention focussed on the formulation of a strategy based on the utilization cycle to finally ensure optimal utilization of the unfamiliar crop, it was always kept in mind that the strategy should be based on these identified steps, and that nutrient preservation had to be applied throughout. It was found that the application of this cycle to the research process was sufficient in identifying all the information needed to design the intervention.

It was concluded that each step of the utilization cycle should receive equal focus and attention, as each of the steps impact on the outcome of utilization/non-utilization of the introduced crop. There are also four areas that require additional attention:

1. Reason to use – consumers need to understand the benefit of the crop that will accrue to them and their families to convince them to cultivate it. The benefit must be based on their known (taste, nutrition) and unknown (alleviating deficiencies, convenience, cost saving) needs, as observed on Orange Farm.

2. The cultivation cycle – if this is not understood, participants/respondents may have unrealistic expectations and rapidly decide not to include a crop in their diets if it does not deliver what they expect. On Orange Farm, it was found that the women believed the OFSP plants had perished as there were no leaves visible and they were very surprised to learn that there were still many roots remaining in the soil.

3. Preparation – as this is where most of the nutrient losses can occur, consumers need to fully understand the effect of their actions on the nutritional outcome of the food

they will serve their family. On Orange Farm, spinach leaves were both soaked and cut very fine before cooking. This demonstrates that the women do not comprehend that this leads to nutrient losses.

4. Cooking – here nutrient losses can also occur and can be limited, but it is important to also demonstrate versatility to entice the community to use the crop or product. It was found that spinach was prepared in various different ways and mixed with a variety of ingredients, and then served as a relish.

The overall conclusion of this study was that it is necessary to study each community in depth, to design the nutrition intervention to impact their very specific needs based on a thorough understanding of their current habits and practices. The generic model that was designed from this study can be used as a starting point, but as there are such varying differences between people and communities in South Africa – it is of utmost importance that the strategy should be tailored to their specific needs, down to the finer details. The whole food supply system needs to be evaluated from cultivation and production to the actual consumption and disposal to ensure overall consumer acceptability when it is tailored to new communities.

Feedback from the agricultural extension officers indicated that the likelihood of the successful introduction of a new crop is increased by the above approach, which ensures that the current utilization cycle is analyzed and the manual is adapted to make procession for the restrictions and limitations experienced by the community.

Education is also a very important aspect of implementation - thorough education and explanation vs. simply demonstrating. Education/information and sharing/explanation forms the basis which gives the strategy longevity due to the understanding and acceptance of the community. Training should be relevant, easily understood and mind-opening, should be supported by reference materials that the communities can keep after the agricultural extension officers leave the area, and should be reinforced.

A specific strategy was formulated for the community of Orange Farm to ensure the successful introduction of OFSP, as well as a broader strategy that can be applied to other communities. This specific strategy was evaluated by exposure to agricultural extension officers who visit such communities monthly to facilitate the utilization of crops to improve dietary diversity and alleviate poverty and resultant malnutrition.

It was concluded that the formulated strategy could be effective when implemented in the specific community, as it was nutrition-based, built on a deep consumer understanding, practical and relevant, easy to apply and focussed on participatory training to ensure longevity. It was, however, noted that such an implementation should not ever be a once-off event. Nutrition interventions always require refinement as the environment, tools and resources of low-income communities change constantly and rapidly. It is important that the base strategy is reinforced every time that the community is visited, and that it is refined by interaction with the community to overcome any new obstacles that may have been identified.

6.3 VALUE OF THE STUDY

There were 2 outcomes to this study:

1) A strategy was developed and structured as a visual representation of an intervention for this specific farming community. This model was built on the specific demographics and psychographics of the community, and their habits and practices. The strategy can be applied to guide the introduction of OFSP, and be further refined during introduction.

This model can also easily form the basis for introduction of any other crop – as the consumer understanding will remain, and it could, therefore, be easily adapted for either crop introduction, or any other habit change that agricultural extension officers would like to bring about within the generic food utilization cycle habits and practices that were identified. For example, the exploring that was done, has uncovered other general obstacles that may impact long-term sustainability of home gardening in this specific community, such as access to water, tools, seeds and stems. Considering these in a larger project will also lead to an increase in home-cultivation, dietary diversity and, in the end, improve nutrition deficiencies.

2) A broad strategy that guides the thinking and information gathering process that needs to take place before and while it is being refined for a specific community for a specific food crop, was also designed. A training manual was designed to accompany this model to act as a guideline when this model is refined and applied. This generic model can guide agricultural extension officers through the exploration process to uncover information and habits that form the basis of principles that are currently applied by the community when they utilise foodstuffs. These principles can then either be reinforced if they are conducive to good utilization habits, or can be changed by training and end-benefit visualisation. The strategy

can also be designed specifically for the community of Orange Farm, identify greater elements that may act as restrictions to successful introduction of new crops, obstacles that must first be removed/ addressed before the new crop can be introduced.

6.4 EVALUATION

It is important for the researcher to evaluate the research truthfully and objectively at the end of the investigation. The evaluation of this study was based on the following:

1. Credibility of the study and the results.

The researcher is aware that the outcome of the strategy could be different at different times or for different communities, a different group of respondents or environmental factors. Based on this conclusion regarding the effectiveness of the strategy, it is, therefore, suggested that such a strategy be designed for a specific community and then refined on an ongoing basis to ensure longevity and success.

The researcher ensured the reliability of the base strategy by doing a thorough literature review, by her selection of the design of the actual research programme and the materials used, and her attention to developing an understanding of the community and the problems they faced. The data collection methods also complemented each other and allowed for sense-checks to be done throughout by means of cross-referencing.

Because the basis of the design of this strategy was based on respondent understanding, it was apparent that the respondents were eager to participate and gave truthful answers and provided relevant information. Also, by ensuring confidentiality, the quality and reliability of the data were improved (Mouton, 1998:149).

2. Evaluation of the methods used to gather data and consumer understanding.

An exploratory research strategy was followed, to identify central concepts and constructs, determine patterns and map newly obtained information (Babbie & Mouton, 2001:79, Mouton, 1998:103). The purpose of the study was descriptive in nature, building theory and methodology and thus the study did not include any quantitative data collection and therefore no statistical data analysis was possible. This could have been useful to understand differences and specific needs within the community and is recommended if this research is conducted in a larger sample.

Various types of data collection techniques were applied, including focus group interviews and direct semi-structured observations. These methods complemented each other, allowed for cross-referencing and clarification if needed – and also ensured data collection happened until saturation occurred (until no new information was collected). The methods also provided the benefit of group feedback, opportunity for individual exploration and deeper understanding, as well as observing and reinforcing the discussed methods and habits. This approach can be recommended for similar future studies.

3. Evaluation of the approach to refine the strategy via involvement of agricultural extension officers.

It was found that this approach was effective in developing both the strategy specifically intended for Orange Farm, and the generic strategy that can be easily adapted for implementation by agricultural extension officers in various farming communities. Agricultural extension officers also realized that they do not address all the steps of the utilization cycle when they attempt to introduce new crops into communities. For example, OFSP was previously introduced to the community on Orange Farm in an earlier study by the ARC and the University of Pretoria by means of the development of home gardens – but this did not lead to cultivation and utilization by the community, and highlighted the need for those active in these communities to focus on more than just the cultivation cycle. It was, therefore, concluded that the strategy is a useful tool to provide a more holistic view of elements that need to be considered when a crop is introduced.

4. Achievement of the objectives, goals and problems.

The overriding objective was to determine whether the current utilization cycle of a food crop, and the beliefs, habits and practices that accompany this, can form the basis for the design of a strategy for nutrition intervention through the introduction of an unfamiliar crop to ultimately increase dietary diversity.

From the results it is clear that sufficient information was obtained to answer this objective. It is also clear that it was sufficient to answer the research questions and goals, but that some of the exploration produced information that can only be applied to the specific community. However, the model that was developed can be applied by agricultural extension officers in any community with a modest input to tailor the model to the needs of any new community or new crop or new product. It was clear from the outcomes of this research, that a strategy could be designed based on current utilization practices and successfully used to contribute to optimal utilization of a new food crop by following a community-based approach.

5. Contribution to the body of knowledge with regard to the impact of food utilization on dietary diversity and malnutrition.

The value of research is enhanced if it can also contribute to the theory of the research area. A considerable contribution has been made concerning:

- The importance of a community-based approach to nutrition education;
- The importance of deep consumer understanding to design interventions/strategies with longevity;
- The importance of focus on all elements of the food utilization cycle in delivering quality, nutritious food;
- The importance of creating programmes and interventions that link agriculture and nutrition more closely;
- A request was made by the ARC at Roodeplaat that this strategy is made available to them for implementation when they introduce OFSP into communities, a successful result of the train-the trainer approach.

6.5 FURTHER RESEARCH POSSIBILITIES AND RECOMMENDATIONS

The results of this research have identified certain aspects that could warrant further exploration:

1. Understanding overriding limitations to the cultivation of crops, such as water availability, tools and resources. This can be done for a specific community, or for a specific area or region.
2. Refinement of the generic strategy to one that could potentially be applied to most communities in South Africa. This would require the study of various communities in various provinces to identify common threads that a new strategy can be built on.

Other recommendations that could be made based on this research study, include the following:

1. To ensure that the developed strategy is both applicable to the broader community but also to specific participants – more focus should be placed on the one-on-one research methods such as individual interviews and observations – as these uncovered a great deal of useful information.
2. Observations should also be given more emphasis as this ensured that the participants shared information which they had possibly forgotten when participating in the focus group discussions at the request of the researcher.

3. When one crop is studied in isolation, some elements of the utilization cycle may not be applicable and may not generate any data – for instance, the respondents claimed that they did not have any formal approach to preserving large quantities of spinach as they would only preserve a few leaves at a time. It would be useful to study at least 2 or preferably 3 crops when a strategy is developed for a new community.

6.6 FINAL THOUGHTS

The research focussed on one of the factors that may affect nutritional status of rural communities, but there are many other factors that should also be considered. The research portion of this study was completed to demonstrate how a community-based programme can be designed, based on knowledge gained from interacting with the people within the community.

This study was aimed at contributing to the body of knowledge by proving the relevance and success of interventions in rural communities within the scope of health and nutrition, using a community-based approach. Some of the findings cannot be generalised or used to design a model for other communities, but they identify elements that should enjoy attention when this type of model is developed and refined for another specific community in future.

The process of studying the community and understanding their habits and practices before suggesting a model for implementation provided the opportunity to validate whether construed models for future projects will be viable.

A commonly accepted approach to rural community development was followed, namely to establish programmes, which were referred to in this study as the nutritional intervention (Green, 2004). The lessons learned from this study should be seen as the foundation on which similar interventions can be built.

The basis for the design of this strategy was training – training of the researcher through mentoring and inter alia a thorough literature review, but more so by learning about aspects applicable to the research problem by the participants of this social study. From there – more education was generated, education designed for the community – thus in the end the educator became the educated. This interaction ensured that the research will benefit the participants, because the solutions to problems in our society lie in the willingness to change – both by the community being willing to change their habits to ensure improved nutrition and food security, and thus to achieve an overall better life, and by causing change in the

researcher in terms of being open to the information that was provided by all aspects of the study and not only by the theoretical written body of knowledge.

I would like to conclude with the following:
"Who dares to teach must never cease to learn." -- John Cotton Dana

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ADDENDUM A

MODERATOR GUIDE FOR FOCUS GROUP INTERVIEWS

1. BACKGROUND

1.1 Introductions

1.2 Brief overview of the purpose of the research

1.3 Do you eat spinach?

1.4 Why?/Why not?

1.5 Does every member of the household eat spinach? (Ask who specifically)

1.6 Why?

1.7 How often do you eat spinach? (How many times per week)

1.8 And when do you eat spinach? Lunch/Supper?

1.9 Why that often/seldom?

1.10 How do you eat spinach? (eg. as is, with pap, with bread, with salt)

1.11 Why in that manner?

2. PROCUREMENT/ ACQUISITION

2.1 Where do you get spinach? Do you buy/grow it/ get it from neighbours/as presents, etc.?

2.2 Why?

2.3 Do you buy/get seeds or stems/plants?

2.4 Why?

2.5 If you buy: how much do you pay for spinach per bunch/per bag of seed?

3. CULTIVATION

3.1 Do you grow your own spinach?

3.2 Why/why not?

3.3 What do you use for planting (Probe: stems/seeds for planting/re-planting)

3.4 Why?

3.5 How do you acquire stems/seeds for planting (if you did not buy)?

3.6 Why?

3.7 How often do you plant spinach? (How many months of the year)

3.8 Why that often?

3.9 How often do you harvest spinach? (How many times per month)

3.10 Why that often?

3.11 Do you prepare the garden in any special way before you plant spinach?

3.12 If yes, how do you prepare the garden before you plant spinach? (Probe for compost, spacing, etc.)

3.13 Why?

3.14 How do you care for the spinach plants? (Probe for how regularly do you water, do you remove weeds, fertilize, etc.)

3.15 Why?

3.16 How long does spinach take to grow before you can harvest? (In months)

3.17 For how many months of the year can you grow spinach here?

4. HARVESTING

4.1 How do you know when to harvest spinach?

4.2 How do you harvest spinach? (whole plant, outer leaves)

4.3 Why in that manner?

4.4 When do you harvest? (Time of day)

4.5 Why at that particular time?

4.6 If only leaves are removed, how many times do you harvest from every plant?

4.7 Why?

4.8 Which tools do you used for harvesting?

4.9 Why?

4.10 What is the yield of spinach per plant (How many leaves over time)?

4.11 Do you prepare the spinach immediately or store it first?

4.12 Why?

4.13 Where do you store the harvested leaves?

4.14 Why?

4.15 How do you store the leaves?

4.16 Why?

4.17 How long can you store the harvested leaves?

4.18 Why?

5. PREPARATION & COOKING

5.1 Are there different ways of cooking spinach?

5.2 What are they?

5.3 Why would you cook the spinach differently?

5.4 Do you prepare the spinach differently for each of the cooking methods?

5.5 Why?

5.6 How do you cook spinach? (in pots, etc.)

5.7 Why?

5.8 How much spinach do you cook at a time? (how many leaves)

5.9 Why?

5.10 Do you add any ingredients to the spinach?

5.11 Which ingredients do you add to spinach? (eg. butter, salt, etc.)

5.12 Why?

5.13 How long does it take to cook spinach?

5.14 Why?

6. CONSUMPTION

6.1 How much spinach is consumed on one occasion per person?

6.2 Why?

6.3 How do you eat the spinach? (utensils, etc.)

6.4 Why?

6.5 Do you eat spinach with other foods?

6.6 Why?

6.7 Do you serve spinach to each household member individually, or does the family eat from one dish?

6.8 Why?

7. STORAGE/PRESERVATION

7.1 Do you store unconsumed, cooked spinach?

7.2 Why?

7.3 How long would you store unconsumed, cooked spinach?

7.4 Why?

7.5 How do you store unconsumed, cooked spinach?

7.6 Why?

8. DISPOSAL

8.1 Do you ever dispose of/discard unconsumed, cooked spinach?

8.2 How do you dispose of/discard unconsumed, cooked spinach?

8.3 Why?

8.4 How do you dispose of uncooked plant materials (such as peels and stems)?

8.5 Why?

ADDENDUM B

GUIDELINE FOR DIRECT UNSTRUCTURED OBSERVATIONS OF THE SPINACH ACQUISITION CYCLE

Activity	Element	Observation
Procurement/ Acquisition	• Method • Equipment	
Cultivation	• Soil preparation • Planting • Watering • Maintenance – removing weeds etc.	
Harvesting	• Timing • Equipment • Quantity • Method	
Preparation	• Equipment • Activities	
Cooking	• Equipment • Method • Ingredients added • Time	
Consumption	• Portion sizes • Utensils • Other items consumed with • Serving	
Storage/ Preservation	• Time • Method	
Disposal	• Method	

TRAINING MANUAL FOR AGRICULTURAL EXTENSION OFFICERS FOR COMMUNITY-BASED INTRODUCTION OF ORANGE-FLESHED SWEET POTATO (OFSP)

INTRODUCTION

Dear agricultural extension officer. This manual is a guideline to introduce orange-fleshed sweet potato (OFSP) to the communities you serve. The aim of this is to motivate the community to cultivate and utilize this crop to improve their dietary diversity. The manual is based on the current habits, practices and beliefs identified in a community with regard to crop cultivation and utilization, as well as resources and tools available.

To make the strategy relevant to the community you serve, you need to study the community and their cultivation and utilization practices beforehand, as well as conduct other preliminary work (pre-work). This will identify the aspects that are key to the success of the intervention within a specific community, which may require that certain elements of the strategy is adapted or changed.

It will take approximately two days to teach the community all the steps of the strategy, but you also need to continue visiting the community to assess whether the crop is being utilized. It is also advisable to work closely with the local medical community, for example a nurse at the local clinic, to strengthen and enforce the information provided on the nutritional benefits of a varied diet. A food-based manual would also complement the content of this manual.

This manual encourages group interaction and the use of visual aids, because this makes it easier to involve illiterate consumers. It has been written to educate the person in the household who is responsible for food preparation, this is usually the mother or grandmother, however all females in the household can be involved as wide community involvement will improve the impact and ensure longevity of the project.

A reference version of this manual is also provided that can be used in field.

This manual is based on the steps shown in Figure 1 (the educational framework); and the subsequent steps are discussed in a dedicated section for each step. The objective and key message for each step are indicated, as well as the approach and the pre-work required. Tools required for the implementation, and important keywords are specified.

The approach is summarized as per Table 1.

The overall implementation of the strategy is a problem-solution format, and was formulated in four phases, and was also explained in these steps:

1. Addressing shortcomings of current diet (Identifying which actions and behaviour are not ideal and reasons for this);
2. Addressing the main underlying cause (Usually the lack of dietary diversity);
3. Proposed changes (Inclusion of OFSP in their diets); and
4. Desired outcome (Utilization of OFSP roots or leaves or both).

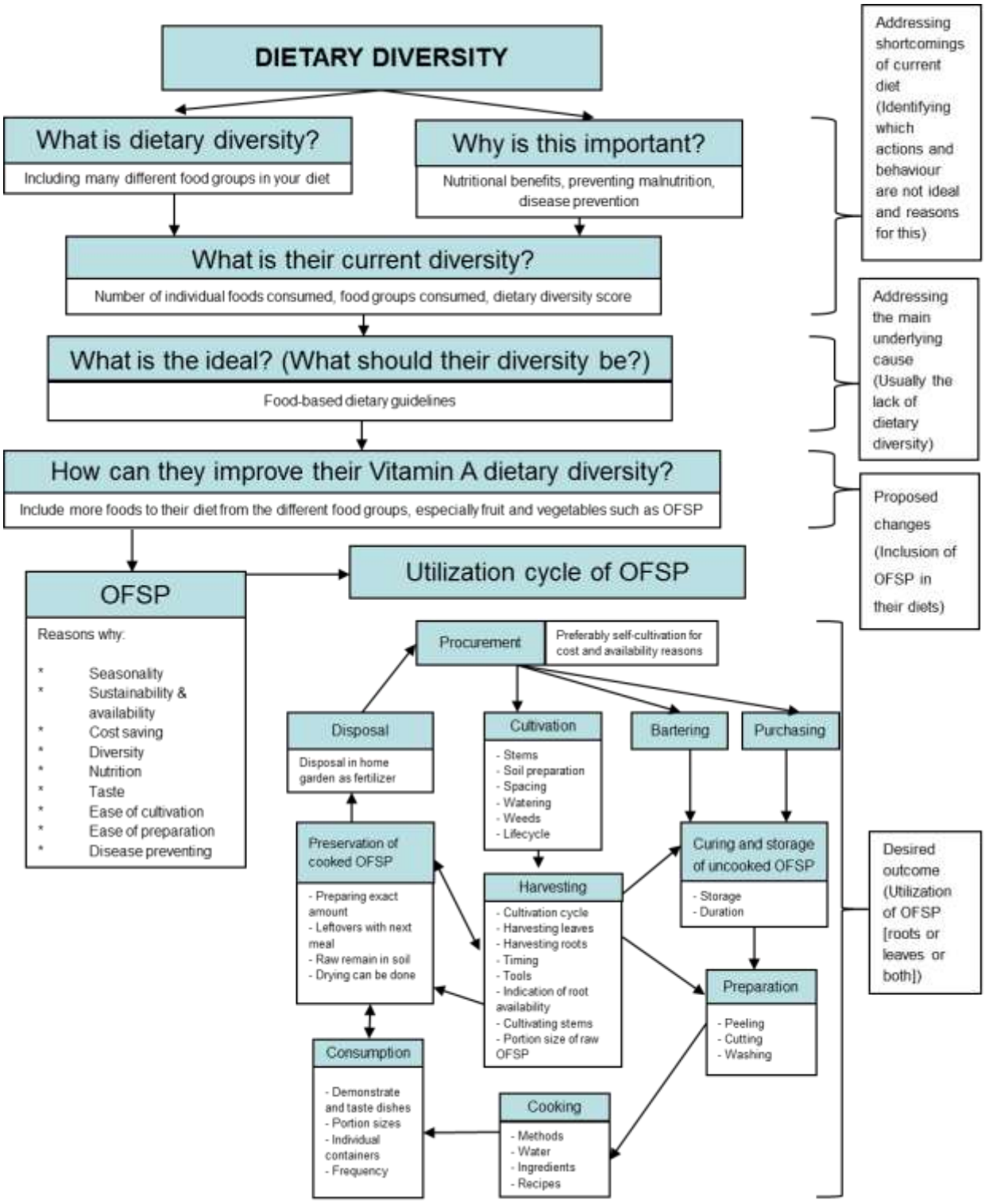


FIGURE 1: EDUCATIONAL FRAMEWORK FOR THE INTRODUCTION OF OFSP/A NEW CROP

TABLE 1: SUMMARY OF STRATEGY TO INTRODUCE OFSP

Phase & theme	Objective and approach	Key message & Key words	Pre-work	Implementation and tools	Manual page no
1. Address shortcomings of current diet: *What is dietary diversity and why is it important?*	Demonstrate that their diet is low in diversity.	Enjoy a variety of foods to access various nutrients. KEYWORDS: Dietary Diversity, Variety	Identify crops/foods they are familiar with.	1. Probe meaning of dietary diversity. 2. Provide correct definition. 3. Probe importance of dietary diversity. 4. Explain importance of dietary diversity. TOOLS: Training tool 1 & Flip-chart.	6
2. Address main underlying cause: *What is their current diversity and what is the ideal?*	Demonstrate how poor dietary diversity causes deficiencies and educate on varied diet.	Diversity refers to consuming foods from 3 different main groups; follow the food-based dietary guidelines. KEYWORDS: Variety, Malnutrition	1. 7-day diary of foods consumed. 2. Nutritional analysis. 3. Identify lacking nutrients. 4. Identify diseases experienced, update training tool number 3. 5. Update training tool 2.	1. Plate activity. 2. Self-evaluation of diet. 3. Provide nutritional analysis of diets. 4. Discuss dietary diversity in relation to malnutrition. 5. Cover the FBDGs. TOOLS: Diary, Food-finder, training tool 2+3	7
3. Proposed changes: *How can they improve their dietary diversity?*	Demonstrate that inclusion of OFSP can improve dietary diversity and has many benefits	OFSP is easy to cultivate, costs little, is tasty and will alleviate health issues. KEYWORDS: Sustainable, Available, Cost-saving, Nutritious, Tasty, Disease preventing, Versatile	1. Identify driver behind crops currently cultivated and consumed. 2. Develop list of reasons to cultivate based on drivers. 3. Make benefits easy to understand.	1. Seasonality 2. Sustainability & availability 3. Cost saving 4. Diversity 5. Nutrition 6. Taste 7. Ease of cultivation 8. Ease of preparation 9. Disease preventing 10. Various uses	8-9
4. Desired outcome: *The utilization cycle of orange-fleshed sweet potato*	Illustrate that cultivation and utilization cycle is simple and very similar to other cultivated crops.		1. Observe utilization of spinach/other crop 2. Identify barriers and enablers. 3. Make notes: tools, resources, water.	Cultivation steps as indicated in Faber et al. (2006), as well as additional information summarized below:	10
4.1 Procurement	Encourage establishing home garden and/or inclusion of OFSP.		Identify main food accessing strategy.	1. Educate on procurement options. 2. Focus on cultivation. 3. Encourage replanting of stems.	10
4.2 Cultivation	Showcase that crop is easy to grow and maintain.		Identify how to apply tools and equipment available for cultivation.	1. Discuss garden preparation, planting, watering, weeding. 2. Address water access issues.	10-11
4.3 Harvesting	Educate on signals indicating readiness for harvesting.		1. Understand current harvesting habits and quantity. 2. Identify tools available. 3. Enquire as to signals used to assess readiness for harvesting.	1. Time lapse between planting and harvesting. 2. How to identify readiness. 3. Quantity to be harvested. 4. Harvesting of various parts of the plant.	11
4.4 Preparation	Illustrate crop is easy to prepare for cooking.		1. Identify preparation methods.	1. Thorough washing without soaking.	11-12

Phase & theme	Objective and approach	Key message & Key words	Pre-work	Implementation and tools	Manual page no
			2. Identify utensils that are available.	2. Trim off spoiled or discoloured portions. 3. Scrape skin vs. peeling. 4. Use a sharp knife. 5. Do not wash or soak after cutting. 6. Cut in larger pieces if cut.	
4.5 Cooking	Illustrate crop is easy to prepare with current cooking facilities.		1. Identify heat and energy sources. 2. Observe average cooking time. 3. Identify additional ingredients.	1. Illustrate basic cooking methods. 2. Encourage methods that retain maximum nutrients.	12
4.6 Consumption	Illustrate that the crop can form part of the meals just like many other vegetables do already.		1. Understand how vegetables and starchy vegetables are consumed. 2. Identify other possible recipes. 3. Enquire as to how portion size is determined.	1. Serve dishes that accompany pap or fit easily into the current menu 2. Educate on correct portion size.	12-13
4.7 Preservation and Disposal	Encourage preparation of what is needed, not more (prevent waste)		1. Observe current preservation and disposal methods. 2. Observe habits relating to discarding organic matter.	1. Advise that only what is needed for meal must be prepared. 2. Encourage to include leftover cooked food in next meal. 3. Dispose of uncooked parts in garden as compost. 4. Preserve raw harvested crop in cold part of home. 5. Cut into big pieces and dry in indirect sunlight.	13
5. Measuring success of the intervention	Assess whether the community intend to include OFSP in their diet.		1. Prepare a nutritional analysis of their diet including some of the prepared OFSP dishes.	1. Repeat plate exercise. 2. Share nutritional analysis and list diseases alleviated 3. Provide poster as reminder of dietary diversity importance. TOOLS: Training tools 2+6	14

1. ADDRESSING SHORTCOMINGS OF CURRENT DIET

What is dietary diversity and why is it important?

Objective: To explain and demonstrate how the diet of the community lacks diversity to ensure that they are interested in the proposed solution.

Key message: People should enjoy a large variety of foods. Because different foods contain different nutrients, and our bodies require a large amount of nutrients to function adequately, the best way to ensure intake of all nutrients is to enjoy a varied diet from all the food groups.

Keywords: Dietary diversity, Variety.

Approach: Dietary diversity is an effective starting point to motivate people to include a new or unknown or unfamiliar crop in their diets. People are mostly unaware of the meaning of or the importance of dietary diversity, and therefore do not strive to include foodstuffs from varied sources in their individual meals or daily food intake patterns. Simply introducing a new crop to them, even educating communities on the benefits of the crop, does not always result in consumption if the benefit is not simplistically presented and understood by the target community.

Pre-work: 1. Identify crops/foodstuffs that the community is familiar with to illustrate the importance of a varied diet.

Tools: a) Training tool 1: Visual aids can be used to demonstrate how different foods (focusing on foods known to the community) contain different nutrients, as well as the benefits that each offers to the body.
b) Flip-chart

Implementation: 1. To address the element of dietary diversity, facilitate a group discussion about dietary diversity. First ask the community to explain what they perceive the meaning to be, and note these on a flip-chart.
2. Provide the community with the standard definition of dietary diversity, i.e. including a wide variety of foods in their diet.

3. Initiate another discussion to probe what they think the importance of dietary diversity is. These can once again be noted on a flip-chart.

4. Inform them of two of the key benefits of dietary diversity, that of:

a) Nutritional benefits (accessing various nutrients from various food sources), as well as

b) Preventing malnutrition

2. ADDRESSING MAIN UNDERLYING CAUSE

What does their diet currently consist of (What is their current diversity?), and what is the ideal?

Objective: To demonstrate how their current poor dietary diversity can cause deficiencies, and educate on what a varied diet consists of.

Key message: Diversity refers to consuming foods from the 3 (different) main groups (starch, protein, fruit & vegetables) in the same meal as well as during the course of the day. Follow the food-based dietary guidelines (FBDGs)[1].

Keywords: Variety, Malnutrition.

Approach: It is easier for someone to understand that their diet lacks diversity if it is documented (i.e. diarised) or visually presented. Providing education about dietary diversity in relation to malnutrition will improve the understanding of why they should consider consuming the newly presented food crop so that it will prevent diseases.

Pre-work:

1.Identify what the community currently consume during a 7-day week.
2. Conduct a nutritional analysis.
3. Identify nutrients/vitamins/minerals that are low in intake or that are not available at all based on their current diversity.
4. Identify diseases that are experienced within the community, and link these to the lacking nutrients, and develop a visual aid such as training tool 3.
5. Update foods of training tool 2 if necessary to ensure it includes foods consumed as identified in the food diary.

Tools:

a) Diary to record weekly foods consumed.
b) Food-finder or other software to conduct nutritional analysis.
c) Training Tool 2 or other appropriate visual aid that demonstrates dietary diversity.
d) Training Tool 3 or other appropriate visual aid that demonstrates nutrient specific malnutrition.

Implementation:

1. Start with an activity to illustrate their current dietary diversity by providing images of various foodstuffs and images of plates (Training Tool 2).
2. Request that the participants demonstrate what their three main meals consisted of the previous day by placing the food images on the plates in the three sections of protein, starch, and fruits and vegetables.
3. Ask that the community to evaluate their own diets in relation to the definition that they provided for dietary diversity, and identify what is lacking.
4. Provide the participants with the nutritional analysis of what they consumed by illustrating how this could be causing some of the diseases that are experienced in the community (updated training tool 3).
5. Discuss the importance of dietary diversity in relation to malnutrition. Establish the link between the consumption of a variety of fruits and vegetables and the intake of vitamins and minerals and the prevention of diseases.
6. Cover the food-based dietary guidelines (FBGDs)[1].

3. PROPOSED CHANGES

How can they improve their dietary diversity?

Objective:	Demonstrate that the inclusion of OFSP can improve the community's dietary diversity.
Key message:	OFSP is easy to cultivate, costs very little to cultivate in the home garden, it is tasty to eat and will alleviate some of the health issues the community is facing.
Keywords:	Sustainable, Available, Cost-saving, Nutritious, Tasty, Disease preventing, Versatile (translated to local language).
Approach:	People are more likely to include a crop in their diets if they are aware of its benefits – main benefits for low-income communities include aspects such as nutrition, cost-saving, taste and convenience.
Pre-work:	1. Understand the reasons why they are cultivating and consuming the crops that are currently included in their diets – thus the main drivers. 2. Use these main drivers to develop a list of reasons why they should also cultivate and utilize OFSP. 3. Ensure that the benefits are easy to understand (describing them in the local language), for example, when focusing on nutrition: it will prevent children from becoming sick.
Implementation:	1. After the inclusion of varied foods as a solution to low dietary diversity has been presented, the inclusion of OFSP as a crop containing high amounts of vitamin A can then be covered, using the utilization cycle and recommending that this crop be included in their diets by focusing on benefits such as: a) Seasonality: the crop grows for most of the year, and can withstand drought and frost *(Local language example: It is always there).* b) Sustainability & availability: as the crop is easy to cultivate and grows with limited maintenance it ensures availability throughout

the year. It is also self-sustaining as shoots can be used to replant *(Local language example: It is a hardy/strong crop).*

c) Cost-saving: shoots can be purchased once-off and then the plant is self-sustaining.

d) Diversity: it adds to dietary diversity *(Local language example: Then you will have many different foods to eat).*

e) Nutrition: provides a good supply of energy as well as vitamins and minerals *(Local language example: It makes you healthy and strong).*

f) Taste: the crop is very tasty.

g) Ease of cultivation: it is a hardy crop, does not require high levels of input and is drought tolerant.

h) Ease of preparation: it is easy to prepare and can be prepared in many different ways.

i) Disease preventing: vitamins and mineral contents aid in preventing diseases *(Local language example: Helps the children fight sickness).*

j) Various uses: roots can be eaten raw, boiled or baked, the tops and shoots of young leaves can be eaten as a vegetable, crop residues can be used for livestock, and roots can also be used to make starch, flour, jam and juice.

4. DESIRED OUTCOME

The utilization cycle of orange-fleshed sweet potatoes

Objective: Illustrate that cultivation and the utilization cycle is simple and that they are not significantly different to spinach or another widely consumed crop.

Approach: People are more likely to adopt a new crop if it mirrors their current utilization practices of other self-cultivated crops.

Pre-work:
1. Observe the utilization cycle of spinach within the community.
2. Identify habits and practices related to the cycle as listed below that can be used as a basis to educate on the utilization cycle of a new crop, or elements that deviate from this strategy.
3. Make note of tools and resources available, as well as access to water.

Implementation:
1.The main steps of cultivation can be covered according to the steps outlined in Faber *et al.* (2006)[2] which explains how to cultivate and harvest OFSP (Training Tool 4), and in Faber, M, Laurie, S, Mall, A & Andrade, M (2010)[3] which outlines how a vitamin A rich vegetable garden can be planned.
2. The following steps (4.1-4.7) in the utilization cycle should be covered while the community is being educated about the cycle, as this stems from the patterns observed when spinach was utilized, and will ensure successful introduction within the community:

4.1 Procurement

Objective: Many low-income communities keep home gardens, and they should be encouraged to include the new crop in their gardens as this will result in it being more accessible and that the community will consume the crop more often, thereby increasing dietary diversity.

Pre-work: 1. Identify whether the community do tend home gardens and whether they have access to shops and whether they barter within the community.

Implementation: 1. Inform the community that there are various ways to procure OSFP such as:
- Purchasing (stems/roots);
- Bartering; and
- Cultivation.

2. Focus on cultivation in home gardens as it saves costs and is sustainable.

3. Encourage the community to procure and re-plant the stems continuously, as they can follow this practice even during the winter period by placing them in a pot inside the house.

4.2 Cultivation

Objective: Women usually tend to home gardens, and cultivate crops that are relatively easy to grow and maintain. They should be convinced that OFSP is easily included in their gardens and is not a labour-intensive crop.

Pre-work: 1. Identify what is available for cultivation, natural resources within their environment, as well as tools and equipment.

Implementation: 1. Discuss garden preparation, planting, watering and weed control when cultivation is discussed, and ensure that the community understands that the methods are simple and low cost.

2. If need be, address water solutions such as gathering dew/rainwater.

4.3 Harvesting

Objective: Women harvest as needed for consumption. They need to look for signals to indicate that the crop is ready for harvesting.

Pre-work: 1. Understand how often they harvest spinach and how much is harvested as well as the reasons behind this approach.

2. Identify which tools are used to harvest spinach and how these can be applied to the new crop.
3. Enquire how they know that the spinach is ready for harvesting, and see whether this approach can be re-applied/altered to identify OFSP readiness.

Implementation: Four important aspects of harvesting that should be emphasized are:
1. Timing (time lapse between planting and harvesting) this for OFSP is 4.5-5 months after planting[2]. Teach the community that for spinach, the time lapse is much shorter.
2. How to identify readiness for harvesting. Leaf size (be specific for the OFSP species that was planted), or cultivation timing can be applied (by recording the date that it was planted on a calendar). The latter is the more dependable approach because the leaves of the OFSP plant sometimes perish while the roots remain in the soil.
3. Quantity to harvest: 0.5kg of OFSP will yield approximately 3 portions[3]. This is approximately 3 large sized sweet potatoes[5].
4. Educate the community that if they harvest all the roots, the leaves and stems can be prepared as spinach/morogo as a relish.

4.4 Preparation

Objective: Illustrate that the crop is easy to prepare for cooking.

Pre-work: 1. Identify what their preferred preparation methods are to address these and provide perspective on the nutrient retention of the approach.
2. Observe which utensils they have available to prepare OFSP.

Implementation: Guidelines for preparation of OFSP are as follows[5]:
1. Encourage thorough washing of the that the OFSP roots and leaves. Washing is essential as it removes soil, pesticide contaminants, microorganisms and mycotoxins. The OFSP should not be soaked.
2. Spoiled and discoloured portions should be trimmed off.
3. If the skin is removed, it should be scraped, not peeled, as most of the nutrients are located under the skin.
4. If the skin is too thick to be scraped, the OFSP should first be cooked before it is peeled to retain nutrients.

5. Using a sharp knife for cutting ensures that the minimum amount of nutrients is lost. If a blunt knife used during the preparation of vegetables it will cause a decrease in vitamin and mineral content as seepage will occur from the ruptured plant cells into the water during boiling.
6. Washing or soaking the OFSP after it has been cut will lead to more nutrient losses. The roots and leaves should be properly cleaned before it is cut.
7. If the OFSP is cut, encourage the community to cut it into large pieces, as smaller pieces will expose a larger surface area, which will lead to higher nutrient losses during cooking due seepage from ruptured plant cells.

4.5 Cooking

Objective: Illustrate that the crop is easy to prepare with the cooking facilities they currently have available, because electricity is not widely available in low-income communities, so many women use gas stoves or fires.

Pre-work:
1. Identify heat and energy sources available and used.
2. Observe what the average cooking time is for other vegetables and reasons for this approach.
3. Identify additional ingredients available in the house, or accessible to the participants, and which ones they generally tend to add to vegetable dishes.

Implementation:
1. Cooking can be demonstrated by illustrating basic cooking methods (boiling, baking or roasting in the coals), and recipes can also be demonstrated (refer to training tool 5 for sample recipes[4], more recipes are available in Faber *et al.,* (2006:121-127)[2]).
2. Encourage cooking methods such as baking in the skin which will retain the most nutrients. If they choose to boil the product, encourage them to boil it in the skin and peel it afterwards. As vitamin A as well as other vitamins is heat sensitive; any intense or direct heat will lead to increased losses[6]. Discourage the use of a high volume of water as this will lead to increased losses of vitamins and minerals that dissolve in the water.

4.6 Consumption

Objective: Illustrate that OFSP can also be prepared in the same way in which other vegetables that they currently consume are prepared. In the case of spinach for example, that OFSP can also be prepared as a relish to accompany starchy foods.

Pre-work:
1. Understand how all vegetables and specifically starchy vegetables are consumed
2. Identify other products or recipes prepared with vegetables where OFSP can replace some of the ingredients.
3. Enquire as to how they determine portion size (such as a specific spoon, etc.) and ensure that a portion size of OFSP can be illustrated using the same approach.

Implementation:
1. Serve a prepared relish together with pap or serve it with other dishes that are regularly consumed.
2. Educate the community about the correct portion size per person (on average 1/2 cup of cooked OFSP)[4].

4.7 Preservation and disposal

Objective: Encourage the community to prepare only what is required for one meal, as most low-income families do not have access to fridges or freezers.

Pre-work:
1. Observe what their current preservation/disposal methods are.
2. Observe whether they prepare a compost heap or discard organic matter in their gardens or provide it to their livestock as feed.

Implementation:
1.Advise participants to only prepare sufficient amounts for their family's consumption for one meal.
2. Advise them to include any leftover sweet potato in their next meal, and not to leave it standing overnight, but rather to dispose of it as compost in the garden.
3. The community can be advised to also dispose of any uncooked sweet potato pieces, skins or leaves in their gardens as compost.

4. Preserving the raw crop (roots or leaves) may be required during winter. Roots can be removed from the soil and stored in the house. In very cold regions, the roots should be removed from the soil at the beginning of winter.
5. The roots can also be cut into big pieces and dried/dehydrated in indirect sunlight (direct sunlight can destroy certain nutrients).

5. Measuring success of the intervention

Objective: Assess whether the community are planning to include OFSP in their diets.

Pre-work:

1. Prepare a nutritional analysis of a diet including OFSP dishes found to be appealing to the community, focusing on the increase of vitamin A content and again linking it to diseases experienced in the community.

Implementation:

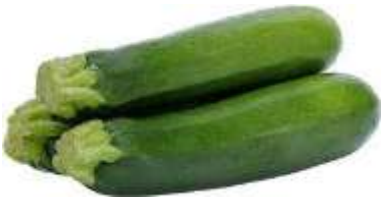
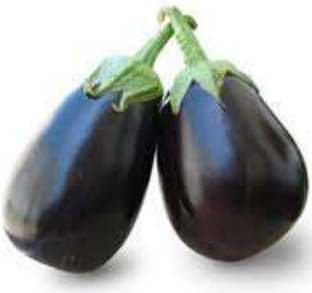
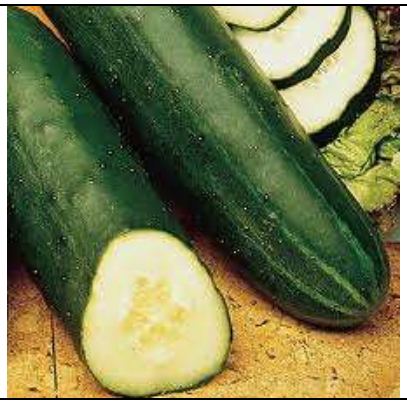
1. The implementation can be concluded by requesting that participants once again prepare plates of a main meal they will be consuming the next day. Inclusion of OFSP and a wider variety of foods will indicate that the education was successful.
2. Share the nutritional analysis of the new varied diet and indicate which diseases will be alleviated
3. Provide the participants with the poster attached in Training Tool 6 to remind them of the importance of dietary diversity.

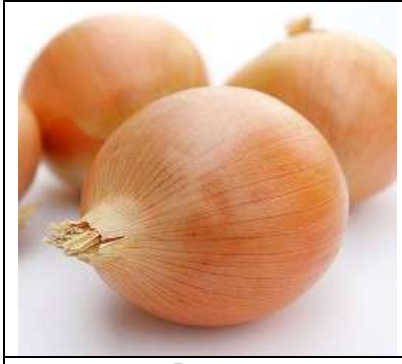
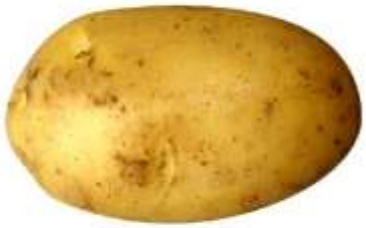
TRAINING TOOL 1
VISUAL AID TO DEMONSTRATE IMPORTANCE OF A VARIED DIET

Vitamin/Mineral	Foodstuff/Source	Role in the body	Translation
Vitamin A			Seeing in the dark
	Orange-fleshed sweet potato	Vision	
Vitamin C			Fights germs
	Orange	Disease preventing	
Vitamin D			Strong bones
	Fatty Fish	Bone calcification	
Vitamin E			Healthy person
	Plant oil (such as sunflower)	Strengthens immunity	
Vitamin K			No bleeding
	Spinach	Blood-clotting factors	

TRAINING TOOL 2
PLATE AND FOOD VISUALS TO DEMONSTRATE DIETARY DIVERSITY

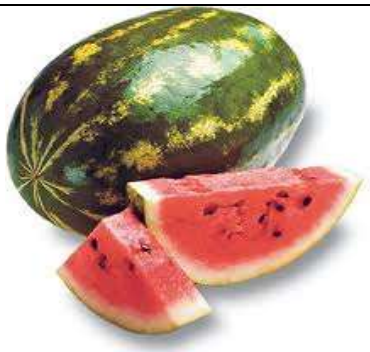
2.1 VEGETABLES:

Baby Marrow	Beetroot	Brinjal/Egg plant
		
Cabbage	Carrot	Cauliflower
		
Corn	Cucumber	Green bean
		
Lettuce	Mushroom	Orange-fleshed sweet potato
		

Onion	Peas	Pepper
		
Potato	Pumpkin	Spinach
		
Tomato	Turnip	Wild leaves (Morogo)
		

2.2 FRUITS

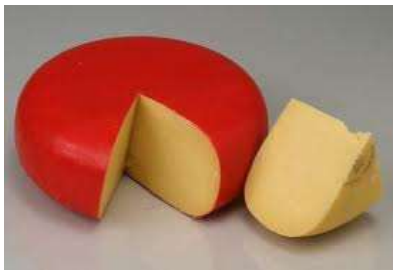
Apple	Apricot	Avocado
		
Banana	**Dried fruit**	**Grapefruit**
		
Grape	**Guava**	**Mango**
		
Marula	**Melon**	**Naartjie**
		

Orange	Pawpaw	Peach
		
Pear	**Pineapple**	**Prickly pear**
		
Strawberry	**Watermelon**	**Wild berry**
		

2.3 STARCH/CEREALS

Bread	Dumplings	Mabela/Maltabella porridge
		
Maize meal	**Oats**	**Pasta/Noodles**
		
Rice	**Samp**	**Vetkoek**
		
Wheat		
		

2.4 PROTEIN

Cheese	Chicken	Cold & processed meat
		
Cow's milk	Dried beans, peas & legumes	Eggs
		
Fish	Peanut Butter	Pork
		
Red meat	Sausage	Soya mince
		

TRAINING TOOL 3
THE CONSEQUENCES OF MALNUTRITION

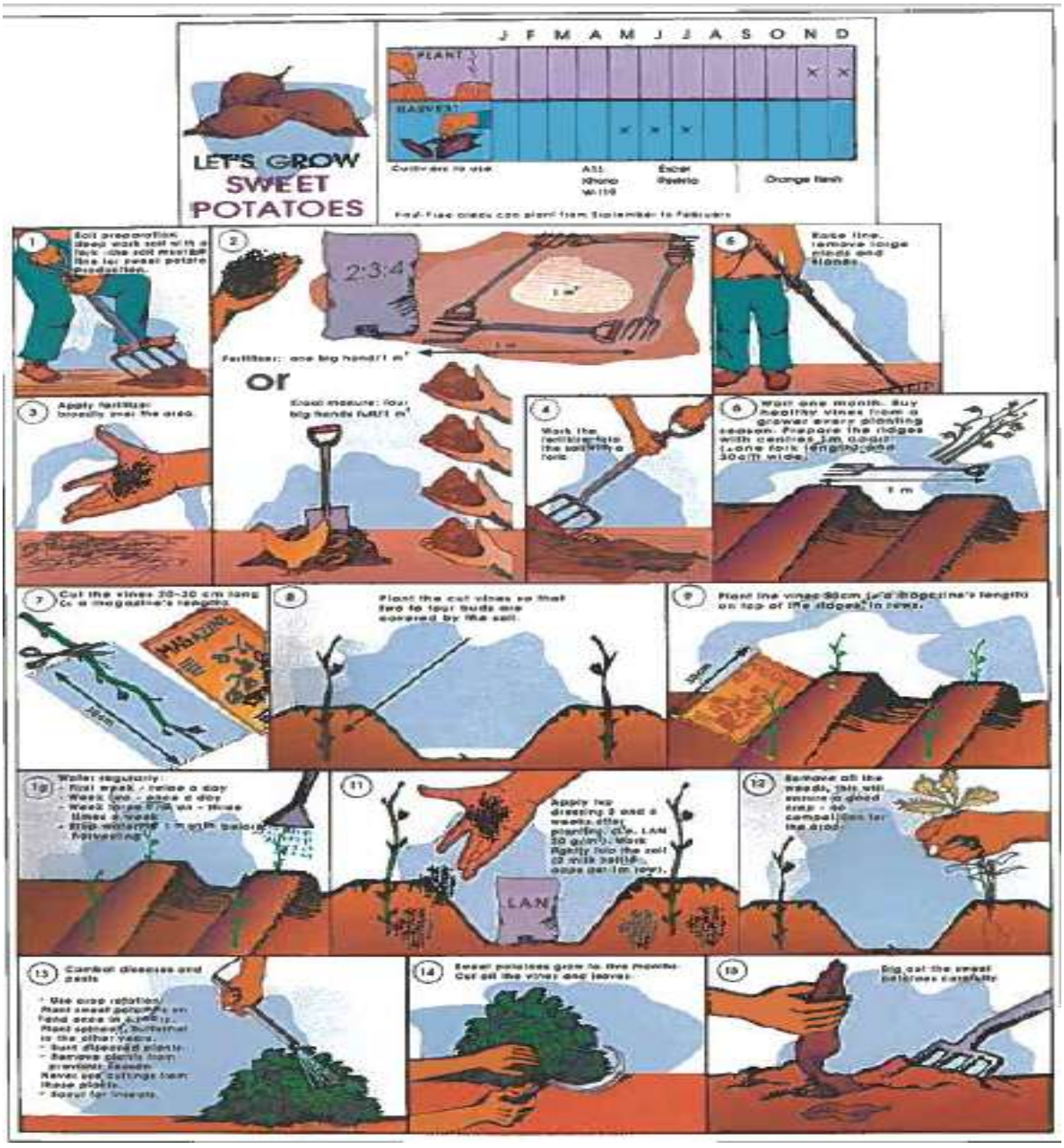
(FOCUS ON VITAMIN A DEFICIENCIES)

1. Night blindness:
   - The inability to see in poor lighting conditions like those which prevail at the end of the day when the sun is setting, and it takes longer to adapt vision to the dark, when a person moves from a lighter to a darker environment.
   - People will complain of stumbling over objects in the house or that children can't find their parents in the house in the evening.
2. Loss of mucus in the eye:
   - Conjunctival xerosis: Dry appearance of the cornea.
   - Bitot spots: A triangular whitish, pearly coloured spot, which is usually found on the lateral side of the conjunctiva, and has a foamy appearance.

CONJUNCTIVAL XEROSIS	BITOT SPOTS
	

3. Follicular hyperkeratosis – skin changes, hair follicles become plugged, giving skin a lumpy appearance.

TRAINING TOOL 4
STEPS IN CULTIVATION AND HARVESTING OF OFSP
(Faber et al., 2006: 70)



TRAINING TOOL 5
ORANGE-FLESHED SWEET POTATO RECIPES
(Vieira, 2006)

Reference for sizes of sweet potato:

Small: <180g	Medium: 180-220g	Large: 220g<

1. STEAMED SWEET POTATO BREAD

Recipe yield: 6-8 portions
Total preparation (preparing & serving) time: 2 hours
Serving suggestion: Serve with sweet potato leaf relish

INGREDIENTS:

3 small sweet potatoes
3 cups (750 ml) white bread flour
1 packet (10 g) dry active yeast
¾ teaspoon sugar
1 ½ teaspoons salt
± ¾ cups of warm water (keep the water the sweet potato was boiled in)
2 teaspoons of sunflower oil

METHOD:

1. Chop the sweet potato into equally sized pieces (without removing the skin).	
2. Place the sweet potato in to a pot with water and boil for 20 minutes.	
3. Drain the cooked sweet potato and keep the liquid.	

4. Cool the sweet potato down and peel it once cooled, removing only the skin and avoiding the unnecessary removal of sweet potato flesh.	
5. Mash the sweet potato together with a small amount of sunflower oil.	
6. Add the sweet potato mash to the dry ingredients (flour, salt, sugar, yeast).	
7. Using your fingertips, mix the mash and the dry ingredients.	
8. Add the warm water (3/4 of a cup) that was used to boil the sweet potato. Add gradually until a soft dough is formed.	

	
9. Knead the dough for 5 minutes until it is soft and forms a ball.	
10. Leave to rise in a warm place (for example in a plastic bag) for 30 minutes until it has doubled in size.	 
11. After the dough has doubled in size, knead again for 2 minutes.	

12. Place in a greased pot. Let it rise for a further 30 minutes.	
13. When it has once again doubled in volume, cover the pot with a lid, and steam the bread on a warm fire (or stove-top on the lowest setting) for 1 hour. Do NOT remove the lid while cooking. To test if cooked, insert a knife into the center of the loaf and then withdraw again; if it comes out clean the bread is cooked.	 

2. SPICY SWEET POTATO RELISH

Recipe yield: 12 portions

Total preparation (preparing & serving) time: 1 hour 10 minutes

Serving suggestion: Serve with sweet potato bread or with pap

INGREDIENTS:

1 small onion
4 large garlic cloves
2 tablespoons sunflower oil
2 medium tomatoes
2 tablespoons tomato paste
1 tablespoon paprika
½ teaspoon peri-peri spice
1 teaspoon salt
4 cups of water
¼ medium cabbage
12 green beans
2 small carrots
2 medium sweet potatoes
2 sweet peppers, red, green or yellow (***optional***)
2 chillis (optional)
1½ teaspoon corn flour (maizena)

METHOD:

1. Peel the onion, sweet potatoes and garlic.	

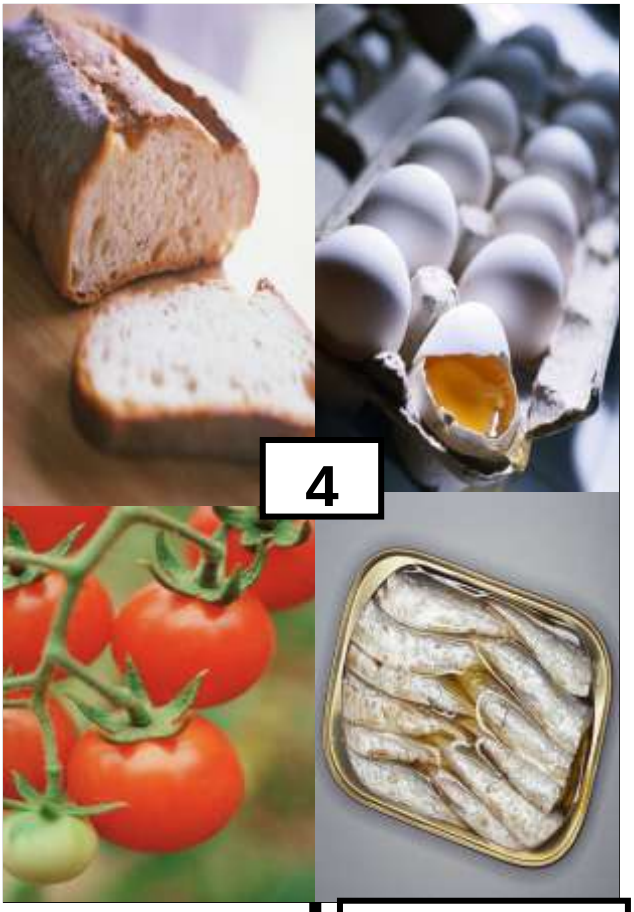
	 
2. Remove the outer layer of the cabbage and the central hard core.	
3. Chop the garlic, tomato and onions into rough dice-sized pieces, without removing the skin and seeds of the tomato. Cut the chilli into small pieces.	 

	
4. Chop the green beans.	
5. Shred the cabbage and set aside.	
6. Grate the carrots and the sweet potato.	 

7. Place the sunflower oil, chopped onions, garlic and tomato in a pot or pan and cook on medium heat for 5 minutes or until soft.	
8. Add the tomato paste, paprika, chillis and peri-peri spice to the onion mixture. Mix well and add 4 cups of water. Season with salt.	
9. Add the grated carrots, sliced green beans and shredded cabbage to the tomato mixture, cover and cook for 20 minutes on medium heat.	
10. Add the grated sweet potato and cook on medium heat for a further 15 minutes, or until the sweet potato is cooked. Stir occasionally to prevent sticking.	
11. After the relish is cooked, prepare a paste with the cornflour and 1 tablespoon of water. Stir the paste into the relish and allow it to thicken. Remove from heat. The relish is now ready to serve. It can be served hot or cold.	

TRAINING TOOL 6
POSTER TO ILLUSTRATE IMPORTANCE OF DIETARY DIVERSITY

EAT MANY DIFFERENT FOODS



Less variety results in higher risk of malnutrition and deficiencies

More variety results in reduced risk of malnutrition and deficiencies

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